Sleep Well

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Introduction

"Sleep is an acquired habit. Cells don't sleep. Fish swim in the water all night. Even a horse doesn't sleep. A man doesn't need any sleep."
--- Thomas Edison, inventor

"I never use an alarm clock. I can hardly wait until five a.m. In the army I always woke before reveille. I hate sleeping. It wastes time."
--- Isaac Asimov, science fiction writer

"Dreaming of eating will not satisfy the hungry."
--- African Proverb

Sleep is the natural state of bodily rest observed throughout the animal kingdom, in all mammals and birds, and in many reptiles, amphibians, and fish. Until the 1950s, most people thought of sleep as a passive, dormant part of our daily lives. Neuroscientists now believe sleep is not only crucial to brain development, but is also necessary to help consolidate the effects of waking experience – by converting memory into more permanent and/or enhanced forms . We apparently spend one third of our lives in sleep. In Dolphins, whales and birds half brain sleep at a time.

Stages of sleep

During sleep, we usually pass through five phases of sleep: stages 1, 2, 3, 4, and *REM* (rapid eye movement) sleep. These stages progress in a cycle from stage 1 to REM sleep, then the cycle starts over again with stage 1.

Stage 1 is light sleep. We drift in and out of sleep and can be awakened easily. The eyes move very slowly and muscle activity slows. People awakened from stage 1 sleep often remember fragmented visual images. Many also experience sudden muscle contractions often preceded by a sensation of starting to fall. These sudden movements are similar to the "jump" we make when startled.

In stage 2 eye movement stops and the waves in EEG become slower, with occasional bursts of rapid waves called sleep spindles.

Stage 3 shows extremely slow EEG waves called delta waves appear, interspersed with smaller, faster waves.

The brain produces delta waves almost exclusively in stage 4. It is very difficult to wake someone during stages 3 and 4, which together are called deep sleep. There is no eye movement or muscle activity. People awakened during deep sleep do not adjust immediately and often feel groggy and disoriented for several minutes after they wake up. Some children experience bedwetting, night terrors or sleepwalking during deep sleep.

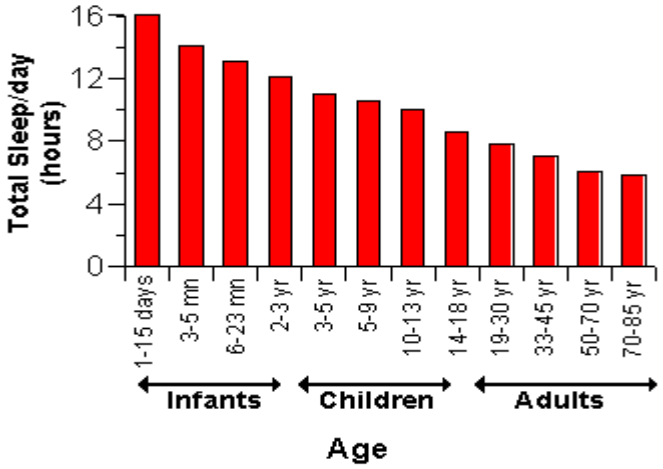
In REM sleep breathing becomes more rapid, irregular, and shallow, eyes jerk rapidly in various directions, and the limb muscles become temporarily paralyzed. Heart rate

increases, blood pressure rises, and males develop penile erections. When people awaken during REM sleep, they often describe bizarre and illogical tales – dreams. [3]

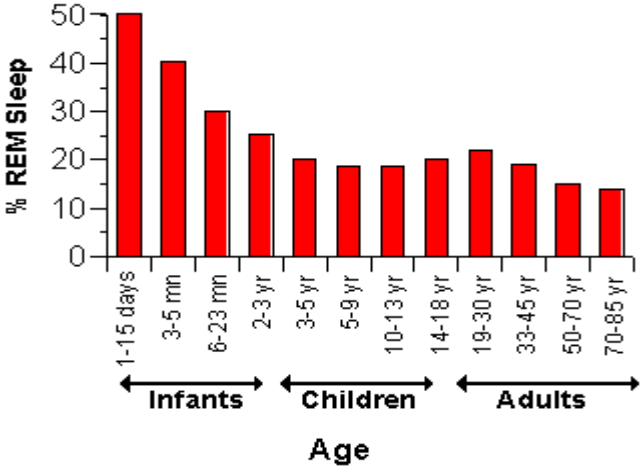
Distribution of Normal Sleep

In a typical sleep, the person passes through the stages 1, 2 and spends about 100 minutes in stage 3 and 4. Then REM follows and the cycle is repeated in about 90 minute intervals. Towards the morning, less stage 3,4 and more REM sleep. REM sleep: 80 % for preterm babies, 50 % for term babies, and 25 % in old age.

Total sleep needed

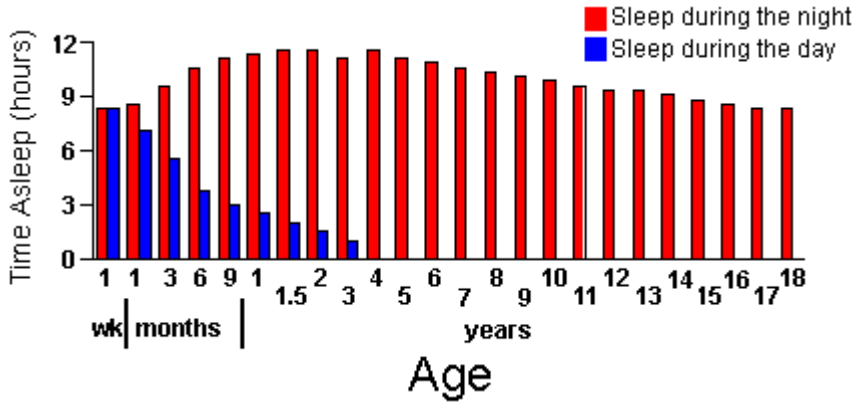


Percentage of REM sleep:



As shown in the two graphs above, infants spend more time sleeping and spend a greater percentage of sleep in REM sleep compared with the times of older children and adults. For example, newborn babies sleep about 16 hours per day and spend about 50% of that time in REM sleep. Older people (50-85 years old) sleep only 6 hours per day and spend 15% of that time in REM sleep.

As children grow, they spend less time sleeping during the day. The graph below illustrates how nighttime and daytime sleep time changes with age. [2]



The amount of sleep each person needs depends on many factors, including age. Infants generally require about 16 hours a day, while teenagers need about 9 hours on average. For most adults, 7 to 8 hours a night appears to be the best amount of sleep, although some people may need as few as 5 hours or as many as 10 hours of sleep each day. Women in the first 3 months of pregnancy often need several more hours of sleep than usual. The amount of sleep a person needs also increases if he or she has been deprived of sleep in previous days. Getting too little sleep creates a "sleep debt," which is much like being overdrawn at a bank. We don't seem to adapt to getting less sleep than we need; while we may get used to a sleep-depriving schedule, the body and brain suffer. [3]. Homeostatic sleep propensity: the need for sleep as a function of the amount of time elapsed since the last adequate sleep episode, is also important and must be balanced against the circadian element for satisfactory sleep. Along with corresponding messages from the circadian clock, this tells the body it needs to sleep. [1]

Anesthesia and Coma

People who are under anesthesia or in a coma cannot be awakened and do not produce the complex, active brain wave patterns seen in normal sleep. Instead, their brain waves are very slow and weak, sometimes undetectable. [3]

Sleep as an Adaptive Process

Sleep may have developed because of a need of animals to protect themselves. For example, some animals search for food and water during the day because it is easier to see when the sun is out. When it is dark, it is best for these animals to save energy, avoid getting eaten, and avoid falling off a cliff that they cannot see. It is interesting to note which animals sleep the most and which sleep the least. In general, animals that serve as food for other animals sleep the least. [2].

Sleep as a Restorative Process

This theory of sleep suggests that sleep helps the body recover from all the work it did while an animal was awake. Experiments have shown that the more physical exercise an animal does, the more NREM an animal will have. Also, people deprived of NREM by waking them up each time they get to stage 4 sleep, they complain of being physically tired. People deprived of REM sleep by waking them up each time they have REM type EEG patterns, become anxious and irritable. Animals deprived of REM for several days and then

allowed to get an undisturbed period of sleep, go into "REM rebound". REM sleep, has been thought to be important for memory and learning. [2]

Mechanism of Sleep

People awakened after sleeping more than a few minutes are usually unable to recall the last few minutes before they fell asleep. This sleep-related form of amnesia is the reason people often forget telephone calls or conversations they've had in the middle of the night. It also explains why we often do not remember our alarms ringing in the morning if we go right back to sleep after turning them off. [3]. The brain seems to reprogram it for sleep as in a computer logging on, off or switching user.

Chemicals associated with sleep

Neurotransmitters such as serotonin and adrenaline keep some parts of the brain active while we are awake. Research also suggests that adenosine builds up in our blood while we are awake and causes drowsiness. This chemical gradually breaks down while we sleep. Signals from the Supra Chaismatic Nucleus of the Hypothalamus travel to the pineal gland which responds to light-induced signals by switching off production of the hormone melatonin. The body's level of melatonin normally increases after darkness falls, making people feel drowsy. [3]

Neural Basis of Sleep

The diencephalic sleep zone in posterior hypothalamus and related structures generate sleep if stimulated at 8 Hz. Faster stimuli produce arousal. Stimulation of the medullary synchronizing zone in the reticular formation of medulla also gives the same result. Basal forebrain sleep zone in preoptic area and diagonal band of Borca produces sleep by slow or high frequency stimuli. Stimulation of mechano receptors at 10 Hz in animals and regularly repeated monotonous stimuli in humans produce sleep. Suprachaiasmatic nuclei of hypothalamus regulate circadian sleep pattern. [5,6]

Neurons at the base of the brain begin signaling when we fall asleep. These neurons appear to "switch off" the signals that keep us awake. REM sleep begins with signals from the pons. These signals travel to the thalamus, which relays them to the cerebral cortex – the outer layer of the brain that is responsible for learning, thinking, and organizing information. The pons also sends signals that shut off neurons in the spinal cord, causing temporary paralysis of the limb muscles. If something interferes with this paralysis, people will begin to physically "act out" their dreams. A person dreaming about a ball game, for example, may run headlong into furniture or blindly strike someone sleeping nearby while trying to catch a ball in the dream. [3]

Disturbance to sleep

Chemicals:

Since sleep and wakefulness are influenced by different neurotransmitter signals in the brain, foods and medicines that change the balance of these signals affect whether we feel alert or drowsy and how well we sleep. Caffeinated drinks such as coffee and drugs such as diet pills and decongestants can cause inability to sleep. Many antidepressants suppress REM sleep. Heavy smokers often sleep very lightly and have reduced amounts of REM sleep. They also tend to wake up after 3 or 4 hours of sleep due to nicotine withdrawal. [3].

According to a new study, Smokers are four times more likely to feel tired when they wake up and they spend less time in deep sleep than nonsmokers do. [6]

Many people use alcohol to facilitate sleeping– the so-called night cap. While alcohol does help people fall into light sleep, it also robs them of REM and the deeper, more restorative stages of sleep. Instead, it keeps them in the lighter stages of sleep, from which they can be awakened easily. [3]

Temperature:

People lose some of the ability to regulate their body temperature during REM, so abnormally hot or cold temperatures in the environment can disrupt this stage of sleep.

Jet lag and night shifts:

When travelers pass from one time zone to another, they suffer from disrupted circadian rhythms, an uncomfortable feeling known as *jet lag*. It usually takes several days for the body's cycles to adjust to the new time. [3]. Symptoms much like jet lag are common in people who work nights or who perform shift work. Because these people's work schedules are at odds with powerful sleep-regulating cues like sunlight, they often become uncontrollably drowsy during work, and they may suffer insomnia or other problems when they try to sleep.

Traffic Noise and Cardiovascular Responses:

The participants in an experiment slept in the laboratory for 4 consecutive nights in each of 3 consecutive weeks and were exposed to aircraft, road, or rail traffic noise with weekly permutations. Cardiac responses did not habituate to traffic noise within the night and may therefore play a key role in promoting traffic noise induced cardiovascular disease. If so, these consequences are more likely for responses accompanied by awakenings than for situations without awakenings. [17]

Signs of Sleep deprivation

If one feels drowsy during the day, even during boring activities, that person haven't had enough sleep. If one routinely falls asleep within 5 minutes of lying down, that person probably has severe sleep deprivation, possibly even a sleep disorder. Microsleeps, or very brief episodes of sleep in an otherwise awake person, are another mark of sleep deprivation. In many cases, people are not aware that they are experiencing microsleeps. [3]

Dangers of Sleep deprivation

Accidents:

Sleep-deprived people perform as badly as or worse than those who are intoxicated when tested using a driving simulator or by performing a hand-eye coordination task. Sleep deprivation also magnifies alcohol's effects on the body, so a fatigued person who drinks will become much more impaired than someone who is well-rested. Driver fatigue is responsible for an estimated 100,000 motor vehicle accidents and 1500 deaths each year, according to the National Highway Traffic Safety Administration in the USA. Since drowsiness is the brain's last step before falling asleep, driving while drowsy can – and often does – lead to disaster. Caffeine and other stimulants cannot overcome the effects of severe sleep deprivation. The National Sleep Foundation says that if one has trouble keeping the eyes focused, if one can't

stop yawning, or if one can't remember driving the last few miles, that person is too drowsy to drive safely. [3]

The number and severity of workplace accidents also tend to increase during the night shift. Major industrial accidents attributed partly to errors made by fatigued night-shift workers include the Exxon Valdez oil spill and the Three Mile Island and Chernobyl nuclear power plant accidents. [3]

It may be possible to reduce shift-related fatigue by using bright lights in the workplace, minimizing shift changes, and taking scheduled naps.

Heart Problems and obesity:

Shift workers have an increased risk of heart problems, digestive disturbances, and emotional and mental problems, all of which may be related to their sleeping problems. Researchers from the University of Warwick, and University College London have found that lack of sleep can more than double the risk of death from cardiovascular disease. Too much sleep can also double the risk of death [1]. Changes in adiposity indices were compared between short- (5-6 hours), average- (7-8 hours), and long- (9-10 hours) duration sleeper groups. Both short and long sleeping times predict an increased risk of future body weight and fat gain in adults. Hence, these results emphasize the need to add sleep duration to the panel of determinants that contribute to weight gain and obesity [16]. In terms of prevention, sleeping around 7 hours per night is optimal for health and a sustained reduction may predispose to ill-health.

Diabetes:

At the American Diabetes Association's annual meeting in June 2001, Eve Van Cauter, reported that people who regularly do not get enough sleep can become less sensitive to insulin. This increases their risk for diabetes and high blood pressure – both serious threats to the brain.

Previous work by Dr. Van Cauter, a professor of medicine at the University of Chicago, found that "metabolic and endocrine changes resulting from a significant sleep debt mimic many of the hallmarks of aging. We suspect that chronic sleep loss may not only hasten the onset but could also increase the severity of age-related ailments such as diabetes, hypertension, obesity, and memory loss. [7]

Brain function:

Sleep loss causes profound impairments in cognitive and behavioral performance. For example, in a prospective, randomized study looking at the effects of sleep deprivation in residency training, interns working a "traditional schedule" made 36% more serious medical errors compared with interns under an "intervention schedule" that included more sleep. Another study demonstrated that traditional-schedule interns had more than twice the rate of attentional failures when compared with the intervention-schedule interns. Taken together, these studies demonstrate that sleep-deprived house staffs make a significant amount of serious medical errors, largely the consequence of attentional failures from sleepiness. [8]. Humans deprived of sleep for long periods begin hallucinating and develop mental problems.

Life span and immunity:

In research studies, rats normally live two to three years, but if rats are totally deprived of sleep, they only live about five weeks. They also develop sores, their immune systems do not work well and their body temperature drops [9]. In a survey done on African

American and Caucasian American women and men without a sleep disorder, markers of inflammation and cardiovascular disease were associated with sleep deprivation [14].

Sleep and Behavior of Children

A Northwestern University study of 500 preschoolers found that those who slept less than 10 hours in a 24-hour period (including daytime naps) were 25% more likely to misbehave. They were consistently at greatest risk for "acting out" behavioral problems, such as aggression and oppositional or noncompliant behavior. Research shows that sleep disturbances in children are not only associated with medical problems (allergies, ear infections, hearing problems), but also with psychiatric and social issues. Children who were aggressive, anxious, or depressed had more trouble falling and staying asleep. Although sleep problems usually decline as children get older, these early patterns are the best indicator of future sleep troubles. [7]

Benefits of Sleep

Neurons:

Sleep appears necessary for our nervous systems to work properly. Some experts believe sleep gives neurons that are used while we are awake a chance to shut down and repair themselves. Without sleep, neurons may become so depleted in energy or so polluted with byproducts of normal cellular activities that they begin to malfunction. Sleep also may give the brain a chance to exercise important neuronal connections that might otherwise deteriorate from lack of activity. Too little sleep leaves us drowsy and unable to concentrate the next day. It also leads to impaired memory and physical performance and reduced ability to carry out mathcalculations. If sleep deprivation continues, hallucinations and mood swings may develop.

Brain Connections in Early Development:

Animal studies show that sleep dramatically enhances changes in brain connections during a period of early development. Researchers at the University of California, San Francisco, examined the effect of sleep on brain plasticity in young cats that had just experienced an environmental challenge. The animals that were allowed to sleep for six hours after the stimulation developed twice the amount of brain change, compared to cats kept awake afterward.

This is the first direct evidence that sleep modifies the effect of environmental stimuli on the development of new brain connections. The finding has broader implications for plasticity in the brains of adult animals and people.

What's more, the amount of plasticity (connections between nerve cells) in the brain depends on the amount of deep sleep, which is indicated by large slow brain waves. This is precisely the time in life when the brain reorganizes its connections to attain the perfect precision it needs as an adult. [7]

Cellular Growth and Repair:

Deep sleep coincides with the release of growth hormone in children and young adults. Many of the body's cells also show increased production and reduced breakdown of proteins during deep sleep. Since proteins are the building blocks needed for cell growth and for repair of damage from factors like stress and ultraviolet rays, deep sleep may truly be "beauty sleep." Tissue repair occurs during sleep, including repair to the daily skin damage done by UV light. Getting enough deep sleep will help your skin repair itself. [9,10]

Learning:

REM sleep stimulates the brain regions used in learning. This may be important for normal brain development during infancy, which would explain why infants spend much more time in REM sleep than adults. Like deep sleep, REM sleep is associated with increased production of proteins. One study found that REM sleep affects learning of certain mental skills. People taught a skill and then deprived of non-REM sleep could recall what they had learned after sleeping, while people deprived of REM sleep could not. [3].

Many of the brain areas activated when people performed the reaction time task were the same as those activated during REM sleep. During REM sleep, the visual cortex, premotor cortex, and some parts of the thalamus were more active in trained subjects than in untrained subjects. These were the same areas that showed significant activation during the reaction time task. [12].

Memory:

A study in rats also showed that certain nerve-signaling patterns which the rats generated during the day were repeated during deep sleep. This pattern repetition may help encode memories and improve learning. A napping study that involved 33 undergraduate students revealed that a nap resulted in waking up with shaper memory [3]. Some research findings support a hypothesis that REM sleep-associated processes facilitate proliferation of granule cells in the adult Hippocampal Dentate Gyrus [11].

Activating Memory Gene in Sleep:.

Scientists at Rockefeller University showed that, in rats, certain brain cells that activate during daytime exploration tend to reactivate during sleep. Sidarta Ribeiro, Constantine Pavlides, and colleagues found that exposure to a "memorable" environment causes the brain to turn on a gene called zif-268 that is associated with strengthened communication between nerve cells.

The researchers exposed a group of rats to novel, enriched environments (labyrinths with toys), and another group of rats to their normal home cages. Then the rats went to sleep, passing through successive stages of slow wave and REM sleep.
During slow wave sleep, zif-268 turned off in all rats, regardless of which environment they had experienced. But during REM sleep, zif-268 turned on in the cerebral cortex and hippocampus of only rats that had explored the labyrinths. The gene stayed off in rats that had not experienced the enriched environments.

This retrieval of zif-268 activity during REM sleep may couple with other reactivated brain mechanisms to "process" memories of novel experiences. Such processing may in turn prove important for cementing the memories acquired while awake. [7]

REM Sleep and Emotional Memory:

German scientists at the University of Bamberg Department of Physiological Psychology compared memory retention of emotional versus neutral text material. Participants were tested over intervals covering either early sleep (dominated by slow wave sleep) or late sleep when REM sleep is dominant. Sleep not only improved retention, but late sleep particularly enhanced memory for emotional texts. Results are consonant with a supportive function of REM sleep for the formation of emotional memory in humans. [7]

Activity in parts of the brain that control emotions, decision-making processes, and social interactions is drastically reduced during deep sleep, suggesting that this type of sleep may help people maintain optimal emotional and social functioning while they are awake.

A Better Way to Prepare for Exams

There is a saying that it is good to get a good night's sleep before a big test. That may be true. These new experiments suggest that it may be important to get a good night's sleep after you study or after you practice a skill such as shooting basketballs. [12]

Sleep could prove to be an important part of the strategy for preparing for challenges such as exams. The fact that sleep provoked slightly more plasticity (connections between nerve cells) than double the amount of exposure to experience suggests that if you reviewed your notes thoroughly until you were tired and then slept, you'd achieve as much plasticity, or 'learning,' in the brain as if you'd pulled an all-nighter repeating your review of the material. [7]

Stress and Sleep Patterns

Why do some people lose sleep during periods of stress, while others seem to "sleep like a baby"? Research suggests that the difference may be explained by the ways people cope.

At Tel Aviv University, Dr. Avi Sadeh conducted a study of students. He found that those who tended to focus on their emotions and anxiety during the high-stress period were more likely to shorten their sleep, while those who tended to ignore emotions and focus on tasks extended their sleep and shut themselves off from stress. If you can't cope with it sleep on it. Sometimes sleep can help you regulate your nervousness and offer you an escape from stress, particularly when there's nothing you can do about it. [7]

Decision Making and Insight

Decision-making also appears to benefit from this overnight form of cogitation. During sleep, particularly the REM phase, the brain integrates information it took in during the day but couldn't process at the time. "Sleeping on it" is not necessary, however, for simple memory or learning tasks [7]. When Nobel laureate Otto Loewi discovered the chemical basis of neurotransmission in 1921, he attributed his experimental design to an insight he made during sleep [8].

Napping

Simply taking a nap may be one of the best things you can do to correct poor mental performance, especially after a stressful night of disrupted sleep, such as from sleep apnea or snoring. In a study of Japanese men, a mid-afternoon nap had positive effects upon the maintenance of their daytime vigilance level. The 20-minute nap improved performance level and their self-confidence. [7]

Dreams

We typically spend more than 2 hours each night dreaming. Scientists do not know much about how or why we dream. Sigmund Freud, who greatly influenced the field of psychology, believed dreaming was a "safety valve" for unconscious desires. Only after 1953, when researchers first described REM in sleeping infants, did scientists begin to carefully study sleep and dreaming. They soon realized that the strange, illogical experiences we call dreams almost always occur during REM sleep. While most mammals and birds show signs of REM sleep, reptiles and other cold-blooded animals do not. [3]

Some scientists believe dreams are the cortex's attempt to find meaning in the random signals that it receives during REM sleep. The cortex is the part of the brain that interprets

and organizes information from the environment during consciousness. It may be that, given random signals from the pons during REM sleep, the cortex tries to interpret these signals as well, creating a "story" out of fragmented brain activity. [3] Scientists also believe that sleep may be involved in "erasing memories from the immediate and distant past," and that dreaming is probably a piece of this process. [7]

Sleep and disease

Disease Disturbing Sleep:

Sleeping problems are common in many other disorders as well, including Alzheimer's disease, stroke, cancer, and head injury. These sleeping problems may arise from changes in the brain regions and neurotransmitters that control sleep, or from the drugs used to control symptoms of other disorders. In patients who are hospitalized or who receive round-the-clock care, treatment schedules or hospital routines also may disrupt sleep. The old joke about a patient being awakened by a nurse so he could take a sleeping pill contains a grain of truth.

Sleep Precipitating Disease:

Sleep and sleep-related problems play a role in a large number of human disorders and affect almost every field of medicine. For example, problems like stroke and asthma attacks tend to occur more frequently during the night and early morning, perhaps due to changes in hormones, heart rate, and other characteristics associated with sleep. Sleep also affects some kinds of epilepsy in complex ways. REM sleep seems to help prevent seizures while deep sleep may promote the spread of these seizures. Sleep deprivation also triggers seizures in people with some types of epilepsy.

Sleep and Immune Reactions:

Neurons that control sleep interact closely with the immune system. As anyone who has had the flu knows, infectious diseases tend to make us feel sleepy. This probably happens because *cytokines,* chemicals our immune systems produce while fighting an infection, are powerful sleep-inducing chemicals. Sleep may help the body conserve energy and other resources that the immune system needs to mount an attack.

Sleep and Mental Disorders:

Sleeping problems occur in almost all people with mental disorders, including those with depression and schizophrenia. People with depression, for example, often awaken in the early hours of the morning and find themselves unable to get back to sleep. The amount of sleep a person gets also strongly influences the symptoms of mental disorders. Sleep deprivation is an effective therapy for people with certain types of depression, while it can actually cause depression in other people. Extreme sleep deprivation can lead to a seemingly psychotic state of paranoia and hallucinations in otherwise healthy people, and disrupted sleep can trigger episodes of mania (agitation and hyperactivity) in people with manic depression.

Effect of Sleeping Problems:

Once sleeping problems develop, they can add to a person's impairment and cause confusion, frustration, or depression. Patients who are unable to sleep also notice pain more and may increase their requests for pain medication. Better management of sleeping

problems in people who have other disorders could improve these patients' health and quality of life. [3]

Sleep Disorders

At least 40 million Americans each year suffer from chronic, long-term sleep disorders each year, and an additional 20 million experience occasional sleeping problems. These disorders and the resulting sleep deprivation interfere with work, driving, and social activities. They also account for an estimated $16 billion in medical costs each year, while the indirect costs due to lost productivity and other factors are probably much greater. Doctors have described more than 70 sleep disorders, most of which can be managed effectively once they are correctly diagnosed. The most common sleep disorders include insomnia, sleep apnea, restless legs syndrome, and narcolepsy. [3]

Insomnia [Inability to Sleep]

People tend to sleep more lightly and for shorter time spans as they get older, although they generally need about the same amount of sleep as they needed in early adulthood. About half of all people over 65 have frequent sleeping problems, such as insomnia. Almost everyone occasionally suffers from short-term insomnia. This problem can result from stress, jet lag, diet, or many other factors. Insomnia almost always affects job performance and well-being the next day. About 60 million Americans a year have insomnia frequently or for extended periods of time, which leads to even more serious sleep deficits. Insomnia tends to increase with age and affects about 40 percent of women and 30 percent of men. It is often the major disabling symptom of an underlying medical disorder. [3] In addition to being a risk factor for a depressive episode, persistent insomnia may serve to perpetuate the illness in some elderly patients and especially in those receiving standard care for depression in primary care settings [15]

Stress Hormones and Insomnia

That stress can affect proper sleep seems obvious. It appears to be due to increased vulnerability of sleep to stress hormones. As men age, it appears they become more sensitive to the stimulating effects of corticotropin-releasing hormone (CRH). When both young and middle-aged men were administered CRH, the older men remained awake longer and slept less deeply. In another study, the researchers compared patients with insomnia to those without sleep disturbances. They found that "insomniacs with the highest degree of sleep disturbance secreted the highest amount of cortisol , particularly in the evening and nighttime hours," suggesting that chronic insomnia is a disorder of sustained hyperarousal of the body's stress response system [7].

Sleep Apnea

Sleep apnea is a disorder of interrupted breathing during sleep. It usually occurs in association with fat buildup or loss of muscle tone with aging. These changes allow the windpipe to collapse during breathing when muscles relax during sleep. This problem, called obstructive sleep apnea, is usually associated with loud snoring. Sleep apnea also can occur if the neurons that control breathing malfunction during sleep.

During an episode of obstructive apnea, the person's effort to inhale air creates suction that obliterates the airway. This blocks the air flow for 10 seconds to a minute while the sleeping person struggles to breathe. When the person's blood oxygen level falls, the brain responds by awakening the person enough to tighten the upper airway muscles and open the windpipe. The person may snort or gasp, then resume snoring. This cycle may be repeated

hundreds of times a night. The frequent awakenings that sleep apnea patients experience leave them continually sleepy and may lead to personality changes such as irritability or depression. Sleep apnea also deprives the person of oxygen, which can lead to morning headaches, a loss of interest in sex, or a decline in mental functioning. It also is linked to high blood pressure, irregular heartbeats, and an increased risk of heart attacks and stroke. Patients with severe, untreated sleep apnea are two to three times more likely to have automobile accidents than the general population. In some high-risk individuals, sleep apnea may even lead to sudden death from respiratory arrest during sleep. [3,7].

Nasal continuous positive airway pressure therapy was effective in controlling obstructive sleep apnoea. [13]

Restless Legs Syndrome

Restless legs syndrome (RLS), a familial disorder causing unpleasant crawling, prickling, or tingling sensations in the legs and feet and an urge to move them for relief, is emerging as one of the most common sleep disorders, especially among older people. This disorder, which affects as many as 12 million Americans, leads to constant leg movement during the day and insomnia at night. Severe RLS is most common in elderly people, though symptoms may develop at any age. In some cases, it may be linked to other conditions such as anemia, pregnancy, or diabetes.

Many RLS patients also have a disorder known as periodic limb movement disorder or PLMD, which causes repetitive jerking movements of the limbs, especially the legs. These movements occur every 20 to 40 seconds and cause repeated awakening and severely fragmented sleep. In one study, RLS and PLMD accounted for a third of the insomnia seen in patients older than age 60. RLS and PLMD often can be relieved by drugs that affect the dopamine, suggesting that dopamine abnormalities underlie these disorders' symptoms. [3]

Narcolepsy

Narcolepsy affects an estimated 250,000 Americans. People with narcolepsy have frequent "sleep attacks" at various times of the day, even if they have had a normal amount of sleep. These attacks last from several seconds to more than 30 minutes. People with narcolepsy also may experience cataplexy (loss of muscle control during emotional situations), hallucinations, and temporary paralysis when they awaken, and disrupted night-time sleep. These symptoms seem to be features of REM sleep that appears during waking, which suggests that narcolepsy is a disorder of sleep regulation. The symptoms of narcolepsy typically appear during adolescence, though it often takes years to obtain a correct diagnosis. The disorder (or at least a predisposition to it) is usually hereditary, but it occasionally is linked to brain damage from a head injury or neurological disease.

Once narcolepsy is diagnosed, stimulants, antidepressants, or other drugs can help control the symptoms and prevent the embarrassing and dangerous effects of falling asleep at improper times. Naps at certain times of the day also may reduce the excessive daytime sleepiness.

In 1999, a research team working with canine models identified a gene that causes narcolepsy–a breakthrough that brings a cure for this disabling condition within reach. The gene, hypocretin receptor 2, codes for a protein that allows brain cells to receive instructions from other cells. The defective versions of the gene encode proteins that cannot recognize these messages, perhaps cutting the cells off from messages that promote wakefulness. The researchers know that the same gene exists in humans, and they are currently searching for defective versions in people with narcolepsy. [3]

Sleep Related Sexual Disorders

A broad range of sleep related disorders associated with abnormal sexual behaviors and experiences exists, with major clinical and forensic consequences. [13] They include sleep exacerbation of persistent sexual arousal syndrome, sleep related painful erections, and sleep related dissociative disorders.

A full range of sleep related sexual behaviors with self and/or bed partners or others were reported, including masturbation, sexual vocalizations, fondling, sexual intercourse with climax, sexual assault/rape. Adverse physical and/or psychosocial effects from the sleepsex were present in all parasomnia [sleep related dysfunction] and sleep related seizure cases. Confusional arousals were diagnosed as the cause of "sleepsex" in 26 cases (with obstructive sleep apnea.

Forensic consequences were common, occurring in 35.5% of parasomnia cases, with most involving minors. All parasomnias cases reported amnesia for the sleepsex, in contrast to 28.6% of sleep related seizure cases. [13]

Snoring

Obstructive Sleep Apnoea is one important cause. In an Italian study of more than 2,200 children, the group with the highest body mass index (BMI) was more than twice as likely to snore, compared to the group with the lowest BMI (a measurement of weight in relation to height). Snoring and attention-deficit/hyperactivity disorder (ADHD) are found to be associated in young children. After collecting data on more than 5,000 six-year-olds, and surveying the parents of 11,000 first-graders, a research team found that twice as many ADHD children experienced frequent loud snoring, compared to the general population of children. When the kids were treated for their snoring, their ADHD became much better or totally disappeared, says Gozal. Even if it did not lead to complete resolution, there was some improvement in behavior and less need for medication. [7]

Gravity and Snoring

Because the respiratory system is greatly influenced by the force of gravity, the effect of weightlessness on sleep-related breathing problems was observed in five space shuttle astronauts. Without gravity, breathing problems were reduced by 55% – and snoring was nearly eliminated.

This report suggests that obstructed breathing might be alleviated by sleeping in a more upright position, instead of on the back. [7]

Optimal amount of Sleep in humans Adults

The optimal amount of sleep is not a meaningful concept unless the timing of that sleep is seen in relation to an individual's circadian rhythms. A person's major sleep episode is relatively inefficient and inadequate when it occurs at the "wrong" time of day. The timing is correct when the following two circadian markers occur after the middle of the sleep episode but before awakening: [1]

- maximum concentration of the hormone melatonin, and
- minimum core body temperature.

Average total number of hours sleeping per day

Age	Hours
Newborn	18
3 months	15
6 months	14–15
1 year	13–14
2 years	13
3 years	12
4 -6 years	11
7-8 years	10
9-17 years	9-11
Adults, Elderly	7-8
Pregnant women**	7-8(+)

** During pregnancy women may need more sleep per night. [1]

Tips for a Good Night's Sleep: [3]

Set a schedule:
Go to bed at a set time each night and get up at the same time each morning. Disrupting this schedule may lead to insomnia. "Sleeping in" on weekends also makes it harder to wake up early on Monday morning because it re-sets your sleep cycles for a later awakening.

Exercise:
Try to exercise 20 to 30 minutes a day. Daily exercise often helps people sleep, although a workout soon before bedtime may interfere with sleep. For maximum benefit, try to get your exercise about 5 to 6 hours before going to bed.

Avoid caffeine, nicotine, and alcohol:
Avoid drinks that contain caffeine, which acts as a stimulant and keeps people awake. Sources of caffeine include coffee, chocolate, soft drinks, non-herbal teas, diet drugs, and some pain relievers. Smokers tend to sleep very lightly and often wake up in the early morning due to nicotine withdrawal. Alcohol robs people of deep sleep and REM sleep and keeps them in the lighter stages of sleep.

Relax before bed:
A warm bath, reading, or another relaxing routine can make it easier to fall sleep. You can train yourself to associate certain restful activities with sleep and make them part of your bedtime ritual.

Sleep until sunlight:
If possible, wake up with the sun, or use very bright lights in the morning. Sunlight helps the body's internal biological clock reset itself each day. Sleep experts recommend exposure to an hour of morning sunlight for people having problems falling asleep.

Don't lie in bed awake:
If you can't get to sleep, don't just lie in bed. Do something else, like reading, watching television, or listening to music, until you feel tired. The anxiety of being unable to fall asleep can actually contribute to insomnia.

Control your room temperature:
Maintain a comfortable temperature in the bedroom. Extreme temperatures may disrupt sleep or prevent you from falling asleep.

See a doctor if your sleeping problem continues:
If you have trouble falling asleep night after night, or if you always feel tired the next day, then you may have a sleep disorder and should see a physician. Your primary care physician may be able to help you; if not, you can probably find a sleep specialist at a major hospital near you. Most sleep disorders can be treated effectively, so you can finally get that good night's sleep you need.

Summary

- Sleep is a restorative process
- It is initiated and terminated by brain mechanisms through transmitters
- Sleep is disturbed by, caffeine, nicotine, alcohol, jet lag, temperature, noise, and diseases
- Sleep deprivation can cause accidents, heart problems and obesity and worsen diabetes, brain function, behavior of children, immune system and reduce life span.
- Adequate sleep benefits, neurons and synapses, cellular growth and repair, learning and memory, reduction of stress, better decision making and erasing unwanted memories.
- Many disease processed interact with sleep.
- Sleep helps to recover from many diseases.
- Sleeping disorders must be treated.
- Good night’s sleep is essential for good quality life.

"Sleep is better than medicine."
--- English Proverb

"The beginning of health is sleep."
--- Irish Proverb

"Disease and sleep keep far apart."
--- Welsh Proverb

Early to bed, and early to rise,
makes a man healthy, wealthy, and wise."
--- Benjamin Franklin, 1758 (in *Poor Richard's Almanack*)

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