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Research Paper

Sleep-Some Perspectives Common People May Not Be Familiar With

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ABSTRACT

Sleep is seemingly a simple phenomenon that we all undergo on daily basis, but it has so many facets not known to many of us. This paper discovers some perspectives of sleep which tend to answer many questions pertaining to sleep. Through this paper, we shall understand what is the state-sleep, how it gets caused, what changes happen in our body, mind, and brain when we are sliding from an awake state to sleep state and then back to the awake state, what happens during sleeping hours, do we continue to think during sleep, how dreams manifest during sleep, what are dreams, do we have sleep without dreams, what is sound sleep and what is disturbed sleep and reasons thereof, why some people are unable to sleep. We shall learn about sleep disorders, are our all five senses working or some are taking rest during sleep, are we conscious during sleep, what is the difference between sleep state and coma...
The readers will be surprised to learn that we know very little about sleep and the contents of this paper will enrich their knowledge.

Keywords: *Sleep, Sleep state, REM/ NREM stages of sleep, Brain and Sleep, Consciousness and Sleep, Sleep disorders, dreams-how they occur, five senses and sleep*

It is advised that humans must take a minimum of 8 hours of sleep. Sleep we must, and be fresh on next morning. Night after night we drift to sleep. How sleep overtakes us? What is happening in the body, brain, and mind when slowly after lying down in bed with closed eyes, sleep engulfs? Last night while tossing in bed, frantically trying to catch the elusive sleep, this thought entered my mind and made me explore the understanding of ***Sleep*** and I am down to this paper.

Through this paper, we shall understand what is the state-sleep, how it gets caused, what changes happen in our body, mind, and brain when we are sliding from an awake state to sleep state and then back to the awake state, what happens during sleeping hours, do we continue to think during sleep, how dreams manifest during sleep, what are dreams, do we have sleep without dreams, what is sound sleep and what is disturbed sleep and reasons thereof, why some people are unable to sleep i.e., what is ***Insomnia***-how is it caused and can it be cured, what is ***Sleep-Walking***, what is ***Sleep Apnea***, what are other sleep orders, are our all five senses working or some are taking rest during sleep, are we conscious during sleep,

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what is difference between sleep state and coma... Questions are many and many more could be added.

In this paper, while understanding sleep, we shall find answers to all the questions and will also answer additional questions which come to the fore while finding answers to the above question.

What is sleep after all!
Sleep in the oxford dictionary is defined as ***"A condition of rest in which eyes are closed, the muscles are relaxed, and the mind is unconscious"***

Sleep is a period of rest for the body and mind, during which volition and consciousness are in partial or complete abeyance and the bodily functions partially suspended. Sleep has also been described as a behavioral state marked by characteristic immobile posture and diminished but readily reversible sensitivity to external stimuli. We alternate between sleep and awake state.

Before the discovery and reporting of rapid eye movements during sleep, it was thought that sleep was a single state of passive recuperation in which the central nervous system was deactivated. Studies concerned with the measurement of central and autonomic activities during sleep have led to its division into two types: *non–rapid eye movement (NREM) sleep*, also called *orthodox* or *synchronized (S) sleep*; and *rapid eye movement (REM) sleep* (so-called because of the rapid eye movements during this stage), also called *paradoxical* or *desynchronized (D) sleep.* (*source: https://medical-dictionary.thefreedictionary.com/sleep)*

NREM and REM in the above paragraphs are further explained as follows:
NREM sleep (stage 1 to 4) is increased after physical activity and has a relatively high priority among humans in the recovery sleep following extended periods of wakefulness.

Stage5—REM Sleep: Within 90 minutes after sleep begins, adult progress through all four stages of NREM sleep and then proceeds into the first of a series of REM periods of sleep.

Brief cycles of about 10 to 30 minutes of REM sleep recur throughout the night, alternating with various stages of NREM sleep. With each cycle, NREM sleep decreases and REM sleep increases so that by the end of the night most of the sleep is REM sleep, which is when dreams occur.

While everyone dreams every night, many do not remember dreaming; most people are aware, however, that they dream more just before rising.

In addition to the rapid eye movements that can be observed through closed eyelids, REM sleep can be recognized by complete relaxation of the lower jaw. Convulsions, myocardial infarction, and cardiac arrhythmias are more likely to occur during REM sleep. This is probably because of increased autonomic activity, irregular pulse, and fluctuations in blood pressure, which are all typical of REM sleep.

The sleep cycle which was discussed above is pictorially explained below:

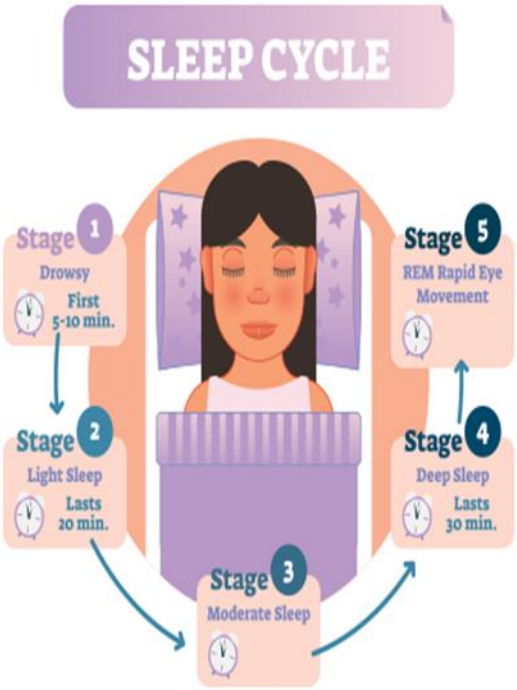

Figure 1—Sleep Stages and Sleep Cycle explained
(source: *sleepassociation.org/about-sleep/what-is-sleep/****)***

While we sleep we keep on drifting between the 4 stages of NREM states and REM states and a lot of changes happen in the body when we drift to sleep and go to the dreaming state. These are explained by Adler Lana (2021):

What happens to Our Bodies While We sleep and dream*?*
Several things happen in your body during sleep and dream, including

- ***Rapid Eye Movement:*** Your eyes move rapidly behind your eyelids when you dream. During this time, your eyes do not send visual information to the brain as they usually do during waking hours. Rather, eye motion during dreams is likely involved with visual processing during deep sleep, and possibly even the ways in which you visually experience your dream space.
- ***Temporary Paralysis:*** When you enter into REM sleep, your body is mostly immobilized. You lose almost all muscle tone, except for the muscles under your eyelids and in your diaphragm. This state is called **Atonia** and is caused by a change in the neurons in the base of the brainstem, which is in contact with the neurons that stimulate muscle movement. Atonia may be the body trying to keep you from physically acting out your dreams in your sleep or accidentally waking yourself up.
- ***Twitching Muscles:*** While many of the muscles in your body are inactive during REM sleep because of Atonia, it is common for people to involuntarily twitch, especially in the fingers and toes. While twitching was originally thought to be a part of the body's reaction to what's happening within a dream, it is now thought that it may have to do more with processing and mapping the neurons that connect the body to the mind.
- ***Breathing Changes:*** Breathing during REM sleep often becomes irregular,

involving dramatic rising and falling. REM sleep is also characterized by brief apneas or pauses in breathing. Apneas during REM sleep correspond to bursts of rapid eye movement and are linked to the body activating the respiratory control system during REM sleep.

- ***Fluctuating Heart Rate and Blood Pressure:*** During the NREM stages of sleep, heart rate and blood pressure usually decrease by around 20%. However, during REM sleep, heart rate and blood pressure can fluctuate wildly, sometimes dipping to NREM rates, and sometimes rising to an average or higher rate of breathing found in everyday life.

The human body lies in an almost inactive state while we are in sleep but our brain is active during sleep. Let us see brain functioning during sleep:

Brain and Sleep

It is said that *the* release of adenosine (a chemical by-product of cellular energy consumption) from cells in the basal forebrain and probably other regions support our sleep drive, also Melatonin when activated during the night induces sleep.

Based on electroencephalographic (EEG) criteria, NREM sleep is subdivided into four stages. The four stages are described in a paper by Krisha K S

Stage 1 • The lightest stage of sleep-

- *Defined by the presence of slow eye movements, this drowsy sleep stage can be easily disrupted causing awakenings or arousals.*
- *Muscle tone throughout the body relaxes and brain wave activity begins to slow.*
- *People may experience hypnic jerks or abrupt muscle spasms and may even experience the sensation of falling while drifting in and out of the stage.*

During this time, there is a slowdown in both the rates of respiration and heartbeat. In addition, stage 1 sleep involves a marked decrease in both overall muscle tension and core body temperature.

In terms of brain wave activity, stage 1 sleep is associated with both alpha and theta waves. The early portion of stage 1 sleep produces alpha waves, which are relatively low frequency (8–13Hz), high amplitude patterns of electrical activity (waves) that become synchronized. This pattern of brain wave activity resembles that of someone who is very relaxed, yet awake. As an individual continues through stage 1 sleep, there is an increase in theta wave activity. Theta waves are even lower frequency (4–7 Hz), higher amplitude brain waves than alpha waves. It is relatively easy to wake someone from stage 1 sleep; in fact, people often report that they have not been asleep if they are awoken during stage 1 sleep. The author goes on to describe stage 2 of NREM sleep as follows:

> *Stage 2 - In the second stage: Awakenings or arousals do not occur as easily as in Stage 1 sleep and the slow-moving eye rolls discontinue. The Brain waves continue to slow with specific bursts of rapid activity known as sleep spindles intermixed with sleep structures known as K complexes.*

The sleep spindles and K complexes are explained hereunder: A sleep spindle is a rapid burst of higher frequency brain waves that may be important for learning and memory (Fogel & Smith, 2011; Poe, Walsh, & Bjorness, 2010). In addition, the appearance of K-

complexes is often associated with stage 2 sleep. A K-complex is a very high amplitude pattern of brain activity that may in some cases occur in response to environmental stimuli. Thus, K-complexes might serve as a bridge to higher levels of arousal in response to what is going on in our environments (Halász, 1993; Steriade & Amzica, 1998).

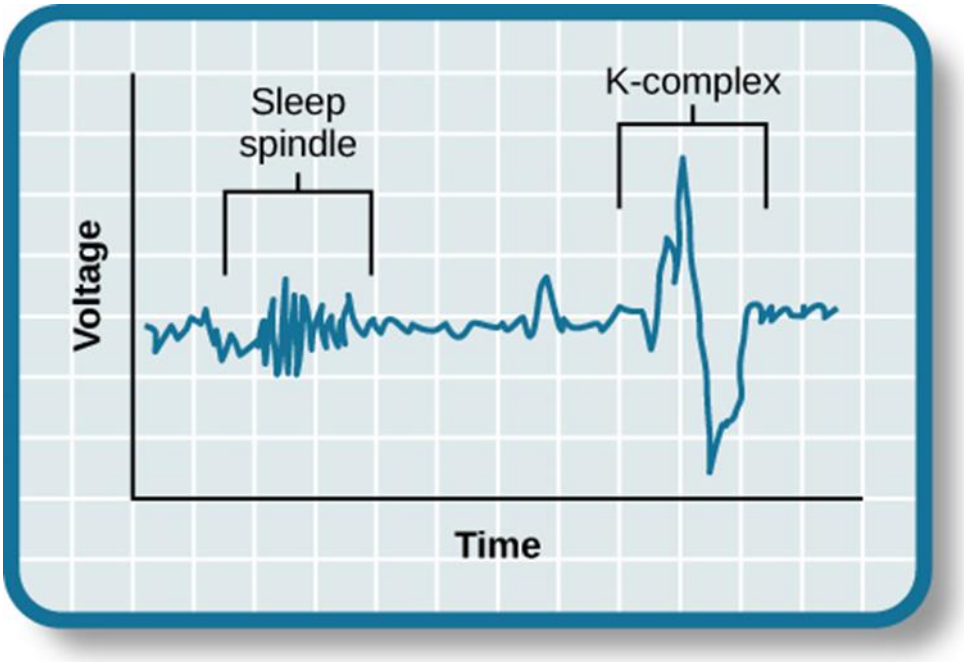

Figure 2: Sleep Spindles and K complex

- *Both sleep spindles and K complexes are thought to serve as protection for the brain from awakening from sleep.*
- *Body temperature begins to decrease and heart rate begins to slow.*

At stage 2 of NREM sleep, the body goes into a state of deep relaxation. Theta waves still dominate the activity of the brain, but they are interrupted by brief bursts of activity known as sleep spindles as described above.

Stage 3 and 4- Delta Sleep- Known as deep sleep.

- *These are deep sleep stages, with stage 4 being more intense than Stage 3. These stages are known as slow-wave, or delta, sleep.*
- *The most restorative stage of sleep, stage 3 consists of delta waves or slow waves. Also, the brain produces extremely slow waves with occasional bursts of faster brain wave activity*
- *Awakenings or arousals are rare and often it is difficult to awaken someone in Stage 3 sleep.*
- *Parasomnias (sleepwalking, sleep talking, or somniloquy and night terrors) occur during the deepest stage of sleep.*

At Stage 4- our brains produce extremely slow waves almost exclusively. These stages are known as "Deep Sleep" or "Delta Sleep". • It's most difficult to wake up during this stage. • During these stages our bodies emit growth hormones and work on repairing physical damage done during the day.

Stage 3 and stage 4 of sleep are often referred to as deep sleep or slow-wave sleep because these stages are characterized by low frequency (up to 4 Hz), high amplitude delta waves. During this time, an individual's heart rate and respiration slow dramatically. It is much more difficult to awaken someone from sleep during stage 3 and stage 4 than during earlier stages. Interestingly, individuals who have increased levels of alpha brain wave activity (more often associated with wakefulness and transition into stage 1 sleep) during stage 3 and stage 4 often report that they do not feel refreshed upon waking, regardless of how long they slept (Stone, Taylor, McCrae, Kalsekar, & Lichstein, 2008).

The above explains sleep and its stages which humans normally undergo. During sleep, we usually pass through five phases: stages 1, 2, 3, 4, and *REM* (rapid eye movement) sleep. These stages of sleep progress in a cycle from stage 1 to REM sleep, then the cycle starts over again with stage 1. Children and adults spend almost 50 percent of their total sleep time in stage 2 sleep, about 20 percent in REM sleep, and the remaining 30 percent in the other stages. Infants, by contrast, spend about half of their sleep time in REM sleep.

The above discussions explain in detail sleep, its meaning and the stages which humans undergo while falling asleep and how the body is affected during sleep.

Next, we shall try to understand the activities happening in the brain during the sleep stages. The EEG patterns in the brain during different stages of sleep are observed as follows:

> *Stage 1 sleep is characterized by low-voltage, mixed-frequency EEG tracing, with predominantly theta-wave activity (four to seven hertz, that is, cycles per second).*
> *Stage 2 is characterized by intermittent waves of 12 to 16 hertz, known as sleep spindles.*
> *Stages 3 and 4 consists of relatively high voltage EEG tracings with a predominance of delta wave activity (one to two hertz).*
> *The EEG patterns of NREM sleep suggest that this is the kind of apparently restful state that supports the recuperative functions assigned to sleep.*

The EEG mapping done during the sleep of an adult is given below:

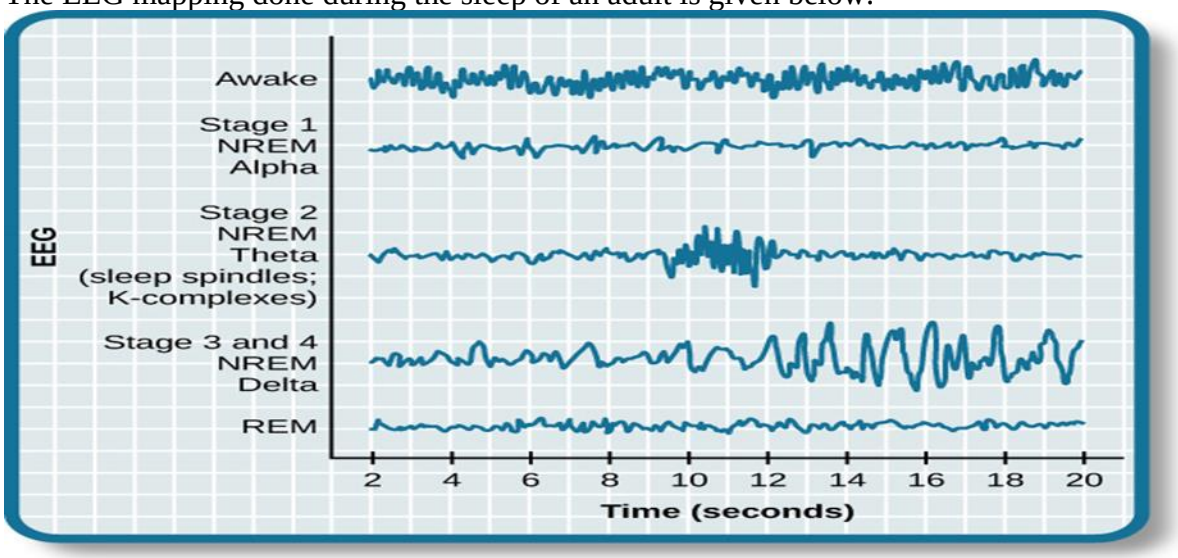

Figure 3: This chart shows the brain waves of a young adult recorded by an electroencephalogram (EEG) during a night's sleep. As the adult passes into deeper stages of sleep, the brain waves slow down and become larger. Throughout

the night, the individual goes through these stages multiple times, with brief periods of REM sleep, during which the EEG is similar to wakefulness.
Illustration by Lydia V. Kibiuk, Baltimore, MD (source: Brain activity during Sleep—brainfacts.org/Thinking-Sensing-and-Behaving/Sleep/2012/Brain-Activity-during-sleep)

The EEG shows that brain waves slow down and the amplitude goes on becoming larger as we move towards deep sleep in contrast to the pattern observed during the awake state. The brain activity in the brain is brought out very well in an article titled, "Brain Basics: Understanding Sleep" posted by the National Institute of Neuronal disorders and strokes on March 4, 2021.

As mentioned above, the brain stays remarkably active while we sleep. Recent findings suggest that sleep plays a housekeeping role that removes toxins in our brain that build up while we are awake. Several structures within the brain are involved with sleep.

Sleep-promoting cells within the hypothalamus and the brain stem produce a brain chemical called *GABA*, which acts to reduce the activity of arousal centers in the hypothalamus and the brain stem. The ***pineal gland***, located within the brain's two hemispheres, receives signals and increases the production of the hormone *melatonin*, which helps put you to sleep once the lights go down. Scientists believe that peaks and valleys of melatonin over time are important for matching the body's circadian rhythm to the external cycle of light and darkness.

The brain stem (especially the pons and medulla) also plays a special role in REM sleep; it sends signals to relax muscles essential for body posture and limb movements so that we don't act out our dreams. The following two pictures show different parts of the brain, some of which are related to sleep and awake states, viz Pineal Gland, Thalamus, Cerebral Cortex, etc.

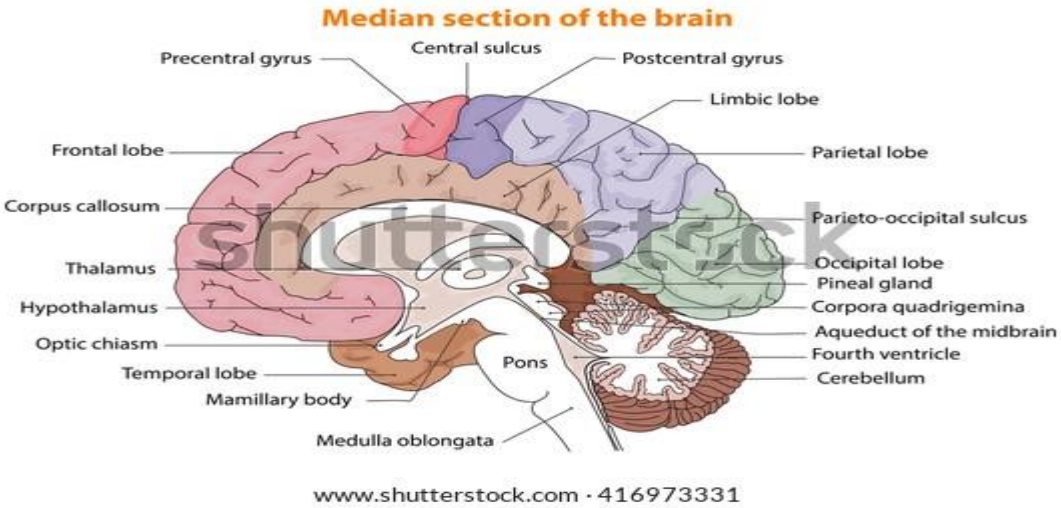

Figure 4—shows Hypothalamus which along with the Brain stem (located where pons is seen) connected to sleep and awake states. The Pineal gland shown in the picture receives signals and increases the production of the hormone* melatonin*, which puts you to sleep.

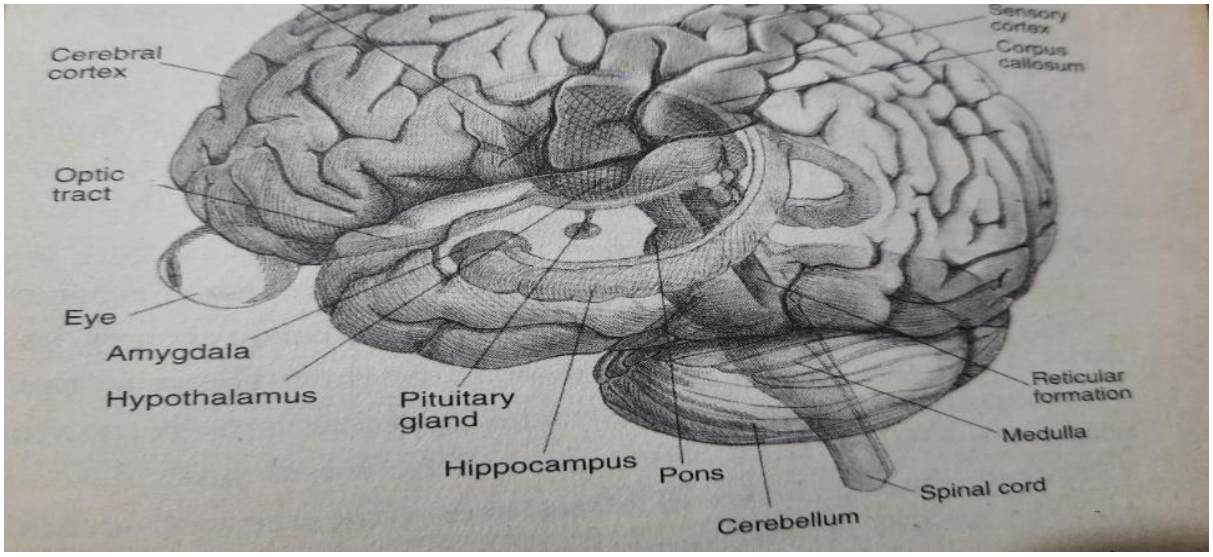

Figure 5 showing internal parts of the brain connected to the sleep phenomenon. The lower portion is the brain stem which has pons and medulla responsible to send signals to body muscles to relax. Hypothalamus has the sleep-promoting cells. The figure also shows Cerebral Cortex that processes short/long term memories.

The ***brain stem***, at the base of the brain, communicates with the hypothalamus to control the transitions between wake and sleep. The ***thalamus*** acts as a relay for information from the senses to the ***cerebral cortex*** (the covering of the brain that interprets and processes information from short- to long-term memory). The ***amygdala***, an almond-shaped structure involved in processing emotions, becomes increasingly active during REM sleep. During most stages of sleep, the thalamus becomes quiet, letting you tune out the external world. But during REM sleep, the thalamus is active, sending the cortex images, sounds, and other sensations that fill our dreams.

Now through the above discussions, we have learned what happens in our body and brain when we drift in Sleep in both NREM as well as in REM stages. Next, we shall learn about dreams which occur during sleep:

Dream State

Adler Lana (2021) explains ***Dreams:***

> *Dreams are stories, images, and sensations created by our minds while we sleep. They often draw from our experiences and can be extremely vivid and lifelike. At times, dreams can resemble waking life. At other times, they can be surreal. Most dreams happen during the rapid eye movement (REM) portion of sleep. REM is the period of sleep when the brain is most active. A small portion of dreams happens outside of REM sleep, especially during slow-wave NREM sleep. However, the vivid dreams that we are most likely to remember upon waking usually occur during REM sleep.*
>
> *Most dreams only last for around five to 20 minutes, though they may seem like they are going on for much longer. Short dream times allow us to have multiple dreams per night, whether or not we remember them.*

Brain functioning during Dreams

We don't yet have a full picture of exactly which parts of the brain are responsible for dreams. However, sleep studies have revealed a good deal about what parts of the brain seem to be involved. Areas of the brain that are active during dreaming include:

- ***The Brainstem:*** One of the most primitive parts of the brain, the brainstem helps control movement, sensation, and the involuntary nervous system. When you dream, the brainstem issues rapid-fire signals, which may be why dreams feel so tactile.
- ***The Amygdala***: The amygdala is a tiny part of the brain that helps control emotion. Activity in the amygdala may be one reason why we feel so strongly about what we experience in our dreams.
- ***The Hippocampus***: This section of the brain has a lot to do with memory, as well as learning and emotional information. It is hyper-active during dreams. This may have to do with how vivid memories are factored into dreams, and also may indicate that dreams are involved with processing and consolidating memory.
- ***The Visual Cortex:*** This area in the cerebral cortex interprets and processes images and visual information. It is also highly active during dreams, which may be why we can see dreams play out before us.

Pictorially brain functioning during a dream is brought out in the following picture:

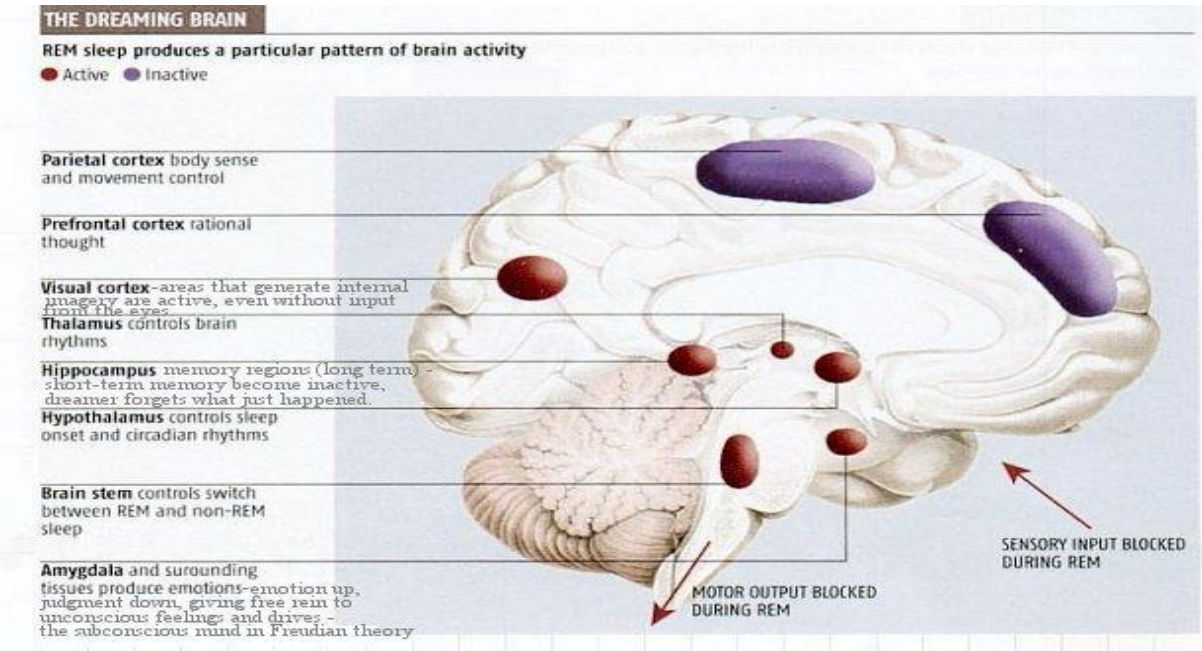

Figure 6: Brain functions during the dream state

During the dream state, the parietal cortex which is controlling body movement and gives us the body sense becomes inactive. Our rational thinking also stops because of the inactivation of the prefrontal cortex which is responsible for rational thought. The thinking during the dream is guided by the brain part Amygdala and the surrounding tissues which remain active during dreams. These produce irrational thoughts where emotions are heightened but judgment is down and the thoughts move in a free manner through unconscious feelings, thus we see situations driven by an irrational logic deviating away from rational thinking. Dreams are like motion pictures and the visual processing of thought pictures happens in the parts of the visual cortex (these remain active during sleep) that generate internal imagery even without inputs from the eye.

We tend to forget dreams on wakening because the Hippocampus memory regions responsible for long-term and short-term memory becomes inactive during dream state.

Hypothalamus is active and helps in inducing sleep and it together with the active Thalamus controls the rhythms during the sleeping state.

As we saw in the cycle of sleep, we keep on switching between NREM and REM sleeps, and the brain part The Brain Stem which is active during the dream state remains active and controls the switching between NREM and REM states.

How do we come out of dreams and sleep?

Wakefulness after sleep

The ***basal forebrain***, near the front and bottom of the brain, promotes sleep and wakefulness, while part of the ***midbrain*** acts as an arousal system. The release of adenosine (a chemical by-product of cellular energy consumption) from cells in the basal forebrain and probably other regions supports our sleep drive. Caffeine counteracts sleepiness by blocking the actions of adenosine**.** Also, it is said that our sleep cycle is controlled by Melatonin which when activated during the night induces sleep and when it reduces and the body starts producing a steroid Cortisol, the waking process begins.

Walker Jennifer (2020) suggests:

> *The actual mechanism of sleep-wake is relatively poorly understood, despite years of research.*
>
> *But what we do know is that an endogenous (i.e. naturally produced by the body itself) sleep-regulating substance, or substances, builds up in the body's cerebrospinal fluid during our waking hours, which has the effect of increasing the pressure to sleep the more it accumulates. This pressure is only released by the act of sleeping itself, during which the levels of the sleep-regulating substance in the body rapidly decline.*
>
> *The best known of these sleep-regulating substances (although probably not the only one) is adenosine. Adenosine operates as a neuromodulator in the brain and has the effect of inhibiting many of the bodily processes associated with wakefulness, particularly those involving the neurotransmitters norepinephrine, acetylcholine, and serotonin.*
>
> *Adenosine levels in the basal forebrain rise as sleep build-up and then fall rapidly during the subsequent sleep period. Adenosine is created over the course of the day, as a natural by-product of using up our internal energy stores (it forms the core of adenosine triphosphate (ATP), the energy-storage molecule that powers most of the biochemical reactions inside cells).*
>
> *Experiments have definitively shown that high levels of adenosine lead to sleepiness. Studies in animals have shown that blocking adenosine's actions in the brain increases alertness, while injections of adenosine or similar compounds induce normal sleep.*
>
> *During the day, homeostatic sleep drive typically increases, making you sleepier and sleepier as the day goes on. Meanwhile, the circadian drive begins to wind down from the arousal phase and begins the release of sleep-inducing melatonin as evening falls. This causes the opening of the so-called sleep gate, the point where homeostatic sleep drive is at its farthest distance from a circadian drive for arousal.*
>
> *At this point, it is believed that neurons in the brain settle into sleep and, once enough of them are at rest, your body follows suit. During the night*

> *as you sleep, sleep homeostasis quickly dissipates as circadian-regulated melatonin production continues.*
> *By morning, the circadian clock shuts down the production of melatonin and the circadian alert system cranks up activity again. This is when the circadian drive for arousal overcomes the homeostatic sleep drive, triggering wakefulness.*

Thus we see that sleeping and awakening are caused by changes in Adenosine levels in the basal forebrain The level rises resulting in sleep build-up, and then the level starts falling rapidly during the subsequent sleep period and finally results in our waking up when the level has fallen substantially.

Having learned about what causes the sleep, dream, and waking states, we move on to sleep disorders.

Sleep Disorders

The term sleep disorder refers to conditions that affect sleep quality, timing, or duration and impact a person's ability to properly function while they are awake.

Pacheco Danielle (2020) explains Sleep orders as follows:
Most sleep disorders can be characterized by one or more of the following four signs:

- *You have trouble falling or remaining asleep*
- *You find it difficult to stay awake during the day*
- *There are imbalances in your circadian rhythm that interfere with a healthy sleep schedule.*
- *You are prone to unusual behaviors that disrupt your sleep*

Sleeping is a normal daily routine for everybody and as the night falls, people go to sleep at their body clock times. Only sleep refreshes us to take on the tiring tasks of the next day. While all normal humans drift into sleep mode effortlessly; there are some less fortunate who keep on tossing in bed trying to drift to sleep but sleep eludes them. They suffer from Insomnia.

Insomnia

Insomnia is the most frequently occurring sleep disorder. Pacheco has the following views on Insomnia:
Insomnia is characterized by the recurring difficulty to fall or remain asleep despite motivation and means to do so. People with insomnia also experience excessive daytime sleepiness and other cognitive impairments while they are awake. Insomnia is considered a chronic condition when patients exhibit symptoms at least three times per week for at least three months. Based on recent statistics, up to one-third of adults live with some form of insomnia.

- ***Sleep-onset insomnia*** occurs when people have difficulty falling asleep, even when they are tired.
- ***Sleep maintenance insomnia*** refers to difficulty staying asleep during the night.
- ***Mixed insomnia*** is a hybrid condition characterized by sleep-onset and sleep maintenance insomnia symptoms.

It would be of interest to understand what causes *Insomnia.*
It's not always clear what triggers insomnia, but it's often associated with:

- stress and anxiety
- a poor sleeping environment – such as an uncomfortable bed, or a bedroom that's too light, noisy, hot, or cold
- lifestyle factors – such as jet lag, shift work or drinking alcohol or caffeine before going to bed
- mental health conditions – such as depression and schizophrenia
- physical health conditions – such as heart problems, other sleep disorders, and long-term pain
- certain medicines – such as some antidepressants, epilepsy medicines, and steroid medication
  (*source: nhsin.scot/illnesses-and-conditions/mental-health/insomnia)*

Some of the reasons are temporary and, when understood, have easy solutions and when we take action, sleep is restored, viz., jet leg, uncomfortable bed, noisy environment, etc… But the persistent insomnia is due to factors that need medical or psychiatry attention, e.g., depression, schizophrenia, heart problems, long term pains, and use of certain medicines which affect sleep
Another Sleep Disorder is ***Sleep Apnea***, also called, ***Sleep Apnoea***. In this disorder, the person has breathing difficulties during sleep which disturbs the sleep and the person finds fatigued after sleep as he/she does not get good sleep.

Sleep Apnea
Pacheco Danielle (2020) describes this Sleep Disorder:

> *Sleep apnea is a common sleep-related breathing disorder that occurs due to blockage of the upper airway. People with this condition often wake up choking or gasping for air. Heavy snoring is another common symptom. Like other sleep disorders, sleep apnea can cause excessive daytime sleepiness and fatigue, as well as various cognitive impairments. Most sleep apnea cases fall into one of the following two categories.*

- ***Obstructive sleep apnea (OSA)*** *is caused by a physical obstruction that blocks the upper airway. This obstruction may be attributed to large tonsils or adenoids, fluid buildup from advanced heart or kidney failure, or genetic syndromes that affect facial structure such as cleft palate. Obese people with fat deposits around their neck are also at higher risk of OSA, and back sleeping can lead to apnea episodes if the tongue falls back into the throat. For many patients, continuous positive air pressure (CPAP) therapy is the most effective treatment*
- ***Central sleep apnea (CSA)*** *occurs when the brain stops sending signals to the muscles that control breathing, leading to choking episodes during the night. As with OSA, obesity is a common risk factor for CSA. The condition may also affect people who have experienced a stroke, brain infection, and other medical problems with the brain stem, as well as those who take narcotic painkillers and other sleep-inducing medications. CPAP therapy is often prescribed for CSA, though some patients find bi-level positive air pressure (BiPAP) therapy more effective.*

The terms CPAP and BiPAP used above are explained by ***Hines Jennifer (2018)*:**
BiPAP (also referred to as *BPAP*) stands for Bilevel Positive Airway Pressure and is very similar in function and design to a *CPAP* (continuous positive airway pressure). Similar to a *CPAP* machine, A *BiPAP* machine is a non-invasive form of therapy for patients suffering from sleep apnea. Both machine types deliver pressurized air through a mask to the patient's airways. The air pressure keeps the throat muscles from collapsing and reducing obstructions by acting as a splint. Both *CPAP* and *BiPAP* machines allow patients to breathe easily and regularly throughout the night. The main difference between *BiPAP* and *CPAP* machines is that *BiPAP* machines have two pressure settings: the prescribed pressure for inhalation, and a lower pressure for exhalation. The dual settings allow the patient to get more air in and out of their lungs.

Snoring is most commonly observed and since the person did not sleep well at the night, he feels drowsy during the daytime. Most obese people are most affected by this sleep disorder. They must take measures to lose weight which will ease up the problem to some extent. Sleeping sideways will help in mid cases. Further, it is advised to stop smoking and avoid drinking before sleep. Sleeping pills may affect a person adversely if they are taken without advice from the doctors.

We discussed Insomnia and Sleep apnea and now we move on to the next common sleep disorder—***Sleep Walking***

Sleepwalking (formally known as somnambulism)
As described by Suni Eric (2020), Sleepwalking is a behavior disorder that originates during deep sleep and results in walking or performing other complex behaviors while still mostly asleep. It is more common in children than adults and is more likely to occur if a person has a family history of the condition, is sleep deprived, or is prone to repeat nighttime awakenings.
Sleepwalking is a type of sleep disorder known as parasomnia. Parasomnias are abnormal behavior during sleep. In fact, parasomnias straddle a border between sleep and wakefulness, which is why the actions that occur during parasomnia episodes are abnormal.

Parasomnias can be categorized based on the part of the sleep cycle during which they occur. Sleepwalking happens during NREM sleep, usually in stage III of the sleep cycle, which is also known as deep sleep. Sleepwalking is classified as an NREM disorder of arousal. It is important to recognize that, despite the name, sleepwalking is not limited to walking. Other types of actions can occur and are still under the umbrella of sleepwalking. Examples include running, routine actions like getting dressed, moving furniture, engaging in sexual behavior (sexsomnia), or urinating in inappropriate places. Less often, behaviors can be violent or may be more complex, including trying to drive a car.

Sleepwalking episodes can last for a few seconds to half an hour with most finishing in less than 10 minutes. The person may return to bed and go back to sleep on their own, or they may wake up confused while they are still out of bed.

A key symptom of sleepwalking and other NREM parasomnias is that the person virtually never has a recollection of the episode when they wake up. For that reason, they most often learn about their sleepwalking from a family member or housemate.

Another common element of NREM parasomnias is that they typically occur during the first third or half of the night when a person tends to spend a higher percentage of time in deep NREM sleep stages.

So much so for Sleep Walking. The next Sleep disorder relates to excessive sleeping-Narcolepsy

Narcolepsy (Inappropriate or Excessive Sleeping)

Narcolepsy is a rare long-term brain condition that causes a person to suddenly fall asleep at inappropriate times.

The brain is unable to regulate sleeping and waking patterns normally, which can result in:

- excessive daytime sleepiness – feeling very drowsy throughout the day and finding it difficult to concentrate and stay awake
- sleep attacks – falling asleep suddenly and without warning
- cataplexy – temporary loss of muscle control resulting in weakness and possible collapse, often in response to emotions such as laughter and anger
- sleep paralysis – a temporary inability to move or speak when waking up or falling asleep
- excessive dreaming and waking in the night – dreams often come as you fall asleep (hypnogogic hallucinations) or just before or during waking (hypnopompic hallucinations)

Narcolepsy does not cause serious or long-term physical health problems, but it can have a significant impact on daily life and be difficult to cope with emotionally.

For the wakefulness of the human body, the brain must have adequate chemical hypocretin (also known as orexin). When the level goes down the sleep order of excessive sleeping happens. The lack of Hypocretin is often caused by the immune system mistakenly attacking the cells that produce it or the receptors that allow it to work.

But this does not explain all cases of narcolepsy, and the exact cause of the problem is often unclear.

Things that have been suggested as possible triggers of narcolepsy include:

- hormonal changes, which can occur during puberty or the menopause
- major psychological stress
- an infection, such as swine flu, or the medicine used to vaccinate against it (Pandemrix)

(Above details are inspired from *www.nhs.uk/condition/narcolepsy/)*

There's currently no cure for narcolepsy, but making changes to improve your sleeping habits and taking medicine can help minimize the impact the condition has on your daily life. Taking frequent, brief naps evenly spaced throughout the day is one of the best ways to manage excessive daytime drowsiness.

We have covered major sleep orders in our discussions.

The research paper had a central theme that revolved around many questions related to sleep and these questions had been put in the beginning paragraphs of the paper. We have dwelled on each question and tried to find answers to most of the questions in detail. Almost all the questions have been tackled which has created more awareness amongst the readers. However, few questions still await the answers:

- are our all five senses working or some are taking rest during sleep?
- are we conscious during sleep?
- what is difference between sleep state and coma?

We take up these last questions before concluding the paper.

Are our all five senses working or some are taking rest during sleep?
We know that activities in our body decreases during our sleep and our five senses also may be affected to a great extent as the body activity gets lowered to a great extent.

We all sleep with our eyes closed. Since the sense organs for seeing are eyes that remain closed during sleep so, obviously, the sense of seeing is not active during sleep. We, however, do dream- in a dream we see things from the mind's eye which means that the external world in real sense is not being seen but processing of seeing is happening inside the brain without the signal coming from the sense organs-eyes.

The sense of touch is dimmed but is active as normally we shake the person for waking him and he/she responds to our touch. Sense of hearing, in the same way, is active but dimmed. It is active because the sound of the alarm from the alarm clock reaches us in the sleep states and wakes us up.

However, the sense of smell and taste are hardly active (we may even say that they are absent) during sleep, how else most of the deaths during the breaking of fire are due to suffocation/intoxication and not due to actual burning. Olfactory awareness in humans is low to absent during sleep, and human olfaction appears insufficiently sensitive and reliable to act as a sentinel system.

The above discussions explain the dimming of our five senses and now we take up the next unanswered question:

Are we conscious during sleep?
The correct meaning of Consciousness is elusive and even scientists find it a hard problem. In the context of sleep and consciousness, we observe that some people define the difference between consciousness and unconsciousness by whether the person's eyes are open or shut. According to the Webster Dictionary, consciousness is defined as the quality or state of being aware especially of something within oneself. William James, a key figure in the study of consciousness, believed that consciousness consisted of a steady stream of thoughts, emotions, and perceptions.

If we weigh sleep against consciousness as per what some people think as, in the above paragraph, we would declare that sleep is an unconscious state but when we look at the other two realistic ways of looking at the conscious and unconscious states, evidently, we cannot deny that sleep is a conscious state as there is a continuous stream of thoughts (evidenced in dreams) and we are aware of something within ourselves. Thoughts during dreams may not be rational but are logical. Mind and brain are active and we are in an aware state so we can answer the question both ways but I, personally, am tempted to take the second view i.e., ***sleep is a conscious state***.

Next, we take up the last question-

What is the difference between sleep state and coma?

Before we answer the question, let us think about why this question? The question has credibility because the two states have something in common i.e., the body parts are inactive in both states. Appearance-wise there is stillness in both cases but sleep differs from a coma in the sense that occasionally there is body movement. We saw above that Sleep is a conscious state. Contrarily, Coma is a profound state of unconsciousness. A person in sleep can be awakened by sound or by touching but the person in Coma does not awaken or respond normally to touch, light or sound.

With the above answers, now, all the questions answered, we come to an end to our discussions on the topic of sleep.

Many aspects of sleep were not known to me and would also be new to many readers like me. This paper intended to understand and make others understand the full meaning of the simple phenomenon of sleep.

As a common man I knew the simple facts that sleep is a normal routine process which the humans routinely undergo on daily basis. Every night we go to bed and sleep engulfs us and we get up next morning refreshed and ready for the next day. Day goes, night comes and we sleep and get up next morning. We have never bothered to think what happens in our body and brain when we sleep and how sleep and wake states are caused. The paper broadens our awareness by explaining to common man the facts behind sleep. By the time reader reaches the end of paper, there will be enlightenment about various facts hitherto unknown. Sleep disorders are generally known but now we know how they happen and what could be done to overcome them. We also know the facts behind dreams that we see.

Through this paper the scientific facts concerning ***Sleep*** are put on a platter so that the common man could have broadened awareness about sleep.

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Conflict of Interest

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