



MRSA CREW



Theejutha Meaklertmongkol
Sarun Kerdrojwongkul
Panicha Boonyalug
Kanik Sritara
Pornpailin Paradeevisut
Arisa Sittichokananon
Rachakorn Nabhindakara
Tanatat Apiwessa

CLUB FOUNDERS



Varissara Narongpanich
Apichaya Sinchaipanich
Punyisa Pintola
Jin Rushchano
Dayada Pujchathum
Thorphan Tienboon
Siorat Khamwanate

CLUB MEMBERS

ABOUT MRSA

Why Was MRSA Created?

The Medical Research Students' Association (nicknamed MRSA) was founded by EPTS18 students who have the common goal of entering medical school. It was originally a LINE group to share news about each university's academic qualifications and medical camps. As the importance of the portfolio increased, the group was used to organize volunteer events, mostly related to healthcare, in order to improve their applicant profiles and understand more about the world of medical services. As BMAT exams approached, the group was used to discuss exam questions and share academic resources.

The founding members of MRSA feel that this support network should also be extended to other grade levels. We also think that establishing a club makes members more organized and the activities they do more legitimized.

Why Should I Join MRSA?

One of the main reasons that you should join MRSA is to test whether you are capable in the medical field. MRSA will help students find out if they enjoy medical science work and to support students who want to go to medical school. MRSA also provides useful activities for medical school portfolios such as community service, social projects, surveys about mental issues, and interesting experiments. Not only that MRSA helps members to find their interests but it also aims to improve every student's health and quality of life.

What does MRSA do?

MRSA provides plenty of essential study materials for medical school admissions. We have a website that houses the association's resources by providing past academic exams such as BioMedical Admission Test (BMAT) and SAT, along with university requirements and other useful information for applications. We also have social projects related to human body with practical and laboratory work. Furthermore, you will be able to participate in community services with our association.

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MRSA WEBSITE

<https://mrsaeps.wixsite.com/mrsa/home>

Scan this QR on enter this URL to approach our website

The Mechanism of Sleeping

INTRO • SLEEP-WAKE CYCLE • STAGES OF SLEEPING
FUNCTIONS OF SLEEP • HOW DREAMS WORK?

INTRODUCTION

Sleep is a physiological condition that is defined by the loss of consciousness and inactivity of one's body for a period of time. Sleep cycle is regulated by the nervous system which includes brain functions and neurons that promote wakefulness and sleep. In general, several structures in the brain are involved with sleep. When the brain receives information about light exposure from the eyes, hypothalamus and brain stem produce a chemical called GABA which send signals to relax muscles and prepare for sleep. Then, arousal signal is sent to cerebral cortex to inhibit activity in the brain to maintain sleep. During the stages of sleep, most regions of the brain become inactive, resulting in periods of stable sleep.

Additionally, neurotransmitters or brain chemicals also play roles in promoting sleep and wakefulness as well. GABA which is associated with muscle relaxation is one of the neurotransmitters that influence sleep. While GABA promotes sleep, other neurotransmitters, such as serotonin, acetylcholine, and histamine, increase brain activity that leads to wakefulness. Therefore, the release of these neurotransmitters are also involved in regulating cycles of wakefulness and sleep.

SLEEP-WAKE CYCLE

From when one is asleep until one is awake, your body goes through cycles between sleepiness and alertness at regular intervals. This is called the 'sleep-wake cycle', in which one cycles between REM and non-REM sleep. The cycle first enters non-REM (non-rapid movement) sleep, followed by a shorter period of REM (rapid eye movement) sleep. The cycle then repeats. During REM sleep, the eyes move quickly in different directions, as opposed to during non-REM sleep. The non-REM period can also be further divided into three stages.

STAGES OF THE SLEEP-WAKE CYCLE

There are five stages of the sleep-wake cycle, beginning with the Stage 0 or the wake cycle. In this stage, the eyes are wide open and the person is responsive to external stimuli enough to hold intelligible conversations. The time spent in this cycle is around 16 to 18 hours per day, followed by the beginning of the non-REM sleep stage. This stage of sleep is divided into subgroups, 'light sleep' and 'deep sleep'. During light sleep, Stages 1 and 2 of the cycle begins. For most people, the sleep cycle begins with a short period of stage 1 sleep, which is around 5-10 minutes and consists of the body beginning to relax and a drowsy state occurring with slow rolling eye movements. Though arousals or awakenings are not uncommon in this stage, it is necessary for the body to enter Stage 1 in order to continue to Stage 2 of the cycle. The main stage of non-REM sleep, Stage 2 lasts approximately 20 minutes and is usually 40-60% of total sleep time. In Stage 2, body temperature begins to drop and the heart rate slows down. Stage 3, which normally occurs during deep sleep, lasts between 5-15% of total time asleep for most adults and much longer for children or adolescents. Growth hormone is secreted and slow waves begin to appear on EEG readings in this stage. The last stage of the sleep cycle is stage R, where REM occurs and brain waves are similar to when the body is awake. The heart rate, breathing rate and blood pressure rise. The body is paralyzed, and most vivid dreams happen in this stage. Stage R usually begins 90 minutes following sleep onset, and the first REM period of the night is usually short. After REM, the cycle resumes with Stages 1, 2, and 3 intermixed before returning to REM again for longer periods of time as sleep time continues. Therefore, the first sleep cycle is about 90 minutes and later cycles average between 100 to 120 minutes. An individual will typically go through four to five sleep cycles a night.

The sleep-wake cycle is run by the circadian rhythm, a 24-hour internal clock within the body. It is responsible for making one feel energized and drowsy around the same time each day. A part of your hypothalamus controls the circadian rhythm. However, external factors such as light intensity can also influence it. When it is dark at night, the eyes send a signal to the hypothalamus to indicate tiredness. The brain then sends a signal to the body to release melatonin, which makes the body feel tired. The rhythm can be disrupted by irregular sleep habits, which may result in severe disorders such as Delayed Sleep Phase Disorder, Shift Work Disorder, and Narcolepsy.

Moreover, the circadian rhythm alone does not regulate the sleep-wake cycle, it is supported by the sleep-wake homeostasis regulation which is balanced against the circadian element. Sleep-wake homeostasis is an internal biochemical system that operates as a kind of timer, generating a homeostatic sleep drive or pressure to sleep and regulating sleep intensity. It effectively reminds the body that it needs to sleep after a certain time: the longer one has been awake, the stronger the desire and need to sleep becomes, and the more likely one will fall asleep. The same is true for the opposite: the longer on has been asleep, the weaker the desire to sleep, and the more likely one will wake up. In conclusion, the homeostasis regulation and the circadian rhythm interact together and balance each other to regulate the sleep-wake cycle.



FUNCTIONS OF SLEEP

Sleep is one of the physical activities which helps maintain both the physical and mental health of an individual. In the past, it was believed that sleeping prevented sleep deprivation. However, scientists have recently revealed that during sleep, a number of processes which are important to adolescents are functioning. Many studies have illustrated that enough sleep improves the function of the brain such as memory consolidation, physical health, and endocrine function.

The process of memory consolidation is performed more actively and efficiently during an individual's sleep. In other words, individuals who have adequate night sleep are likely to have more permanent and high active memory storage than those who do not. According to a study conducted by researchers at Beth Israel Deaconess Medical Center (BIDMC), which was done with twelve college-aged individuals practicing finger movements (similar to playing the piano) before either waking up or going to sleep for twelve hours, those who sleep had more improvements on their motor skills. MRIs have shown that while sleeping, the cerebellum, which controls speed and accuracy, is more active at work. On the other hand, the limbic system, which controls emotions, has its activities decreased. "When you are asleep, it seems as though you are shifting memory to more efficient storage regions within the brain. Consequently, when you awaken, memory tasks can be performed both more quickly and accurately and with less stress and anxiety," says Walker, an Assistant Professor of Psychiatry at Harvard Medical School. The better sleep an individual has, the better memory they possess.

It is known that good sleep results in good physical health. However, sleep can be even more beneficial to health than it seems. According to National Heart, Lungs, and Blood Institute (NHLI), sleep helps support an individual's health in two ways. First, adequate sleep reduces the risk of many diseases, such as heart disease, kidney disease, high blood pressure, diabetes, and stroke. This is because when an individual falls asleep, the body has time to rest, repair and restore muscle tears, and generally prepare organ systems for the following day. Second, an individual's immune system, which fights pathogens and harmful substances, is dependent on sleep. Lack of sleep or sleep deficiency can damage the system.

The functioning of the endocrine system is also dependent on sleeping habits. The endocrine system is a collection of glands which release hormones throughout the body. According to the National Sleep Foundation, some hormones released during sleep, such as growth hormone, prolactin, and luteinizing hormone. Other hormones, such as thyroid hormone and cortisol are inhibited. Growth hormone is generally secreted in the first few hours of sleep. Melatonin is released in the dark and is inhibited by light. Insulin is another hormone which can be influenced by sleep habits. Many studies have shown that adults who get five or fewer hours of sleep a night were 2.5 times more likely to have diabetes, compared to those who get seven to eight hours of sleep a night. However, individuals who sleep nine or more hours have higher risks of diabetes. It can be inferred that deficient sleep and excessive sleep cause negative effects on insulin's mechanisms and may result in diabetes.

In conclusion, sleep is an essential activity of humans which has great impact on many body mechanisms. Efficient and sufficient sleep enhances the process of memory consolidation and maintains physical health. As Walker says in his research, "Sleep appears to play a key role in human development."

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Dreaming isn't tied to
any brain stages

G. William Domhoff
DREAM EXPERT

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HOW DREAMS WORK?

Domhoff's theory seems to be true since research has proven that dreaming will happen mostly during Rapid Eye Movement (REM) sleep and will also indicate high-frequency electrical activity in the brain. Somehow, a dream might occur in non-REM sleep, such as Slow Wave Sleep, and when the brain has low-frequency electrical activity.

According to neuroscience, dreaming is about memory consolidation which happens in the brain during sleep. Memory consolidation is a process of long term memory formation which can enhance the consolidation of information from memory and solidify new memories.

The Relevance of Dreaming

There are two main reasons why dreaming is important. First and foremost, a dream can be considered as an overnight therapy. In REM sleep, our brain is emptied from the anxiety triggering molecule, noradrenaline. The upsetting memories can then be reprocessed in an atmosphere where our brain is free from stress factors. Since the dreams help de-escalate emotional reactivity, dreaming is an important mechanism for mental well-being.

Second, a dream can increase creativity and enhance problem-solving skills. During REM sleep, our memories mix together in an abstract way. So, when one is dreaming, the brain will analyze the received knowledge before applying common sense. Therefore, dreaming can provide creative ways to solve problems presented. There is a study where participants had to navigate a maze, and those who slept can solve the maze better than those who do not. Furthermore, those who slept and dreamed about the maze can solve it better than those who only slept.

What causes a dream?

There are many theories about dreaming but no one knows exactly why humans are dreaming. Certain studies have shown that people who do not dream can experience depression, increased tension, anxiety, difficulty concentrating, lack of coordination, and weight gain. Sigmund Freud believed that dreams could reveal a person's desire, thoughts, and motivations. Perhaps, dreams may be a way in which people satisfy desires that are unacceptable in society.

Health Risks from Sleep Deprivation

CARDIOVASCULAR SYSTEM

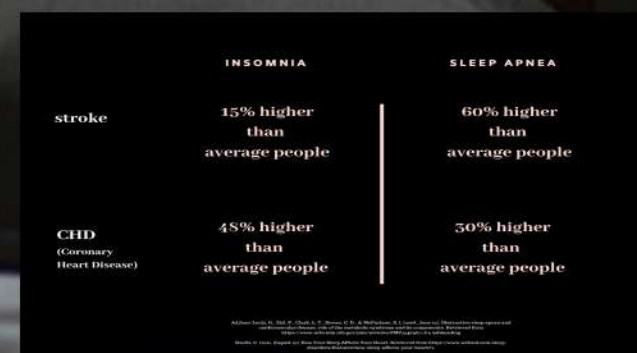
Short sleepers, mostly insomniacs, according to the Center for Disease Control and Prevention, are more prone to be at risk for obesity, coronary heart diseases and diabetes more than those who regularly sleep 7-9 hours a night. Agreeing with the statement, irregular sleep patterns are also found to be linked to cardiovascular diseases including the mentioned conditions, stated by the American Heart Association.

In a quest to find the correlation between Sleep Deprivation, Susanna Larsson, Ph.D conducted a unique research using the Mendelian randomization which studies the association between the genetic variants of a certain condition to the potential factors. As a result, the insomniac genes were linked to higher risks for coronary artery disease, heart failure and ischemic stroke. Though the data obtained may come with certain limitation, such linkage of sleep behaviours to critical heart conditions is a significant finding that amplifies the importance of sleep regulation.

Sleep Apnea, a condition in which breathing is stopped and started frequently, exhausts the sleeper and causes fatigue during daylight. The disorder occurs mainly with loud snoring interrupted sleep, and sleepiness during the day. As the episodes of sleep apnea occurs, the intake of oxygen decreased while that of carbon dioxide increased. Therefore, the sympathetic nervous system is activated during nighttime as well as during the day. Hence, the study shows that the sufferers have 4 times the odds for irregular heart beats than the controlled population. Moreover, men with the disorder are 58% more likely to develop heart congestive heart failure, in comparison to those without the condition. Even worse, the Center for Disease Control and Prevention claims that Sleep Apnea increases the risk for cardiovascular diseases including high blood pressure, heart attack and stroke.

CENTRAL NERVOUS SYSTEM

The central nervous system (CNS) consists of the brain and the spinal cord. It plays a role in processing and interpreting data, controlling voluntary and involuntary movements, reducing the impact of negative memories, and controlling our emotions, thoughts, perceptions, and cognition. Sufficient sleep is vital for keeping the CNS functioning properly. While sleeping, new pathways form in one's neurons. It enables individuals to recall and remember information. Sleeping also helps enhance long-term memory by strengthening certain neural connections and by disposing unwanted ones. Without enough sleep, the brain will be left exhausted and will not be able to perform with its full capacity. That being said, chronic insomnia can disrupt the process, which will result in decreased productivity, delayed coordination, difficulty in concentration and learning new skills, and mood swings.



A recent discovery has found out that the brain clears out toxins, including those associated with alzheimer's disease, much more rapidly while we are asleep than when we are awake. If sleep deprivation continues long enough, it can even cause hallucinations, mania in people with bipolar disorder, and other psychological risks including depression, anxiety, paranoia, impulsive behaviors, and suicidal thoughts.

Depression and sleep problems are correlated. People with depression often do not get enough sleep or get too much sleep. Research has shown that sleep deprivation can cause and worsen depression. Studies have found that people who sleep less than six hours per night or more than eight hours per night are more likely to be depressed. In addition, people with insomnia are many more times likely to have depression and anxiety. A plausible explanation is that the part of the brain that controls circadian rhythm (daily sleep-wake cycle, and all the body functions that depend on it) is disrupted in depressed people. Moreover, one can also experience microsleep during the day. Microsleep is when you fall asleep and become unconscious for a few seconds or minutes without realizing it. Microsleep can be extremely dangerous especially when driving.

HOW TO SLEEP WELL

Waking up in the morning seems to be a very hard thing to do. Unsurprisingly, it is influenced by how you slept last night. Someone might find it difficult to go to bed early and sleep right away, so here are some tips to help you get a proper sleep and enjoy a better life.

Exposure to Blue Light

Blue light is a short wavelength which is visible to human eyes. During the daytime, blue light can be beneficial, but it causes adverse consequences at night. Combining with the fact that blue light is the brightest light, humans can be harmed from staring too long at blue light. Too much exposure of blue light may result in eye strain, dry eyes, and blurred vision. Apart from these symptoms, exposure to blue light at night can impact our sleep cycle. Blue light also exists in sunlight. Therefore, our brains will be tricked, and keep our body awake even at night. In addition, blue light lowers hormones that aid deep sleep such as melatonin. However, we can reduce blue light exposure by wearing glasses that intercept blue light, install applications on gadgets to block blue light, reset the color temperature on computer screen to 5000k, using warm white light bulbs instead of cool white or daylight bulbs, and avoid watching TV or using computers or smartphones two to three hours before bed.

Exercising Regularly: The Cliche

Having regular exercise expands the amount of slow wave sleep you will get in each day. Slow wave sleep is also known as deep sleep. Getting a sufficient amount of deep sleep helps your brain and body to rejuvenate. The perfect time of exercising in order to see a change in sleep quality is at least 30 minutes of moderate aerobic exercise. However, exercising causes the body to produce endorphins which makes you stay awake, so we should exercise at least one to two hours before we go to bed.

Mind Clearing

Clearing your mind before bedtime results in better sleep quality. Many people are stressed from work or school, and feel strained even at night. This may cause insomnia, or may restrict deep sleep. However, there are multiple ways to relax your mind, including listening to music, reading books, meditating, relaxing your muscles, doing breathing exercises, and postponing your worries by taking notes and start thinking again on the following day. Furthermore, if you have a lot of time, you can also take a 90-minute relaxing bath or shower before bed. This is one of the most famous ways people use to lessen anxiety, because hot water can calm your central nervous system. However, if you only have a little amount of time, you can easily bathe your feet instead.

Healthy Diet

The food that you consume during the day plays a big part in how you sleep at night. You should avoid drinking any beverages that contain caffeine because it causes sleep problems up to ten to twelve hours after drinking it. Big, heavy meals before bed cause stomach problems and heartburn. Some light snacks before bed such as a turkey sandwich, low-sugar cereal, a small bowl of whole grains, milk, yogurt, or a banana help promote sleep.