



SLEEP DEPRIVATION AND ITS IMPACT ON COGNITIVE PERFORMANCE

- A LITERATURE REVIEW

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ABSTRACT

Sleep plays an important role in body functions, brain functions and overall well being. During sleep, the brain undergoes various processes like memory consolidation, hormone regulation and tissue repair. Sleep deprivation can have significant consequences on physical and mental health. Sleep deprivation is the condition where the individual is not getting enough of sleep over a period of time. Every individual at different ages has different requirements of sleep, like infants require 14-17 hours of sleep while toddlers require 10-12 hours, adolescents require 9-11 hours, adults require 8-10 hours and older adults require 7-9 hours of sleep everyday. Sleep deprivation can result from various factors ranging from lifestyle and environmental factors to sleep disorders and other medical conditions. Impaired cognitive performances is one of the short term effects of sleep deprivation. Cognitive performance comprises learning, creativity, innovation, information processing speed, memory, attention and concentration. Lack of sleep interferes with all the above process of cognitive performance. Creating a conducive sleep environment, practising good sleep hygiene, managing stress and making changes in the lifestyle can help prevent sleep deprivation. The present paper outlines sleep deprivation and its impact on cognitive performance.

Keywords : sleep, sleep deprivation, memory, cognitive performance.

INTRODUCTION

Sleep is an vital part of our daily routine. It is estimated that we spend about a third of our time sleeping. Sleep is largely driven by the body's internal clock, which takes cues from external elements such as sunlight and temperature. Our body's natural sleep-and-wake cycle is reasonably attuned to a 24-hour period. Sleep offers the body and brain time to restore and recover, affecting nearly every tissue in the body. Most adults need at least seven to nine hours of sleep. Sleep deprivation is when an individual does not get the required amount of sleep over a period of time. Sleep deprivation increases the risk of health conditions like diabetes, heart disease, and stroke. Prolonged sleep deprivation can also affect concentration, memory and other cognitive functions.

Our bodies undergo a rounds of cycles in our sleep. In a typical night, we undergo four to six sleep cycles. Each sleep cycle on an average lasts for at least 90 minutes, but all sleep cycles are not of the same duration. Sleep cycles vary from individual to individual and from night to night based on different factors such as age, lifestyle changes and recent sleep patterns.

STAGES OF SLEEP

There are four sleep stages – three that are part of NREM(non-rapid eye movement) sleep and one REM(rapid eye movement) sleep. These stages are based on brain activity during sleep.

NREM sleep – stage 1 : In this stage, the body has not fully relaxed yet and there are light changes in brain activity. It is easy to wake the individual during this stage. This stage normally lasts for around one to seven minutes. If an individual is not disturbed, they will quickly enter stage 2.

NREM sleep - stage 2 : In this stage, the body temperature drops, muscles relax and there is slowed breathing and heart rate. Also, at this stage, eye movement stops, body temperature drops, breathing and heart rate becomes more regular and brain waves show a new pattern and the body resists being woken up. This stage typically lasts around ten to twenty five minutes.

NREM sleep – stage 3 : This stage is known as the deep sleep stage. It is quite difficult to wake up those in this stage of sleep. During this stage of sleep, muscle tone, pulse and breathing rate decreases and body relaxes further, the brain activity during this stage is in delta waves .This stage of sleep is also known as delta sleep or slow – wave sleep.

It has been believed that this stage is most critical to restorative sleep and also allows body to recover and grow.This stage of deep sleep contributes to thinking, creativity and memory.This stage lasts for about twenty to forty minutes .

REM sleep : During this stage, the brain activity begins to increase, eye movement is faster, there is temporary paralysis of muscles with the exception of eye muscles and the muscles that control breathing.This stage is known for the most vivid dreams and is believed to help in memory, creativity and learning.The REM sleep occurs more than once in a complete nights sleep, the first lasts for only a few minutes but the later stages may last for around an hour almost. In adults, 25% of the sleep consists of REM sleep.

SEQUENCES OF SLEEP STAGES

It is important to know that sleep always does not progress through all the four stages and always in the same sequence. If the individual has a full night of uninterrupted sleep, the stages will look as follows:

NREM1-NREM2 -NREM3 -NREM2- REM.

Once we reach REM sleep, the body generally returns to NREM2 before beginning the cycle again.But, every time the cycle repeats, the time spent in each stage of sleep changes.

FACTORS AFFECTING SLEEP DEPRIVATION

Individuals who have sleep deprivation, are those who do not obtain deep sleep and REM sleep. Those who do not manage to sleep well or are awakened frequently in the earlier stages may struggle with disorders such as sleep apnea, insomnia and other issues.

An evidential backing for the above point comes from a study which says in addition to attention and working memory, sleep deprivation also affects long term memory and decision making especially vigilance.Although, there are various factors responsible for sleep deprivation, aging and gender play an important role.Individuals have different ways in coping with sleep deprivation. Another study used the Groton maze learning test to identify significant differences among people completely sleep deprived and people partially sleep deprived. Although there were no significant differences, certainly daily study load and coffee intake impacts the cognitive performance .

IMPACT OF SLEEP DEPRIVATION

An article in IOL news, says they effects of sleep deprivation by dissecting it into three time intervals. It has been proved that after 36 hours without sleep, an individual is likely to experience extreme exhaustion, hormone imbalances, diminished motivation, dangerous judgements, rigid reasoning, impaired concentration and speech impairments.The article also says, if an individual is 48 hours sleep deprived, the body is likely to circulate higher levels of inflammatory makers. There is also a decline of natural killer cell activity supported by National centre for biotechnology information study.The same study, proved if an individual is 72 hours sleep deprived, his executive skills is specifically multitasking, remembering and paying attention is impaired and even basic chores becoming challenging.In addition, there is also an emotional impact on sleep deprivation.

SUGGESTIONS

There are a few ways to prevent sleep deprivation. A few methods are listed below:

1. Follow a good sleep hygiene
2. Limit electronic gadget and television usage to an hour before bedtime.
3. Limit the amount of food and avoid spicy food and alcohol.
4. Get in enough of physical activity in the day .
5. Keep the room in an comfortable environment to induce sleep.

CONCLUSION

A few suggestions to improve sleep have been suggested but, sleep duration and quality differs from individual to individual with respect to age, gender, lifestyle and other health conditions.

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