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Abstract

The purpose of this research was to obtain an understanding of the adverse impact of sleep deprivation on cognitive and physiological functions. The goal of this research was to determine if sleep deprivation has a damaging impact on analytical thinking, memory consolidation, mental health and cardiovascular health, the research will aim to discover sleep's effect on medical professionals. The reason for this research was to provide a greater understanding of the importance of sleep, to improve productivity and health. Within this research there is a conclusion, to make sense of the findings and references from previous studies.

Introduction

Sleep is a crucial part of development and daily functions, it allows the body to rest and recover, and the brain to form memories. Sleep allows the brain to focus and effectively clean itself, when properly given the needed amount of sleep. Sleep seems to be abused and not seen as paramount in our lives; it appears that sleep is refused and not given as much focus as work or leisure tasks.

What is sleep?

Sleep is a process where the body and mind relax and regains energy, to recover from being awake. Sleep allows the body to remove waste proteins from the body through the lymphatic and glymphatic systems; the removal of waste may reduce the risk of Alzheimer's disease, due to the removal of beta-amyloid, but if not removed it would accumulate and harm the body. 'What we see is the CSF is rushing through the brain, and we discovered at the same time when the brain goes to sleep, the brain cells themselves seem to shrink, opening up spaces in between them and allowing fluid to rush through and allowing waste to be cleared out' (Iliff, 2014, 7:30-7:44)

Sleep is controlled by the circadian rhythm, which is also known as the body's internal clock and controls the 'sleep/wake cycle' (Cirelli, 2009), which is based on the experiment done on fruit flies, used as a model for our 24-hour circadian rhythm, and shows that the 'Period' gene (Konopka, 1971) plays a role in controlling sleep within the cells. It is believed that circadian rhythms can be found in all organs in our body, as stated by Chronobiologist Emily Manoogian (2018), 'almost every cell in your body has a molecular clock'.

Why is sleep important?

Sleep is important because it allows us to maintain normal functions throughout the body such as homeostasis, metabolism, cardiovascular functions, etc. Sleep is necessary for memory consolidation, wound healing, immune function and hormone regulation. As stated by the NHS (2018), insufficient sleep could cause: 'obesity, heart disease and diabetes' and 'shortens your life'.

Sleep provides a means of repairing the body, by promoting cell growth, lack of sleep can create problems in focusing and thinking by interrupting neuronal function and could increase the risk of cancers. The sleep foundation (2019) describes sleep as 'food for the brain', and 'as important as the air you breathe, the water you drink and the food you eat.' A lack of sleep can be deadly, a symptom known as 'fatal familial insomnia' is a rare disease described by the NIH (National Institute of Health) as:

A prion disease that affects the thalamus. Symptoms include hallucinations, confusion, muscle twitching and jerks (myoclonus), the inability to sleep is later seen by the end of the disease and later death (NIH, 2016). Sleep also has the ability to impact the endocrine system as stated by sleep scientist Matt Walker: 'Men who sleep five hours a night have significantly smaller testicles than those who sleep seven hours or more, in addition men who routinely sleep just four to five hours a night will have a level of testosterone which is that of someone 10 years their senior' he also states that there are 'equivalent impairments in female reproductive health' and 'lack of sleep will age a man by a decade' (Walker, 2019, 0:21-0:55).

How much sleep do we need?

The NHS (2018) suggests that on average adults need '7-9' hours of sleep, children need '9 to 13' hours and toddlers and babies need '12 to 17 hours'. However, a sleep survey

showed: 'on average, adults globally only sleep 6.8 hours per night during the week and 7.8 hours per weekend night. Rather than getting the recommended eight hours each night' (philips,2019).A study conducted by the American Sleep Association (ASA) claims that too much sleep may not be good for us. It suggests:

` The results of the study revealed that participants with more than eight hours of sleep had an increased risk of dying from cardiovascular heart disease. Similarly, people who slept less than four hours each night showed an increased risk as well. The participant with more than eight hours of sleep demonstrated a 34% significant increase of dying from CHD and those who sleep below four hours had 35% risk.` (ASA,2016)

What is sleep deprivation?

Sleep deprivation as defined by Kathleen Davis (2018), is 'when an individual gets less sleep than they need to feel awake and alert.' She also states the symptoms of sleep deprivation, which are: 'forgetfulness', a 'depressed mood', 'lack of motivation', 'clumsiness', etc. Other symptoms of sleep deprivation include:

`Yawning, moodiness, fatigue, irritability,depressed mood, difficulty learning new concepts, forgetfulness, inability to concentrate or a "fuzzy" head ,lack of motivation, clumsiness, increased appetite and carbohydrate craving` and `reduced sex drive`(Davis,2018).

What are the Benefits of sleep ?

Ana noia (2018), a clinical Physiologist in Neurophysiology and Sleep, she explains that sleep may aid in maintaining concentration,allow us to maintain a healthy weight due to the bodies ability to regulate hormone production during sleep, it allows the body to support heart health and manage insulin levels, it allows us to keep a stable immune system and helps us to reduce our stress by reducing a stress hormone known as cortisol.

What is chronotype?

Based on Tuck; a website centred on sleep, explains that there are four chronotypes, which are:

Wolves, sleep and wake up later than others.Bears who wake and sleep based on the sun.lions who wake up early and sleep early. Dolphins, who sleep lightly and find it difficult to follow a routine.Chronotypes dictate when the body is best suited for different activities `primal activities you would do during the day, such as eating, sleeping, and having sex.`(Tuck,2019)

How does sleep affect productivity?

A Sleep deprivation survey showed that workers who are deprived of sleep report:

`struggling to stay focused in meetings, taking longer to complete tasks, and finding it challenging to generate new ideas. Along with a lack of focus and diminished creative capacities, participants also indicated a reduced motivation to learn and be less able to

manage competing demands` (Renolds,2017) .Sleep can impact concentration and focus as stated by Tuck:

`Being sleep-deprived has a similar effect to being drunk, and we all know how unproductive we are when we're intoxicated. Pull an all-nighter, and your response time is 50% slower than someone with just 0.1% blood alcohol level.`

Does diet affect sleep?

Caffeine is used by doctors, workers and students to help them stay awake and maintain focus, caffeine does this by binding to our adenosine receptors making us feel awake. Once ingested caffeine can disrupt sleep if taken at night or during a late work shift. Professor Andrew Smith states that:

`The amount of caffeine peaks in the bloodstream between 15 and 45 minutes after ingestion. Its half-life – the time it takes for its level to halve – is between five and six hours` (smith,2010).

Cherie Berkly suggests that spicy food causes heartburn and would make sleeping more difficult and that alcohol may cause us to wake up later in the night. How often we eat can also impact our ability to sleep as Satchin Panda (2017) states that when two mice are provided the same diet but one is fed at random times and the other fed all of their meals at nighttime at the recommended time, the mouse fed at random becomes obese and develops multiple health problems, whilst the other mouse remains healthy.

Does light affect sleep?

Harvard health publishing(2012) Explains that blue light may boost attention and reaction times when used in the morning, but later at night blue light can impact circadian rhythm. It suggests that a link between blue light, cancer, and heart disease has been found but does not mean that they are the cause, they explain that blue light impacts hormone secretion and may impact our ability to sleep and that even dim light may interrupt our sleep.

Are sleep studies ethical in data handling?

Research on the ethics of sleep studies as provided by Devin.L Brown (2011) explains that doctors and scientists are required to seek consent before running a trial on groups, the researcher is required to explain the possible risks and impact of taking part in the trial to ensure patients are well informed before experimentation. Brown explains that control groups are needed to effectively determine the use of medication ;if applied, to form a basis for the impact of drug testing on patients, and that an evaluation of medical conditions should be taken into account to avoid high risk of patient fatality.

Patients who live in developing countries should be investigated and informed of the study, so that they are less likely to be misled into believing that the purpose of the trial is for medical screening or care. A consent form is required to obtain evidence that the patients are willing participants of the trial. Randomised and double blind samples are required to create a fair trial and for the patients and researchers to give a fair examination with accurate results. (Brown,2011)

Conclusion

The use of medication to enhance performance and concentration when sleep deprived, such as caffeine and food, may lead to adverse effects on the body and mental

health; however, provided that the use of stimulants such as caffeine or depressants like alcohol may aid in sleep and heightened alertness when used correctly, the long term impact is unknown, it is advised that sleep should be paramount in our lives and adapted to our biological needs rather than our need to complete tasks. A lack of sleep may over-time lead to life threatening conditions that may be irreversible, therefore caution should be given to prevent damage to the body and body systems to maintain adequate living body function in the future. It is best that we maintain a minimum of eight hours of sleep and limit exposure to light at night and prepare for bed in advance to limit blue light exposure to bring a gentle transition to sleep.

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