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# Sleep Experiments And Sleep Deprivation

## Case Study 1

In December 1963, two boys decided that it would be a good idea to stay awake for as long as possible for a school project. 17-year-old Randy Gardner managed to stay awake for 11 days and 25 minutes. They had planned to observe their cognitive abilities themselves but failed to do so effectively just after three nights of no sleep. Randy's friend ended up writing the observations on a wall instead of a piece of paper which is when they realised they needed a 3rd person involved. After a few days, they didn't seem to be particularly impaired to an outsider; however, as the days went on, the boy's sense of taste, smell, and hearing and after a while their cognitive and sensory abilities were noticeably impaired. They would experience things like not being able to stand certain smells. After about 11 days, Randy was rushed to the hospital where his brain waves were monitored. His REM state sleep unsurprisingly skyrocketed and he slept for about 14 hours and woke up because he needed to go to the bathroom. After a few days, everything had returned to normal.

## Case Study 2

Just over four decades after the first experiment In 2004 a reality television program called 'Shattered' was broadcast on Channel 4 in the United Kingdom. This was analysed in a study by Boonstra, Stins, Daffertshofa and Beek titled Effects of Sleep Deprivation on Neural Function. In the show, a number of contestants struggled to stay awake for as long as possible. They remained awake for days on end. Lack of sleep in the contestants resulted in extreme mood swings and a severe concentration capacity loss. At some point, the contestants began to behave in an erratic fashion, hallucinate and started to have delusional thoughts (known as hypnagogia). Fortunately, this all disappeared after a few nights of good sleep. Such dramatic behavioural effects reflect changes in the functioning of the nervous system. It was concluded that sleep loss is associated with deterioration performance. Sleep deprivation has widespread detrimental effects influencing mood, memory, and cognitive performance. However; a limitation of this study is that they analysed a reality TV show which very often exaggerate the behaviours of people.

## Eisha's Story

I would like to share a personal story with you guys. Around this time last year, I had an English creative due. I decided to do a painting and my plan was to do the finishing touches the night before it was a bad idea and I wouldn't recommend it. It was around eight o'clock at night and up until about 2 in the morning I was still trying to finish my painting but I wasn't happy with it. So I decided to start over and paint another painting and I went through about 3 paintings before I ran out of paint. Keep in mind, the assignment was due that day. It was around 4 in the morning and by this point and I was about to have a breakdown. Anyways I decided to stay up the rest of the night and made a pamphlet instead and I finished by 3 in the afternoon. I had an excruciating headache the whole day and my vision had started to get blurry. Luckily I was catching the bus home and not driving because by around 2 in the afternoon I started to see

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different shapes in the air. When I reached home I took my glasses off but I could still feel my glasses on my face and I could still see the frames of my glasses and by this time it had only been around 33 hours of no sleep. Luckily it was my last assignment before exams and I went straight to sleep and slept for about 4 hours and my sleep returned to normal.

## **Why is Sleep Important?**

We all know that sleep is important and as year 12 college students, I'm sure we most of you guys have a similar story to mine. But why exactly is sleep so crucial and beneficial to our health? Sufficient sleep plays a significant role in neurological functioning. When we sleep, pathways form between nerve cells (neurons) in your brain that help you remember new information you've learned.

Some years ago, people thought that sleep was a time when the body and the brain "shut off" for a few hours in preparation for the next day. However, that is not the case. After many years of research, scientists have concluded that neither the body nor the brain is shut down when we sleep; in fact, they are working much harder than they are during the day, undergoing processes to restore cells, process information and improve health. Although we have already studied the different stages of sleep, I'm going to briefly outline what occurs during each of the four stages.

When we go to bed, we begin in non-REM sleep and spend about 75% of our time in it. Non-REM sleep consists of three stages, stage 1, 2, and 3. In stage 1, you are between being awake and falling asleep and it is the lightest stage of sleep. Stage 2 is the onset of sleep and we spend about 50% of our normal night's sleep in this phase. In this stage, we become disengaged from our surroundings, our breathing and heart rate are regular and our body temperature drops. Scientists believe that you store away long term memories in this stage. Stage 3 is the final stage of non-REM sleep. During this stage, you experience the deepest and most restorative sleep, your blood pressure drops, your breathing becomes slower and your muscles are relaxed. Other things that are crucial to our health also occur during this stage like tissue growth and repair, the release of hormones such as the growth hormone and blood supply to our muscles increase. The second major stage of sleep is the REM stage. In this stage, your eyes dart back and forth, your pulse, body temperature, breathing and blood pressure rise to day time levels. The sympathetic nervous system, which helps with automatic responses like fight or flight, gets very active. However, your body stays almost completely still. This stage is responsible for providing energy to the brain and the body and supports daytime performance.

## **What Happens When You are Sleep Deprived**

One thing I have noticed amongst teenagers and specifically college students is that with our packed schedule, sleep has fallen behind on our list priorities especially in the 21st century. In fact, we tend to brag to our friends about how little sleep we got the night before; however, this is not something to be proud of. Sleep deprivation can result in many health issues and has many side effects. One of the biggest problems of sleep deprivation is that people don't know they are sleep deprived. Sleep deprivation has both short term and long term side effects. Short term side effects include:

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Impaired cognitive process - sleep plays a critical role in thinking and learning. Sleep deprivation impairs attention, alertness, concentration, reasoning and problem-solving. This makes it difficult to learn efficiently and has significant impacts on teenagers, especially college students. As mentioned earlier, during the night, the brain is processing information and storing away memories. Thus sleep deprivation is detrimental to your ability to learn and retain information.

Sleep deprivation mimics being drunk - lack of sleep dulls activity in the brain's frontal lobe which involves motor function and problem-solving. This decreases reaction time and you don't have the mental clarity to make the best decisions. A national sleep foundation survey revealed that 60% of adult drivers say they have driven vehicles while feeling drowsy and more than 1/3 have fallen asleep behind a wheel. Unfortunately, many of these end in a severe injury or even death. It is estimated that a drastic 20% of all vehicle crashes are caused by sleep-deprived driving.

Another short term side effect of being sleep deprived is relationship stress - sleep deprivation can cause mood swings and you become more likely to have conflicts with others. Sleep deprivation can also cause hallucinations.

Luckily these short term side effects can be reversed by ensuring a good night's sleep the next night and continuing to get sufficient sleep.

If sleep deprivation continues for years, it can have lasting, long term, irreversible side effects which include:

- Obesity
- Anxiety
- Depression
- A lowered sex drive

And you might even die early - in fact, reduced sleep is a greater mortality risk than high blood pressure, heart disease which by the way can also be caused by sleep deprivation and even smoking. In one meta-analysis, they discovered that people who slept for less than six hours each night were 12% more likely to die prematurely than those who slept the recommended amount for adults of six to eight hours. The team analysed 16 studies which involved 1.3 million people before reaching their conclusions. This can be due to a number of reasons. While you sleep, your body carries out all the regenerative jobs it needs to keep healthy. Without sleep, this regenerative process isn't complete and the immune system is not able to do its job. Sleep deprivation can lead to significant issues in terms of your body's ability to fight off infections.

Unfortunately, our busy schedules and endless amounts of distractions result in us being heavily sleep-deprived. If this continues, the harmful side effects will start to catch up and have damaging impacts on our minds, bodies and lives. I hate to say this but as we get older, things will only get worse so it is essential for us to breakdown how our lifestyle is impacting us and thus tackle the problem. I am going to give you guys a scenario and I want you guys to answer the questions in relation to the scenario.

## **Scenario**

Amanda is a 16-year-old college student from Iceland. When she comes home from school, she

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spends her evening on her laptop studying and before going to bed, watches an episode of 'Stranger Things' to 'de-stress'. Amanda is also taking her mid-year exams but is finding it difficult to fall asleep during the night.

What effect would this have on her performance on her exams?

- Impaired memory and learning abilities
- Decreased alertness
- Difficulty in concentration
- Impaired motor functioning and problem-solving skills

How do you think she could fall asleep faster and get more hours of sleep?

- Blue light suppresses melatonin production which is sleep hormone. It is produced by the pineal gland in the brain by the suprachiasmatic nucleus.
- Blackout curtains as sunlight also decrease melatonin production
- Sleep app

## Conclusion

As I mentioned before, sleep is one of the most important things we need to stay alive. It is up there with food and water. Through research, experiments and experiences, we have come to the conclusion that the amount of sleep we get has a direct impact on our health and the way we perform in our daily lives. It is essential for every age group to get sufficient amounts of sleep in order to stay healthy and for optimal neurological function.