The Correlation of Sleep and Academic Performance

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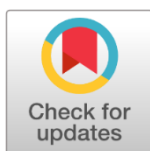*Corresponding author Email: keanubsygaco@su.edu.ph
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Abstract: The essence of sleep is to keep life in balance, ensuring that energy used during day time will also be replenished by resting at night. However, when sleep is interrupted and unable to achieve a blissful rest, it may compromise the health and unfolding tasks that teenagers need to accomplish. Young adults need at least 8 to 10 hours of sleep. Thus, grade 12 Science, Technology, Engineering, Agriculture, and Mathematics (STEAM) students from Silliman University Senior High School in the Philippines answered the online questionnaire on sleep deprivation, which correlates with sleep with academic performance. For nearly eight hours, these respondents in school were swamped with several academic tasks even after class hours leaving so little time to sleep. While this study reveals that sleep deprivation may affect academic performance, the study obtains 95% confidence that respondents show a mean between 6.85 hours and 7.40 hours 6. This indicates the respondents may occasionally lack 1 to 2 hours of sleep from the required average of 8 to 10 hours of rest. Also, it illustrates no linear correlation between the number of hours of sleep and the general average. This further demonstrates that students can sacrifice a portion of their sleep to have their desired grades and be accustomed to the lack of sleep and difficult academic tasks. Aside from that, 17 respondents are not sleep deprived. At the same time, 70% have partial sleep deprivation where most of their time is spent studying for exams, doing school projects, using social media, and video gaming. The top three outcomes of sleep deprivation are exhaustion, fatigue, and pessimism and succeeded by health risks, as well as a decline in thinking. Thus, to minimize having debt in sleep is to have time management, establish a comfortable sleeping environment, and less time on social media. The study concludes that there is no correlation between sleep and academic performance.

Keywords: Sleep, Sleep Deprivation, Academic Performance

1. Introduction

The addition of two years of senior high school in the Philippine education system becomes an overwhelming situation for grade 12 students. They are bombarded with an overload of academic tasks such as assignments, product making, practices, and other activities that comprise a larger portion of their grade. That is why it is no surprise that these students with STEAM as their academic tracks are drowned with academic undertakings. Project making alone consumes many hours and thus, students stay up late at night to work on their projects and study for their exams the next day. Consequently, if these students continue to be sleep-deprived, they may face health risks in the future.

There are so many negative outcomes when teenagers do not get the required amount of sleep. Thus, they must be aware of the consequences and understand the dangers they are facing (Anna S. Urrila *et al.,* 2017; Ahmed S BaHammam *et al.,* 2012).

Peri (2014) narrates that the brain events known as sharp wave ripples are linked to the consolidating memory. The ripples often pass acquired data from the hippocampus to the brain's neocortex, where long-term memories are processed. Mostly during the deepest stages of sleep, sharp wave ripples occur. Consequently, interpretation of events and judgements is affected. It is said that sleep-deprived individuals are prone to poor judgments.

In the study, *Sleep and academic performance: considering amount, quality and timing* by Angela Gomez Fonseca and Lisa Genzel (2020), sleep control is a mixture of internal clocks and external regulators, as well as the general sleep need for homeostatic pressure. Both forces are in harmony in optimal conditions, allowing the person to do the right thing at the right time (Fonseca & Genzel, 2020).

Medic *et al.,* (2017) reported that in Short- and long-term health consequences of sleep disruption that long-term effects of sleep deprivation may hamper the health, which will result in weight issues, hypertension, cardiovascular problems, metabolic syndrome, diabetes as well as colorectal cancer. This may lead to death, especially with men who have sleep disturbances, while children and teenagers may suffer from gastrointestinal problems. Hence, it is best to optimize sleep and take an earlier precaution when experiencing sleep loss.

While inadequate sleep declines vigilance and weakens interest, that results in a reduction in cognitive processing. The deficiency of sleep inhibits the function of the brain structures, which is perilous to rational thinking (Zeek *et al.,* 2015). Prof. Amy Johnson (2005) from Grobstein, in her article, *Sleep Deprivation and Effects on Everyday Life,* shares that when an individual is tired and fatigued, it causes pessimism, sadness, stress, and anger (Johnson, 2005).

The lack of sleep negatively impacts the day activities, particularly performance in school. This includes off-task behavior, drowsiness, irritability, and lack of focus (Edwards, 2008). This is further verified in a study by Stanford that the consequences of sleep deprivation include lack of concentration, poor grades, anxiety, depression (Richter, 2015).

According to the Väsykysely research in Finland by Prisma Studio and University of Helsinki 66% of applicants experienced morning tiredness and 4% felt energized. The same test result from the Väsykysely research parallels the findings of an earlier survey from the Finnish Institute of Occupational Health (Merenheimo, 2018).

Meanwhile, it is believed that people who sleep fewer than seven hours become obese and overweight. Insufficient sleep affects the appetite, where ghrelin and leptin tend to be affected. Likely, maintaining or losing weight is best achieved when people achieve a regular sleeping habit. Or when people take a nap, they become smarter because it refreshes the body. A study of 24,000 Greek adults showed that people who napped several times a week had a lower risk of dying from heart disease (Stibich, 2018).

Another drawback of being sleep-deprived is experiencing, in severe cases, health risks such as cardiovascular diseases, which range from having an irregular heartbeat, heart attack, heart failure, stroke, and diabetes. On the other hand, sleep deprivation and depression go hand in hand since the loss of sleep triggers depression, while when one is depressed may unlikely fall asleep. Accordingly, having less time to sleep based from the Whitehall II study revealed that 10,000 British civil servants who had only less than 5 to 7 hours of sleep died of cardiovascular disease. Aside from this, teenagers may develop yellow skin and swollen eyes when they have enough sleep barely. The constant lack of sleep will cause "lackluster skin, fine lines" and dark circles under the eyes. The stress hormone called cortisol is released, which affects the skin's texture (Peri, 2014).

In terms of academic performance, when people are busy cramming and not sleeping, the important information they learnt and thought they had memorized basically slips out of their brain, and they'll have trouble recalling them the

following day. Aside from that students who do not sleep or wake up at consistent times daily were more likely to have lower grades. Differences between regular and irregular students include significant differences in grade point averages. Students with irregular sleep patterns were given lower scores close to zero, while the regular sleepers were given higher scores close to 100 (Knight, 2017).

Meanwhile, stress is a contributing factor to sleeplessness, while others can be credited to "early school and work hours", the absence of exercise, and accompanied by bedtime rituals that would be altered. In such a case, students express that sleep is needed for them to avoid being tired and do their tasks in school effectively, as concentration is compromise (Merenheimo, 2018).

Most often, the cognitive ability becomes insufficient when students sleep less than seven hours a day (Zeek et al., 2015). In teenagers and young adults who stay up late but are limited by rigid morning schedules, sleep inconsistency tends to be highest. In college, adolescents who experience more significant sleep variability perform worse (Okano et al., 2019).

Nasim *et al.*, (2018) reported that near one-half of teenagers suffer from sleep deprivation during weekdays and three-fourths are not feeling fresh in the morning. The researchers discovered that regular day-time napping observes within the week. The number of biological, demographic, lifestyle, and environmental factors are notably related to sleep deprivation in teenagers from Saudi Arabia. Given the health, academic, and societal impact of sleep deprivation, there should be preventive approaches. Delaying the time when school should start in the morning and sleep hygiene behaviors encourages teenage and public responsiveness of the importance of sleep and consequences of sleep deprivation.

Likewise, understanding the underlying factors that causes of sleep deprivation will provide a solution on which parts of a student's daily routine should be changed. Knowing the consequences of sleep deprivation may compel teenagers to always have adequate sleep despite their busy schedule.

1.1. Significance of the Study

The results of the study will be of great benefit to the following:

Students. This study benefits Senior High STEAM grade 12 students enrolled at Silliman University who are experiencing sleep deprivation. This research will change the students' perspective so that both academic performance and their health will not be affected. This study will detail the cause and effect of sleeplessness on how it takes a toll on their health, day-to-day activities, and school performance.

Teachers. Meanwhile, this research study will also change the perspective of teachers especially, in giving assignments, projects, and exams. Additionally, this research will enumerate the negative impacts of sleep deprivation of which teachers will take notice. Other similar research studies related to sleep deprivation towards grade 12 and college courses in this university and other schools may conduct this study and enrich the given results.

1.2 Scope and Limitations of the Study

This research covers only Grade 12 students who are taking STEAM at Silliman University Senior High and does not include other grade levels in the university and other schools. It will solely focus on the number of hours of sleep and the previous General Average of the first semester and the factors and negative impacts of sleep deprivation. This study does not intend to entirely alter the status quo of the educational system in Silliman University. However, it can be a basis for change if the results of the information gathered yield significantly negative results from the respondents.

2. Methodology

This study aims to find a significant difference between the academic performance of sleep-deprived and the academic performance of those who received enough sleep for grade 12 STEAM students of Silliman University. Furthermore, it explored the sleeping patterns and the factors of sleep deprivation and its negative effects.

2.1 Research Design

This research was quantitative in nature. It was a case-control study since it used statistical methods such as correlation and regression, mean and frequency, estimation of parameters, and hypothesis testing to evaluate the strength of the relationship between the number of hours of sleep and the student's previous general average. This study used the same respondents as well as the results throughout the study.

2.2 Research Environment

This research was conducted at Silliman University Senior High School, Dumaguete City since the researcher knew the target population. Meanwhile, it was convenient for the researcher, as well as, the respondents since the survey was conducted through Facebook Messenger. This ensured that the data would not be invalid and error would be minimized and a fast response rate.

2.3 Research Instruments

An online research survey was used as an instrument to elicit relevant information concerning this study. It would be the most ideal instrument to gather data since the research dealt with quantitative data. This was designed to find out the level of sleep deprivation among the respondents and its negative effects. Meanwhile, this method worked best since most students used internet connection and Facebook Messenger. It was accessible to most students in senior high school. It eliminated room for error since these students would most likely answer the survey during their free time, they would feel relax or at ease yielding more accurate results. It was significantly better than the paper-based survey because the respondents would answer the survey either on the spot or for a limited time. Whereas in the online survey, the respondents could answer it anytime and could give time to thoroughly answer and assess each question.

2.4 Research Respondents

The respondents of this research were a critical sample of 50 grade 12 senior high school students from Silliman University who were taking Science, Technology, Engineering, Agriculture and Mathematics (STEAM) as their academic strand. The total population of the strand was 643

students. There were twenty-five male and twenty-five female students; at least two respondents from each section were selected since there were 17 sections in total. The researcher acquired a list of all students who were currently enrolled in STEAM from the Silliman University Senior Highschool Office. After that, the researcher selected the respondents from the given list. The sampling technique used was cluster sampling with a combination of simple random sampling. It involved cluster sampling since it required dividing the total population into sections. From the sections, simple random sampling decided the respondents. The sample size of the survey respondents was the most ideal since it provided more accurate results and minimized the margin of error.

2.5 Procedure for Data Collection

In order to collect data, the online survey was sent to the randomly selected male or female respondents from each section of grade 12 STEAM students of Silliman University Senior High School during their free time to ensure their availability. They were given an online survey questionnaire to answer using Facebook Messenger.

2.6 Statistical Test

Mean and frequency were the basis of the online-based research survey which was documented. Meanwhile, the number of hours of sleep, as well as the general average, was compared using correlation in statistics. Estimation of parameters would be used to determine the mean hours of sleep. Additionally, hypothesis testing would determine if the number of hours of sleep was between 7 to 8 hours of sleep. It tested if the students were sleep deprived or not. The results of the survey analyzed through a chart of the most frequent answers of the study.

2.7 Ethical Consideration

The responses benefited this research and would be treated with respect and confidentiality. After the study was conducted, the result of the survey would not be shared publicly and would remain in only Google Drive. This research was anchored how many Grade 12 STEAM Students of Silliman University were sleep-deprived in a given sample size. This research determined the factors

that led the respondents to be sleep-deprived. It distinguished the significant difference between the academic performance of sleep-deprived individuals compared to the individuals who received enough sleep. Meanwhile, it identified the negative effects of sleep deprivation towards students' health, day to day activities, and academic performance. And lastly, this study wished to find the link between gender with sleep deprivation and academic performance. The respondents were given the free choice to answer the survey and were free to refuse anytime without negative consequences.

3. Results and Discussion

The results of the online survey have been analyzed using estimation of parameters, hypothesis testing, correlation and regression, or mean and frequency. These are presented through tables which includes formulas and solutions as well as charts. Meanwhile, these analyses are also correlated with other studies so that it will validate the results.

Table 1. **Estimation of Parameters of The Number of Hours of Sleep**

GIVEN:
Mean: 7.12 hours
Standard Deviation: 0.91 hours
Sample Size: n=50
FORMULA: $X - z\,\alpha/2, v\,\frac{s}{\sqrt{n}} < \mu < X + z\,\alpha/2, v\,\frac{s}{\sqrt{n}}$
COMPUTATION:
α = 1-0.95 = 0.05
$\frac{\alpha}{2}$ = 0.025
$z_{0.025}$= 1.96
$X - z\,\alpha/2, v\,\frac{s}{\sqrt{n}} < \mu < X + z\,\alpha/2, v\,\frac{s}{\sqrt{n}}$
$7.12-(1.96)(\frac{0.91}{\sqrt{50}})<\mu< 7.12+(1.96)(\frac{0.91}{\sqrt{50}})$
6.85 hours $<\mu<$7.40 hours

Table 1 shows that the respondents have 95% confidence that the mean is between 6.85 hours and 7.40 hours if both genders were taken into consideration. This indicates that the population may occasionally lack 1 to 2 hours of sleep from the required average of 8 to 10 hours of sleep. This scenario illustrates that despite the academic tasks being handed into the students, they have time management and may work in teams and groups to complete the academic requirements and not hampering the students' sleeping time. According to Graven (2013) research, *Teens need more sleep, but don't sleep enough* with 6.5 hours of sleep that most teenagers have during weekdays.
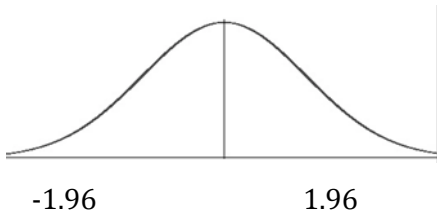
Table 2 shows that there is sufficient evidence to suggest that the mean hours of sleep for male and female SHS students is not 9 hours and thus, indicates they are sleep deprived. As shown in *A study about students' sleeping habits* by Henna Merenheimo (2018), it is being observed that the average amount of sleep of teenagers during the week is 4-5 hours every night. Meanwhile, the San Diego State University (2017) reports that in 2015, 40% of teenagers sleep less than seven hours each night more than in 1991 while 17% are sleep deprived in 2009. About 50% of teenagers who spend online have difficulty sleeping than those who use the internet for only one hour.

Table 3 indicates there is insufficient evidence to suggest that there is a linear correlation between the number of hours of sleep and the general average of SHS Students. This means that sleep does not affect academic performance in school. According to Knight (2017), the lack of sleep should have resulted to poor academic performance. Tables 1 and 2 show that students are partially sleep deprived, however the results of table 3 do not match with the impacts of sleep deprivation. It is inferred that these students are accustomed to partial sleep deprivation and are capable of handling their academic tasks. Figure 1 shows that in the given sample size of 50 student, 70% of them are more likely to have Partial Sleep Deprivation since most of the activities are academic related that delay their ability to sleep. The next level is short-term sleep deprivation (6%) which is a kind of sleep debt with no sleep less than or equal to 45 hours. Lastly, long-term sleep deprivation is (2%) which is sleeplessness of more than 45 hours (Lowry *et al.,* 2010).

Table 2. Hypothesis Testing of The Number of Hours of Sleep of SHS Students

Statement: Is there a reason to believe that the mean hours of sleep of male and female SHS Students is not 8 hours?

GIVEN:

Mean: 7.12 hours

Standard Deviation: 0.91 hours

Sample Size: n=50

Ho: μ = 9 hours

Ha: $\mu \neq$ 9 hours

α=0.05

Test Statistic: Z-Test

Critical Region:

α/2=0.05/2= 0.025

z<-1.96, z>1.96

-1.96   1.96

Computation:

$$z = \frac{X - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{7.12\ - 9}{\frac{0.91}{\sqrt{50}}}$$

z = - 14.61

Decision: Reject H_0

Table 3. The Linear Correlation of the Hours of Sleep and General Average

HYPOTHESIS:

- Null Hypothesis: *Ho: p=0*

- Alternative Hypothesis: *Ha: p≠0*

LEVEL OF SIGNIFICANCE:

α = 0.01

CRITICAL REGION: ±0.361

COMPUTATION:

r= -0.206259048

DECISION: Accept H_0

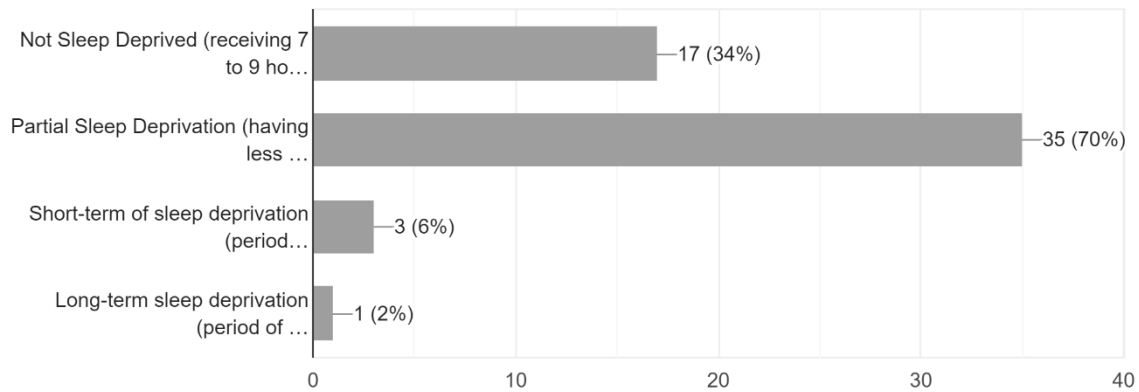What category of sleep deprivation do you belong?
50 responses

Figure 1. Category of Sleep for Both Genders

What are the reasons for not having enough sleep during weekdays?
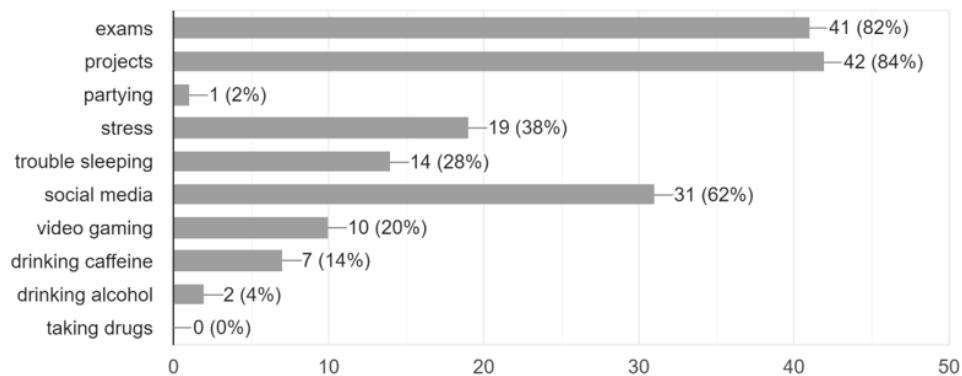50 responses

Figure 2. Factors Affecting Sleep Deprivation During Weekdays

What are the reasons for not having enough sleep during weekends?
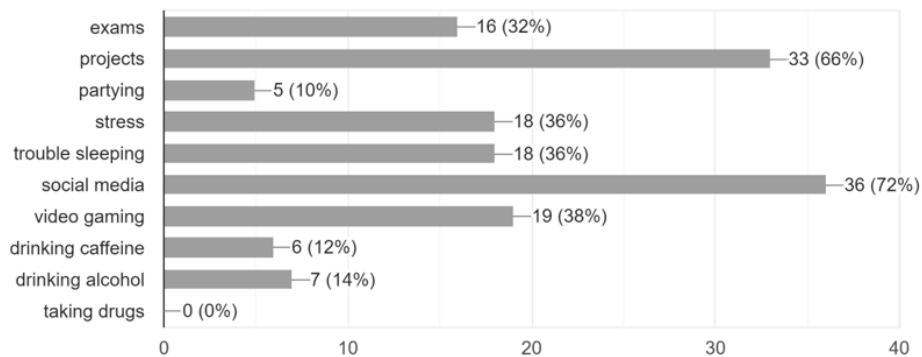50 responses

Figure 3. Factors Affecting Sleep Deprivation During Weekends

What negative outcomes are you aware when you are sleep deprived?
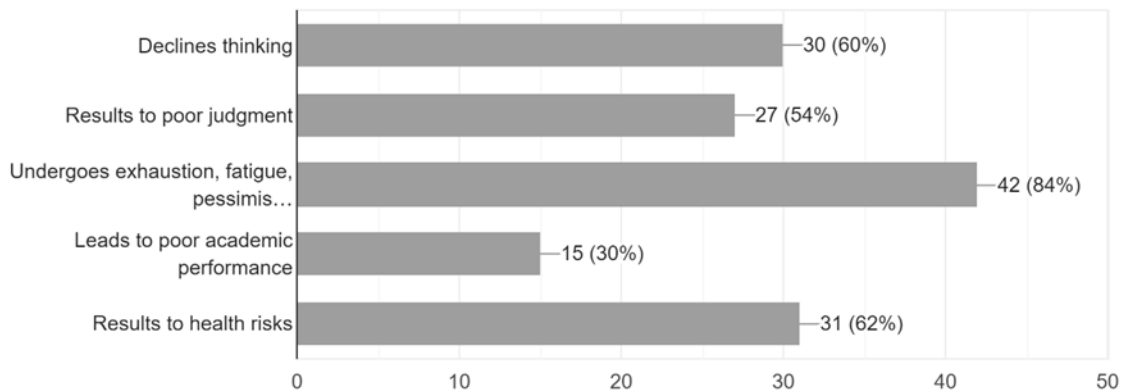50 responses

Figure 4. Negative Outcomes of Sleep Deprivation

How do you minimize or address sleep deprivation throughout the entire week?
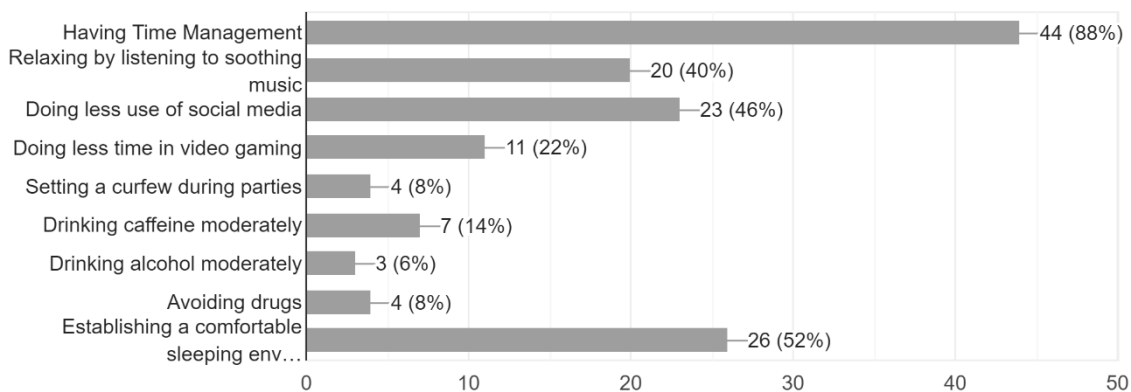50 responses

Figure 5. Solutions to Sleep Deprivation

Based from the Figure 2, students bombarded with so many academics and projects which is #1 in the rank of factors affecting sleep debt, showing (84.2%). It is followed by 82% of exams and then succeeded by the use of social media with (62%) resulting to why Silliman senior high students stay late at night. Thus, stress (38%) is the result of accomplishing projects and preparing for exams rank fourth in the scale of sleeplessness. Students also complain of having trouble sleeping with 28% and then followed by video gaming (20%), drinking coffee (14%), drinking alcohol (4%), and partying (2%) was the least selected. No students acknowledge of taking drugs.

Figure 3 shows the majority of respondents (72%) are engaged with social media during weekends. Meanwhile, 66% of these respondents are undergoing project making. Then the third category is playing video games (38%). These result to stress and trouble sleeping (36%). Students that study for their exams comprise 32% from the 50 respondents. At times, students will escape from it through drinking alcohol (14%), drinking caffeine (12%), or partying (10%). There is no report of taking drugs. According to Megan Lowry, Kayla Dean, and Keith Manders (2010), several factors may provide to the disturbance of sleep habits. "Late night studying, all-nighters, parties, social obligations, work, and alcohol and/or drug abuse all likely play a role".

Figure 4 shows the negative outcomes of sleep deprivation, where mostly 84% of the respondents believe that major result of sleeplessness is exhaustion, fatigue, and pessimism. This is noted in the research of Johnson (2005) where individual tiredness and fatigue which result to pessimism, sadness, stress, and anger become the common symptoms of sleep debt. This is succeeded by health risks (62%) and is reflected by irregular heartbeat, heart disease, heart attack, heart failure, stroke, diabetes are the ultimate health risks that a person faces when sleep deprived. Depression is one of the end results when people fail to achieve a regular sleep (Peri, 2014). On the other hand, third factor it declines thinking (60%) as well as it results to poor judgment (54%) as mentioned by Camille Peri (2014) who says that constant sleeplessness results to poor judgment and reduction in cognitive processing as reported by Zeek *et al.,* (2015). It is also followed by poor academic performance with 30% where school performance is also affected which includes off-task behavior, drowsiness, irritability, and lack of focus (Edwards, 2008).

Table 5 describes that majority of the respondents have time management (88%) and have established a comfortable sleeping environment (52%) as well as doing less use of social media (46%). Students feel relaxed by listening to soothing music (40%). There is a 22% of doing less time in video gaming, drinking caffeine moderately (14%) and a tie-up of 8% setting a curfew during parties and avoiding drugs. And the least selected is drinking alcohol moderately (6%). The same choices have been included in many researches but what is emphasized is preparation when heading to sleep such as going to bed early to regulate enough sleep, less use of electronic gadgets such as smartphones, computers, and televisions prior to sleep, and avoiding the use of bright light an hour before sleep. It is also advisable to reduce stress before closing the eyes and setting the appropriate room temperature (Aemmi *et al.,* 2020).

4. Summary

The research is 95% confident that the mean of the respondent's sleep is between 6.85 hours and 7.40 hours when both genders are taken into consideration. This indicates that the population may occasionally lack 1 to 2 hours of sleep from the required average of 8 to 10 hours of sleep. When combined, the results yield to that they are sleep deprived. Meanwhile, there is no linear correlation between the number of hours of sleep and the general average among the respondents.

Now based from the study, in a given sample size of 50 respondents, only 34% are not sleep deprived. It is combined with 70% of respondents having partial sleep deprivation where most of their time are doing school projects, making projects, and using social media on weekdays. While the factors affecting their grades and sleep on weekends include using social media, making projects, and playing video gaming.

The top three outcomes of sleep deprivation in the survey are exhaustion, fatigue, and pessimism and succeeded by health risks, as well as decline in thinking. Thus, to minimize having debt in sleep is to have time management, establish a comfortable sleeping environment, and doing less of social media.

5. Conclusion

The Silliman University Senior High School students regardless of the drowning projects, exams, and the influence of social media are partially sleep deprived even though they are aware of the consequences of sleep loss. However, the lack of correlation of sleep and general average show that students can get away sacrificing a portion of their sleep to have their desired grades. It also shows that the students are accustomed to sleep deprivation and the school's curriculum.

Recommendations

To the future researchers who will conduct this research, it is ideal to increase the population size and to include other STEAM tracks from different schools in Dumaguete City should be taken into consideration. This will help solidify the results of this research as well as eliminate any ambiguities in the results. Aside from that, conducting interviews using a qualitative perspective in this research to analyze sleep deprivation will enrich the results of the respondents.

The research recommends that senior high school students of Silliman University must exercise time management to be able to cope up with the rigorous academic requirements. Teachers should also adjust to the needs of the students so that their sleep will not be compromised.

It is also suggested that these students must minimize the use of social media one hour to their sleeping time. It is also expected that students should sleep early to regulate enough sleep, less use of electronic gadgets such as smartphones, computers, and televisions prior to sleep, and avoiding the use of bright light an hour before sleep. It is also advisable to reduce stress before closing the eyes and setting the appropriate room temperature.

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