

# Association Between Teenagers' Screen Usage Time and Sleeping Time

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## 1 Introduction

In our daily lives, we always complain that high school students cannot get enough sleep and hence fail to concentrate on their studies and achieve the highest productivity. The minimum amount of sleep teenagers need should be at least 7 to 8 hours each night. However, it is often seen that students' screen usage time occupies their sleeping time - for instance, they might use a phone to communicate with others near bedtime and stay up late to wait for a reply. Thus, in order to help high school students on improving their concentration and productivity, we aim to look for an association between their screen usage time and sleeping time.

In this essay, we will conduct a Fisher's Exact test for the association between high school students' screen usage time and sleeping time. Our null hypothesis is that high school students' sleeping time is not associated with their screen usage time. Our alternative hypothesis is that high school students' sleeping time is associated with their screen usage times. Meanwhile, the study is also open to finding other factors in our further interviews.

## 2 Background Research

Numerous studies have found a correlation between using screen-based devices before bed and increased sleep latency, or the time it takes someone to fall asleep. For our ages, an estimated two out of every three teenagers sleep less than the recommended amount, and screen usage may be to blame for sleep deprivation and other issues.[3] Teenagers' use of screens is associated with a variety of insomnia symptoms. Screen usage prolongs the time it takes to fall asleep and results in less restful sleep overall by delaying the production of melatonin. A later bedtime often leads to disturbed sleep and increased next-day drowsiness because most teens have stringent school start times.[4] The circadian rhythm is eventually disrupted by routinely staying up late throughout the week and sleeping in on the weekends.[5]

Because we have two group variables with more than two options and it is

estimated that most of our expected counts for cells are not greater than 5, we will use Fisher's Exact Test. Like the Chi-Squared Test, it can also be used to determine if there is a significant association between two variables. The analysis will directly result in a probability or p-value, which represents the chance of seeing our results if there is actually no difference in sleeping times for different phone screen usage times. [2]

### **3 Methods and Procedures**

#### **3.1 Procedures for Obtaining Sample and Collecting Data**

A random sample consisting of 25 tenth-grade students and 25 eleventh-grade students is collected. The procedure is as follows:

1. A list of grade 10 students (sorted alphabetically by initials) is obtained.
2. A random number generator is used to generate 25 distinct numbers within the total number of grade 10 students.
3. Questionnaires are handed out online, in which each chosen individual's average phone usage time and average sleeping time per night in the past 7 days are surveyed.

The same procedure will be repeated for G11 students.

#### **3.2 Composition of the Questionnaire**

The questionnaire will include the following questions:

1. What is your average phone screen usage time in the past 7 days?
  - a. Below 4 Hours
  - b. 4 - 6 Hours
  - c. 6 - 8 Hours
  - d. 8 - 10 Hours
  - e. More Than 10 Hours
2. What is your average sleeping time per night in the past 7 days?
  - a. Below 5 Hours
  - b. 5 - 6 Hours
  - c. 6 - 7 Hours
  - d. More Than 7 Hours

Data will be collected from their responses.

### 3.3 Inference Test

Because most of our expected counts are not larger than 5, we will use the Fisher's Exact Test. We will set our significance level to be 0.05. The conditions that are checked for the Fisher's Exact Test are:

- The sample is randomly collected.
- The observations are independent. We eventually obtained 45 valid answers to the questionnaire, and 45 is less than 10% of the total number of students in G10 and G11.
- The different possible observations of both categorical variables are mutually exclusive.

## 4 Results

Eventually, 45 valid answers to the questionnaire are obtained. The observed counts for each possible answer to the questionnaire are as follows:

Average Phone Screen Usage Time in the Past 7 Days	Average Sleeping Time Per Night in the Past 7 Days				Total
	Under 5 Hours	5 - 6 Hours	6 - 7 Hours	More Than 7 Hours	
Under 4 Hours	0	2	3	2	7
4 - 6 Hours	0	2	6	1	9
6 - 8 Hours	0	2	7	1	10
8 - 10 Hours	2	3	2	1	8
More Than 10 Hours	3	2	3	3	11
Total	5	11	21	8	45

Figure 1: The Observed Counts for Each Possible Answer to the Questionnaire

The result of Fisher's Exact Test for this sample is as follows:

	Value	p
Fisher's exact test		0.448
N	45	

Figure 2: The Results of Fisher's Exact Test for This Sample

[1]

Because the p-value is 0.448, which is larger than the significance level 0.05, the null hypothesis is not rejected. There is no significant association between teenagers' phone screen usage time and sleeping time.

## 5 Problems in the Project/Suggestions for the Future

While our study reveals no association between teenagers' phone screen usage time and their sleeping time, some other studies conclude that an association is present.[6] Some possible limitations of this study that leads to a result that differs from other studies may include:

- We were able to collect a random sample from G10 and G11 students in the international department of BNDS only, so the sample is not enough to represent all teenagers. If possible, a random sample can be collected from a larger population, such as all the teenagers in Beijing or in China.
- A questionnaire is used to obtain data in this study, yet since people usually don't precisely record their phone screen usage time and sleeping time, the data may not be accurate enough to show an association between teenagers' phone screen usage time and sleeping time. An experiment is also hardly feasible because it is difficult to strictly restrict teenagers' phone screen usage time and to control the confounding variables that may affect their phone screen usage time and sleeping time, such as each person's lifestyle and sleeping habits, etc. Hence more random samples could be obtained from a larger population of teenagers in order to reduce the vast differences between individuals that would affect the two variables.

## 6 Conclusion

We have observed that some teenagers fail to pay attention and reach maximum productivity in their studies because they lack sleep, as they often stay up late to chat or play video games on their phones. Thus, we intended to look for an association between teenagers' phone screen usage time and their sleeping time in order to help high school students to improve their efficiency in their studies. Through a Fisher's Exact Test analysis of the answers collected from the sample, it appears that there is no significant association between teenagers' phone screen usage time and sleeping time. However, we were only able to collect a random sample from G10 and G11 students in the international department of BNDS, hence this research is still limited. Answers to the questionnaire could be collected from more random samples from a larger population of teenagers in order to reduce the differences between individuals that may act as confounding variables in this analysis.

Although the study reveals no significant association between teenagers' phone

screen usage time and sleeping time, too much phone usage can still influence students' concentration and efficiency in their schoolwork in other ways, such as distracting them. Moreover, excessive smartphone use is associated with psychiatric, cognitive, emotional, medical and brain changes, such as impaired cognitive function, reduced physical fitness, and changes in the brain's gray matter volume.[6] Therefore, due to health concerns, it is advised to use the phone in an appropriate amount.

## References

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