“BEDTIME SMARTPHONE USAGE AND ITS EFFECTS ON SLEEP AND PRODUCTIVITY AT WORK PLACE”

SUBMITTED BY

RAJDEEP CHAKRAVORTY

ASHISH KUMAR

KARTIK MEHER

AEGIS SCHOOL OF DATA SCIENCE

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UNDER GUIDANCE OF

DR. VINAY KULKARNI

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CHAPTER 1

INTRODUCTION

The technological revolution has made smartphones to be exceptionally appealing and well-known. They have become an important piece of daily life, being progressively utilised among the kids and adults. The smartphones are one of the most widely recognised methods for corresponding and communicating; therefore, they are becoming a necessity in the humans' lives. For most populations, a smartphone is a primary thing human will use when awake in the morning and before they sleep. However, the excessive usage of mobile phones has been associated with many health problems, including both biological and psychological issues.

The findings warrant the continued managerial as well as academic research attention, as the smartphones are now used by many organisations to run businesses as well.

The increasing frequency and time spent on the smartphone lead to smartphone addiction. Smartphone addiction is a non-chemical behavioural addiction that involves human-machine interactions, also known as technological addictions Recent studies show that smartphone addiction is related to sleep disturbance and depression. The addiction leads to sleep interference as the smartphones are placed within reach even when sleeping at night.

The report is a detailed attempt to prove the theories stated above through the approach of hypothesis testing and stating our claim through the inferences derived from it.

CHAPTER 2

LITERATURE REVIEW

The previous study by Rehman et al. (2019) observed that the smartphone usage at the workplace might decrease the work performances. Regardless of the subjective evidence showing the impacts of the smartphone on the employees' subsequent sleep and functions at work, unfortunately, these propositions were not empirically confirmed (Lanaj et al., 2014). Moreover, there has been a scarcity of research exploring the links between the bedtime usage of smartphones with sleep quality in adults, both locally and globally (Alshobaili and AlYousefi, 2019).

Overall, the literature suggests that the research related to smartphone usage is scattered, particularly in psychology, medical, education, and technology topics. The specific number of research related to smartphone usage in the management or organisational behaviour domain is very less, as most have focused on work-related use of smartphones and its consequences instead (Panwar and Agrawal, 2021). However, this study aimed to contribute to the existing information technology and organisational behaviour literature, while providing insights into smartphone usage and its linkage with the employees' workplace behaviour.

In previous literature, many studies found that smartphone overuse at night time has a virtual role in sleep quality (Rod, 2018). Most companies provide smartphone to their employees for instant access to work emails and documents, thus also providing connectivity to work (Carlson, 2012). The employee connectivity with work while away from the office and after the working hours affect the rest and recovery times from a hectic workday (Huhman, 2011).

CHAPTER 3

RESEARCH METHODOLOGY

STATEMENT OF THE PROBLEM

The focus of this report is conducting a study and inferring whether sleep and mobile usage at bedtime has a negative impact on the work efficiency of the employee.

DATA COLLECTION METHOD: PRIMARY DATA

An online survey was conducted among the employees working in IT sector to test the hypotheses used in this study statistically

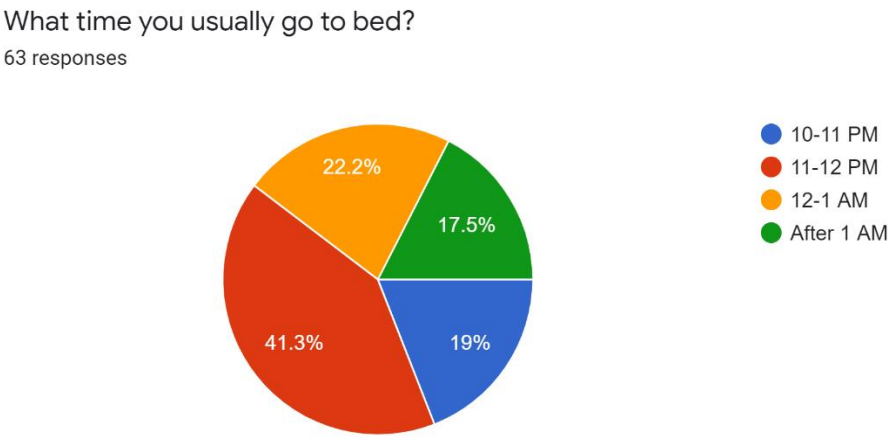
INSTRUMENT DEVELOPMENT

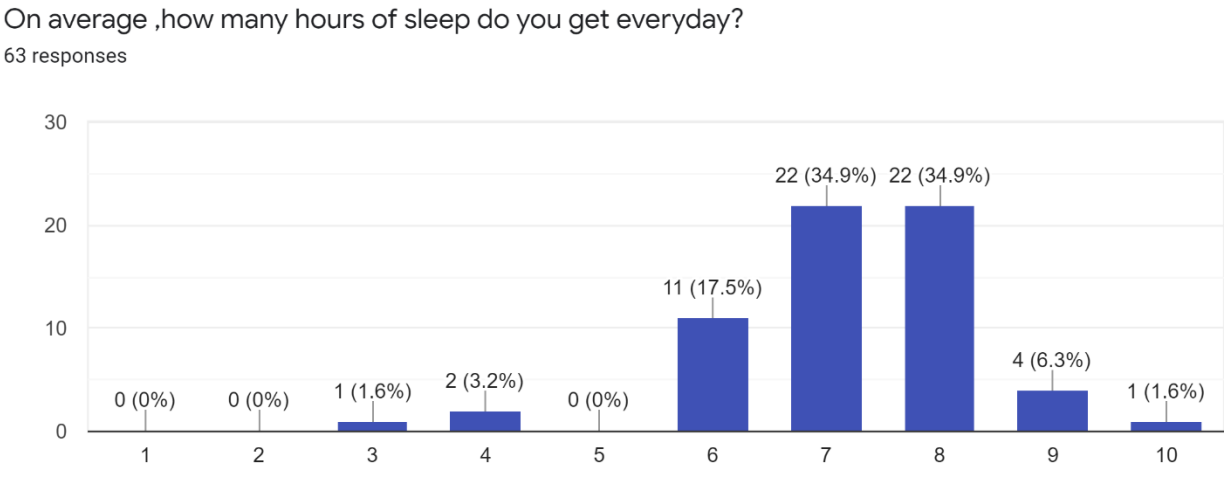
A survey questionnaire was used as an instrument for data collection. The questionnaire was designed using Google form; then the link was shared among the participants to get quick and timely response.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

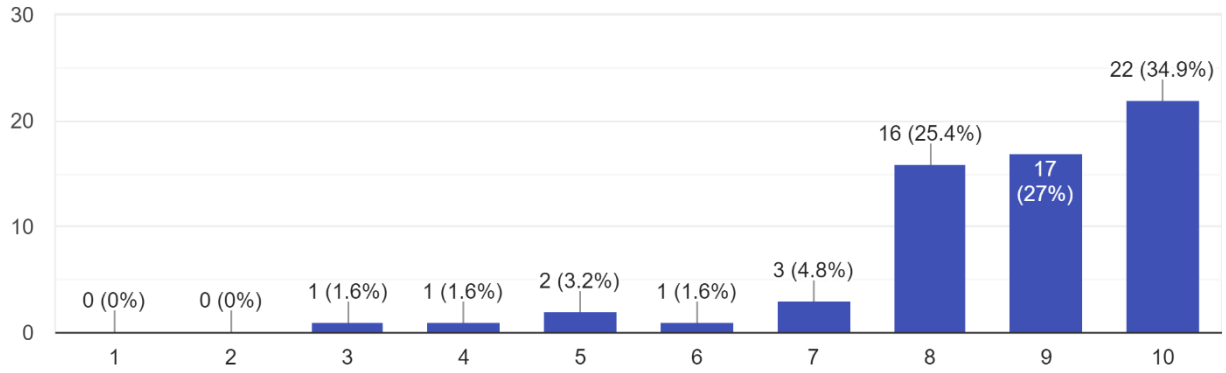
The data were collected through responses from google form and the subsequent graphs obtained from it were as follows:





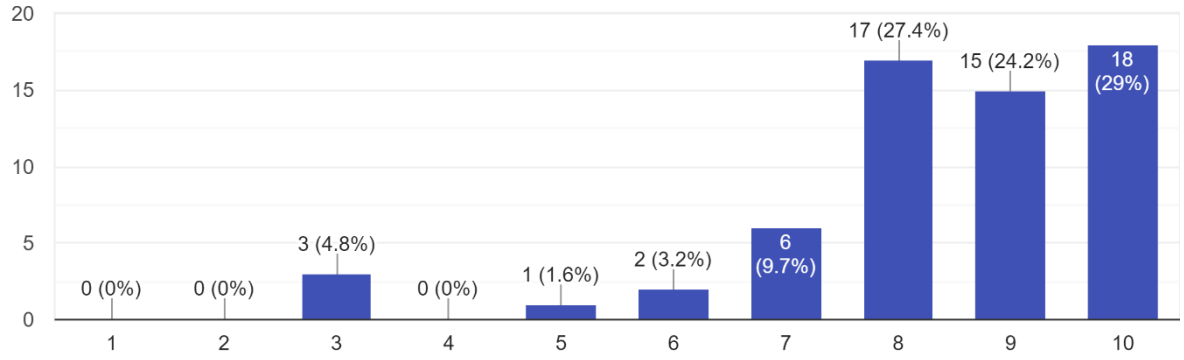
How much hours do you work?

63 responses



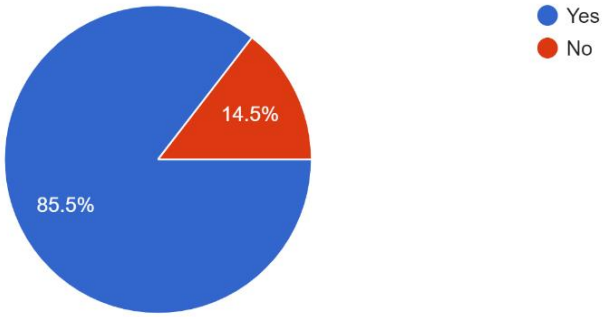
How much you can rate your work efficiency if you sleep good?

62 responses



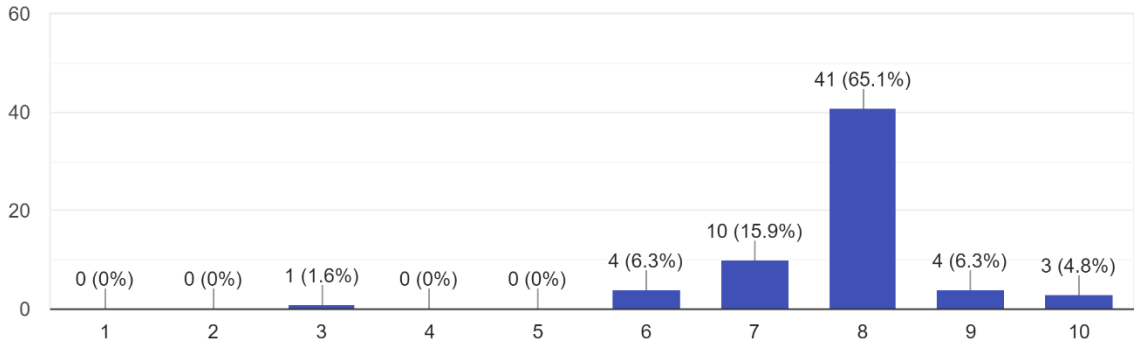
Does sleeping less, effect on work?

62 responses



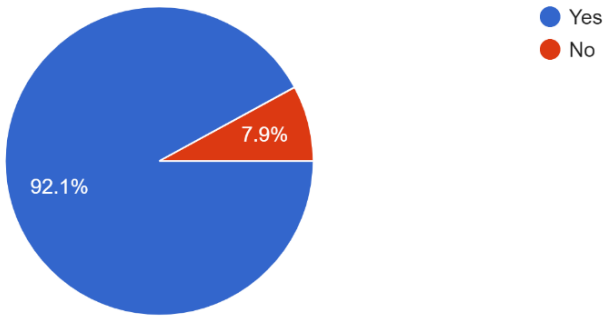
On an average how much sleep should a person get if he/she is a working?

63 responses



Do you use smartphone at bed time?

63 responses



CHAPTER 5

CALCULATION

Formulation of hypothesis and calculation related to it

In [1]:
```
#importing requied libraries
import pandas as pd
import scipy.stats as sp
import numpy as np
```

In [3]:
```
#importing dataset
df=pd.read_csv('dataset.csv')
```

In [4]:
```
df
```

Out[4]:

	Timestamp	Gender	What time you usually go to bed?	On average ,how many hours of sleep do you get everyday?	How much hours do you work?	How much you can rate your work efficiency if you sleep good?	Does sleeping less, effect on work?	On an average how much sleep should a person get if he/she is a working?	Do you use smartphone at bed time?	Purpose of smartphone use at bedtime
0	12/12/2021 23:34:47	Male	12-1 AM	8	8	10	Yes	7	Yes	Social Networking sites
1	12/12/2021 23:43:02	Male	10-11 PM	8	8	9	Yes	8	Yes	Social Networking sites
2	12/13/2021 0:03:00	Female	After 1 AM	7	7	10	No	8	Yes	Social Networking sites
3	12/13/2021 0:49:30	Male	12-1 AM	7	8	9	Yes	8	Yes	Entertainment
4	12/13/2021 12:09:38	Female	11-12 PM	8	8	10	Yes	8	Yes	Other
...	...	...	...	...	...	...	...	...	...	...
58	12/15/2021 18:53:03	Male	11-12 PM	3	3	3	Yes	3	Yes	Entertainment
59	12/15/2021 23:10:11	Male	10-11 PM	6	9	7	No	8	Yes	Web Surfing
60	12/16/2021 13:09:16	Female	12-1 AM	7	9	9	Yes	8	No	Entertainment
61	12/16/2021 20:47:04	Male	11-12 PM	8	8	10	No	6	Yes	Entertainment
62	12/16/2021 23:01:53	Male	11-12 PM	9	10	10	Yes	10	Yes	Entertainment

63 rows × 10 columns

As we can see data is not normally distributed but according to Central limit theorem, irrespective of the distribution of the population, sample is normally distributed. So assuming this we carry out further calculations.

In [19]:
```
#pearson correlation
from scipy.stats import pearsonr
stat, p = pearsonr(df.iloc[:,3], df.iloc[:,5])

print('stat=%.3f, p=%5f' % (stat, p))
if p > 0.05:
    print('independent samples')
else:
    print('dependent samples')
```

```
stat=0.259, p=0.040278
dependent samples
```

Lets find correlation between dataset

In [21]:
```
df.corr()
```

Out[21]:

	On average ,how many hours of sleep do you get everyday?	How much hours do you work?	How much you can rate your work efficiency if you sleep good?	On an average how much sleep should a person get if he/she is a working?	Do you use smartphone at bed time?
On average ,how many hours of sleep do you get everyday?	1.000000	0.098346	0.259144	0.401204	0.046865
How much hours do you work?	0.098346	1.000000	0.175587	0.326542	-0.184138
How much you can rate your work efficiency if you sleep good?	0.259144	0.175587	1.000000	0.175892	-0.041197
On an average how much sleep should a person get if he/she is a working?	0.401204	0.326542	0.175892	1.000000	-0.059962
Do you use smartphone at bed time?	0.046865	-0.184138	-0.041197	-0.059962	1.000000

The correlation between the required two columns is 0.2591.

Testing the Significance of the Correlation Coefficient

Pearson's correlation coefficient, r, tells us about the strength of the linear relationship between x and y points on a regression plot. However, the reliability of the linear model also depends on how many observed data points are in the sample. We need to look at both the value of the correlation coefficient r and the sample size n,together.

We perform a hypothesis test of the "significance of the correlation coefficient" to decide whether the linear relationship in the sample data is strong enough to use to model the relationship in the population.

The hypothesis test lets us decide whether the value of the population correlation coefficient ρis "close to 0" or "significantly different from 0". We decide this based on the sample correlation coefficient r and the sample size n.

H0: Sleep doesn't affect the work efficiency

H1: Sleep affects the work efficiency

In [40]:
```
#All the values were found to be

r=0.25
n=63
dof=62

#Consider 5% of significance level

```

t_critical is calculated from below table

df =N-2	Level of significance for a one-tailed test .05	.025	.01	.005
	Level of significance for a two-tailed test .10	.05	.02	.01
1	.988	.997	.9995	.9999
2	.900	.950	.980	.990
3	.805	.878	.934	.959
4	.729	.811	.882	.917
5	.669	.754	.833	.874
6	.622	.707	.789	.834
7	.582	.666	.750	.798
8	.549	.632	.716	.765
9	.521	.602	.685	.735
10	.497	.576	.658	.708
20	.360	.423	.492	.537
30	.296	.349	.409	.449
40	.257	.304	.358	.393
50	.231	.273	.322	.354
60	.211	.250	.295	.325
70	.195	.232	.274	.302
80	.183	.217	.256	.284
90	.173	.205	.242	.267
100	.164	.195	.230	.254
∞	.073	.087	.103	.114

Figure 1: Critical values for r

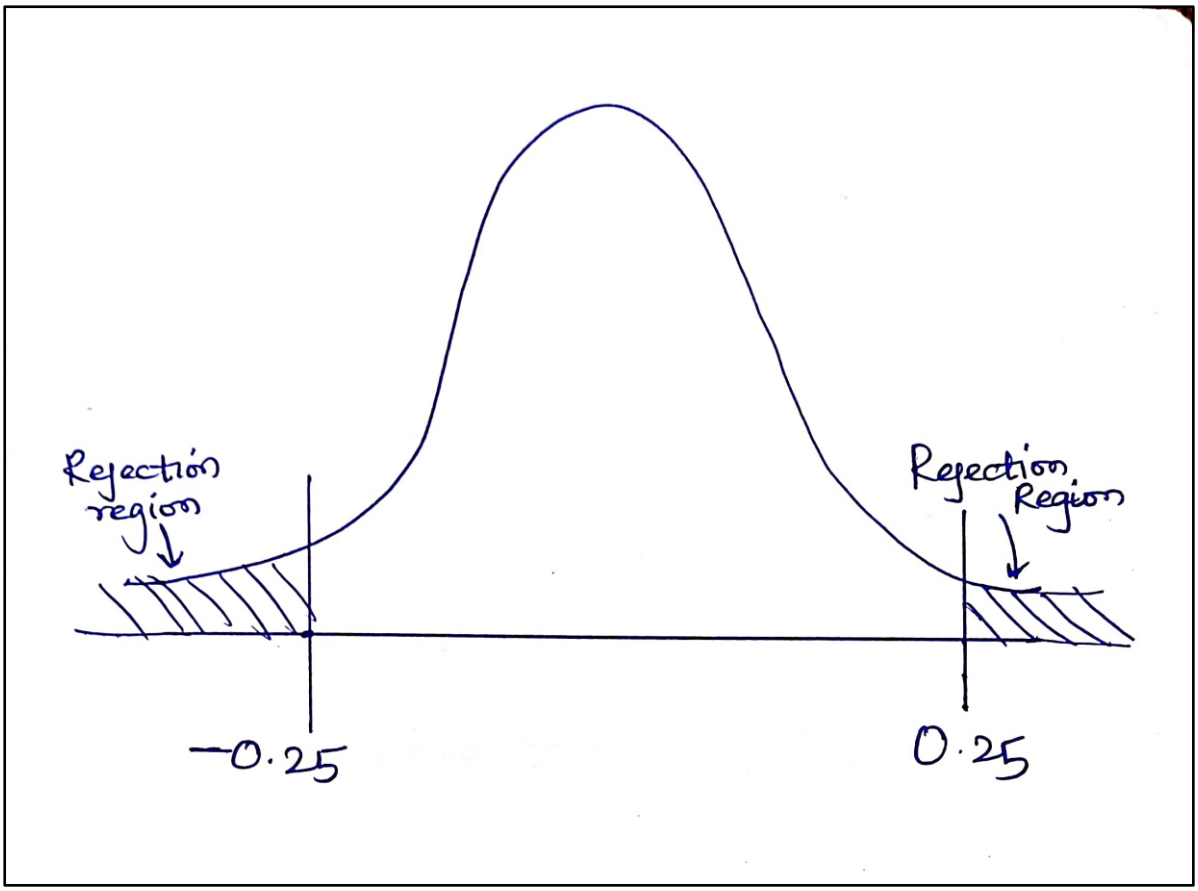


Figure 2: Diagram

In [42]:
```
t_actual= (r*(np.sqrt(n-2)))/(np.sqrt(1-r**2))
t_actual
```

Out[42]: 2.016597794967223

t_actual lies in rejection rejection region

Hence, null hypothesis is rejected.

Conclusion: There is sufficient evidence to conclude that there is a significant linear relationship between sleep quality and work efficiency because the correlation coefficient is significantly different from 0

```
Since the significance level is 5%, p_critical=0.05
```

In [44]:
```
p_actual=1-sp.t.cdf(2.106,62)
p_actual
```

Out[44]: 0.019630127256329177

Since p_actual< p_critical, null hypothesis is rejected. **We can statistically say that sleep quality and work efficiency are correlated.**

CHAPTER 6
LIMITATION AND FUTURE SCOPE

Limitations

In the course of the study, some challenges were encountered that limited the research in one way or another and some of them are as follows so that the findings of the study are understood in proper perspective.

The limitations to the study are as follows:

- Sleep can also be affected by other factors like age, health issues etc which were not considered in our study.
- The respondents were limited since we were within a time constraint.
- We cannot tell whether this might be their actual behaviour so there might be self-reported bias.

Future scope

- In this study the data that was collected was limited to one sector only, in future the study could be extended to different sectors.
- The number of respondents could also be extended to get better insights about data.
- If someone wants to research in the future about this topic then they can also add an important factor like smart phones which can affect both sleep and work efficiency.

CHAPTER 7

CONCLUSION

From our research conducted we can conclude that usage of smart phones can lead to sleeping less which ultimately has an adverse consequence on work efficiency and productivity resulting in great loss to the companies.

The employees should be extra vigilant, as this behaviour might unknowingly affect their career growth and progress since it is proven to be an inhibitor for work performances and productivity.