Analysing Sleep and Stress Patterns in College Students

Riya E. Shaju, Meghana Dirisala

SCOPE,
Vellore Institute of Technology,
Vellore

Email: riyaeliza.shaju2019@vitstudent.ac.in
Email: meghana.dirisala2019@vitstudent.ac.in

Abstract: *The main aim of this project was to analyze the sleep and stress levels of college students and whether or not it affects mental wellness. In order to facilitate this study, a survey is conducted, with a total of 116 participants of various age groups, i.e., 18-20 (82.8%), 21-23 (16.4%), 24-25 (0.9%), varying gender identities (Male (44.8%), Female (53.4%), Non-binary (1.7%)) and from different STEM branches. Further, subjects are asked if they have been diagnosed or treated for mental illnesses. The questionnaire further contained questions about stress-inducing situations, how one would handle those, and some questions regarding sleep schedules and behaviours. A correlation is discovered between wellness patterns and diagnosis of illness.*

Keywords: Irregular sleep patterns, stress patterns, PSQI index, mental wellness, mental illness, college students

Introduction:

Sleep problems have a great impact on the students' daily life, decreased concentration on work, difficulty in maintaining work-life balance, difficulty meeting deadlines, which in turn can affect the cumulative grade point average of CGPA. Due to irregular daytime routines, different chronotypes, internships, other work overload and exam periods, college-going students face a lot of disturbances in their sleep. However, sleep disturbances and reduced sleep quality and time due to situational stress such as an exam week could have a relation to an underlying mental disorder like GAD, ADHD, ADD, which in turn affects sleep, regardless of the aforementioned reasons.

Previous studies have linked sleep issues to worse mental health outcomes from infancy through adulthood (signs of increased depression, anxiety, aggression, and delinquent behaviors)[1] [2] Understanding the relationships between sleep and mental health among college students seems essential because of the possibility to intervene and enhance student psychological wellbeing before they become clinically worrisome. Hence, we have decided to take this up as our project. We would like to correlate and find out the impact of irregular sleep and high stress affect mental wellness.

Literature survey:

The most recent survey about the relation between sleep and stress was conducted by Ayse Gulsen Teker and Nimet Emel Luleci; where they measured the sleep quality and anxiety level of a group of employees, as well as determined the relationship between sleep quality and anxiety and other factors using PSQI and BAI and univariate analysis. [3]

PSQI (Pittsburgh Sleep Quality Index) is an index developed by **Daniel J. Buysse** and **collaborators,** to measure the quality of sleep and to help discriminate between individuals who experience poor sleep versus individuals who sleep well. [4] [5]

BAI or Beck Anxiety Index measures the frequency of anxiety symptoms experienced by the individual. It is a self-assessment consisting of 21 items, each question scored between 0 and 3. The maximum total score possible is 63 points. A greater total score indicates increased levels of anxiety. [6]

A close relationship between sleep-related disorders and mental disorders has been demonstrated in numerous studies. Anxiety disorders are known to be associated with the severity and chronicity of sleep-wake disorders. A lot of studies have been conducted in the medical field. (See references from [7] to [11]). Frequent features of anxiety disorders include an unhealthy amount of fear and worry, which make everyday activities and interactions very tedious and can lead to behavioral disorders.

An extensive study found that the 1-year and lifetime prevalence of anxiety disorders were 10.6 percent and 16.6 percent, respectively[2]. In a survey of 14915 people, around 28% of individuals with insomnia had a current diagnosis of a mental condition, and 25.6 percent had a psychiatric background [12]. In another study, those who suffer from insomnia were shown to be 17.35 times more prone to clinical anxiety [13].

Proposed model:

Steps (overview):

1. Identify varying degrees, categorize them and encode with the range as 1-n
2. Take rowSum of all encoded rows as FINAL INDEX
3. Normalise FINAL INDEX column to the range 1-n
4. Conduct statistical analysis on FINAL INDEX to derive conclusions

Detailed steps:

Reading the dataset containing the responses of the students who gave the survey and renaming the columns.

We performed label encoding on columns containing demographic information and responses related to stress and tried running an Apriori algorithm on the data frame. However, our dataset is compromised from a medical standpoint and was making a stretch to correlate basic stress quotients to be indications of undiscovered mental illnesses.

We have used the concept of *indexing* to derive new conclusions from the data. We created two new data frames containing columns about sleep and stress responses respectively and performed *label encoding*. For example: In the dataframe df.stress ('not stressed', 'mild', 'moderate','severe','very severe') is encoded to (1,2,3,4,5).

In each dataset, we summed all the columns up by using rowSums to get the INDEX_sleep and INDEX_stress. These indexes were further *normalized* to get new columns normINDEX_sleep and normINDEX_stress to a scale of 5 using looping statements. For example: in INDEX_sleep; the min value is 1 and the max value possible is 41, so we divided it into groups of 8, to get the range as 1-5. Similarly, for INDEX_stress; the min value is 1 and the maximum value is 35 and is divided into groups of 7, to obtain the range 1-5.

We created another dataframe final_index containing normINDEX_sleep and normINDEX_stress and performed rowSums to get TOTAL_INDEX that has the sum of both the indices.

We then combined required columns like demographic information; *Gender, Age, Major and Sleep_index*(normINDEX_sleep),*Stress_index*(normINDEX_stress) and TOTAL_INDEX to form a dataframe-final.

We also created another dataframe combining all calculated indices to the original data called complete.

Finally, for better understanding of statistics, visualization of the data using graphs like pie-chart and stacked bar charts is done.

Empirical study:

The first question we considered was: Are sleep patterns affected in mentally ill people? To verify this, we took the sleep and stress patterns of people who've been diagnosed with a mental illness. Further, we investigated to see how many people in the group could have a mental illness. To find this we analysed sleep and stress patterns of diagnosed people and cross-checked with undiagnosed people.

Then we investigated further, looking into irregular sleep patterns and if that affects the mental wellness of a person. We considered late sleepers and people who sleep for less than 6 hours.

We saw that the number of people treated is not equal to the number of people diagnosed. No notable patterns were found while analysing this subgroup, but we concluded that if a more detailed survey was conducted focusing more on the circumstance of diagnosis/ treatment, we would be able to find patterns relating to their economic and social standpoint.

We also wanted to analyse the stress patterns of people who take more than 2 hours to fall asleep. 66.67% had been diagnosed with a mental illness and they belong in the 3rd quartile with relation to their stress and sleep indices.

Experimental analysis:

We found that approximately 22.42% of undiagnosed people show the same patterns and diagnosed people, hence indicating a possibility of an undiscovered mental illness.

On further introspection, we concluded that 16.37% of the population have irregular sleep, out of which 36.87% show signs of mental distress out of which 14.28% have been diagnosed.

66.67% of people who take more than 2 hours to fall asleep had been diagnosed with a mental illness and they belong in the 3rd quartile with relation to their stress and sleep indices.
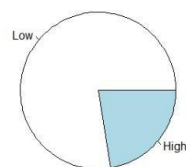
Visualization:
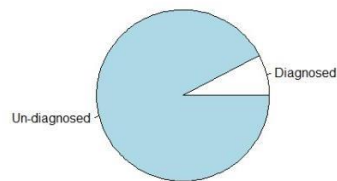
Figure 1: Pie chart showing strength of members diagnosed with mental illnesses v/s un-diagnosed

Figure 2: Strength of undiagnosed members who may have a mental illness

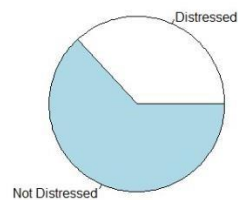**Late sleepers showing signs of mental distress**

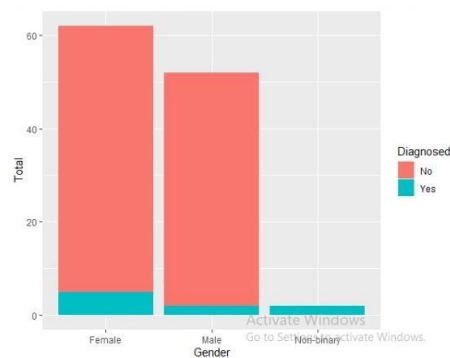**Figure 3:** Percentage of late sleepers showing signs of mental illness

Figure 4: Percentage of people getting diagnosed with a mental illness, categorized by gender

Conclusion:

It is observed that a vast majority of surveyees show high values for stress and often have unhealthy sleep patterns. These may lead to the development of mental illnesses that further deteriorate the quality of one's life. With more insights from a medical standpoint, one could bring in more precise conclusions regarding the specifics of the illnesses from which the students may suffer.

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