



Sleep

and its relationships with lifestyle

Mid-Bootcamp Project for Ironhack
by Izabella Wojciechowska



Sleep in today's life ...

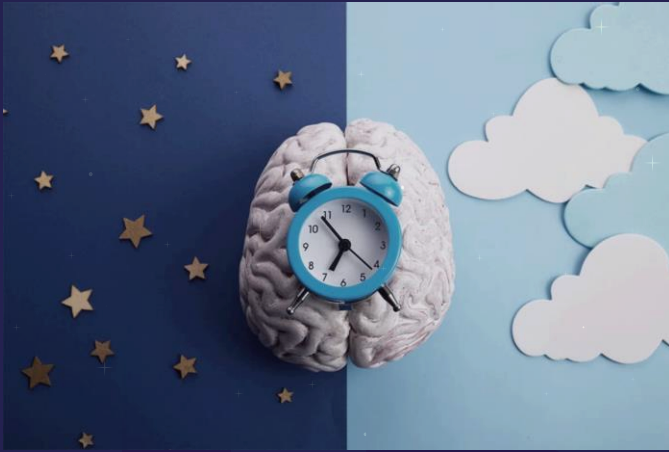
... fundamental pillar for health, yet so little appreciated and ignored by many.



**But why
do we
actually
sleep ?**

**Why is
it so
important ?**

Role of sleep:



- Enhances **learning** by consolidating information acquired during waking hours
- Strengthens the **immune system**
- Is vital for the **regeneration of cells**, **physical growth** and **tissue repair**
- Plays a role in **regulating metabolism** and **balancing hormones**
- Supports **heart health** and **helps regulate blood pressure**
- Influences **mood regulation** and **emotional well-being**

and many more...

Case of study

As a first case of study for my analysis, I used:

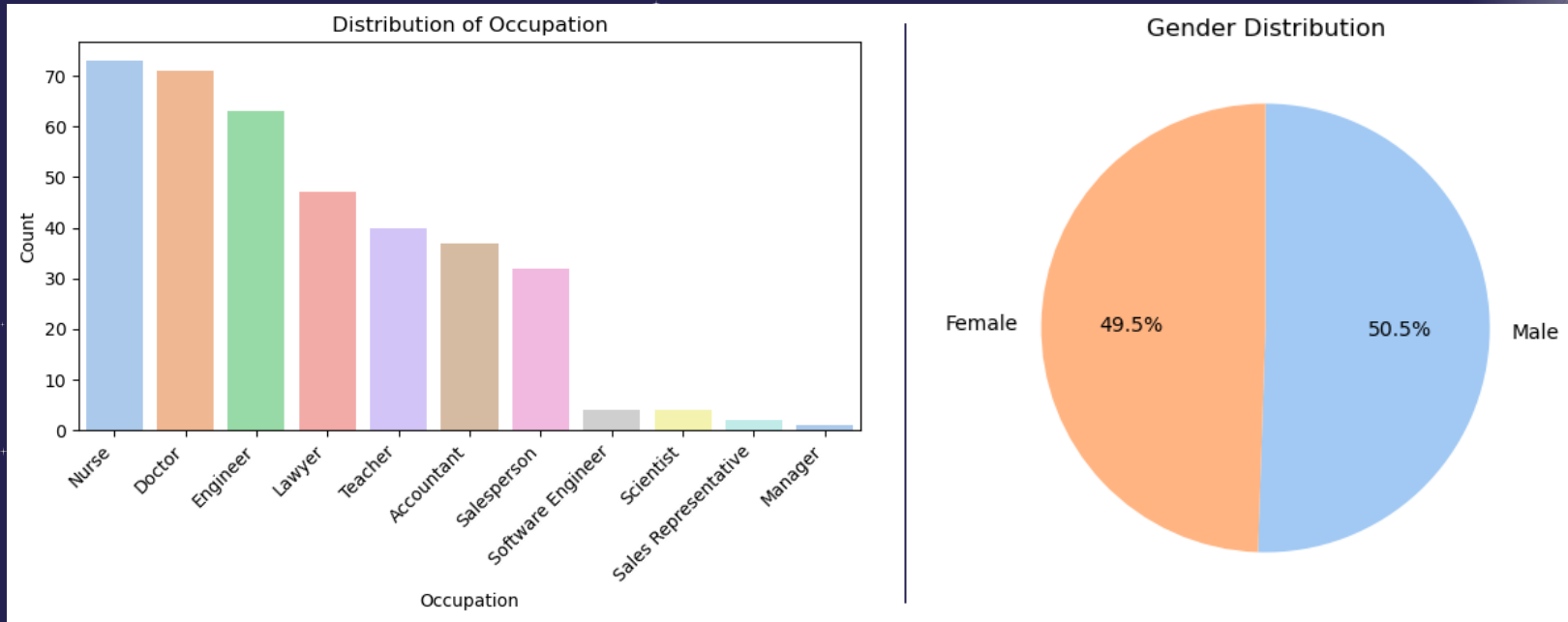
Sleep Health and Lifestyle Dataset

This dataset covers a wide range of variables related to sleep and daily habits. It includes details such as gender, age, occupation, sleep duration, quality of sleep, physical activity level, stress levels, BMI category, blood pressure, heart rate, daily steps, and the presence or absence of sleep disorders.



My analysis was intended to find the relationships between sleep and lifestyle.

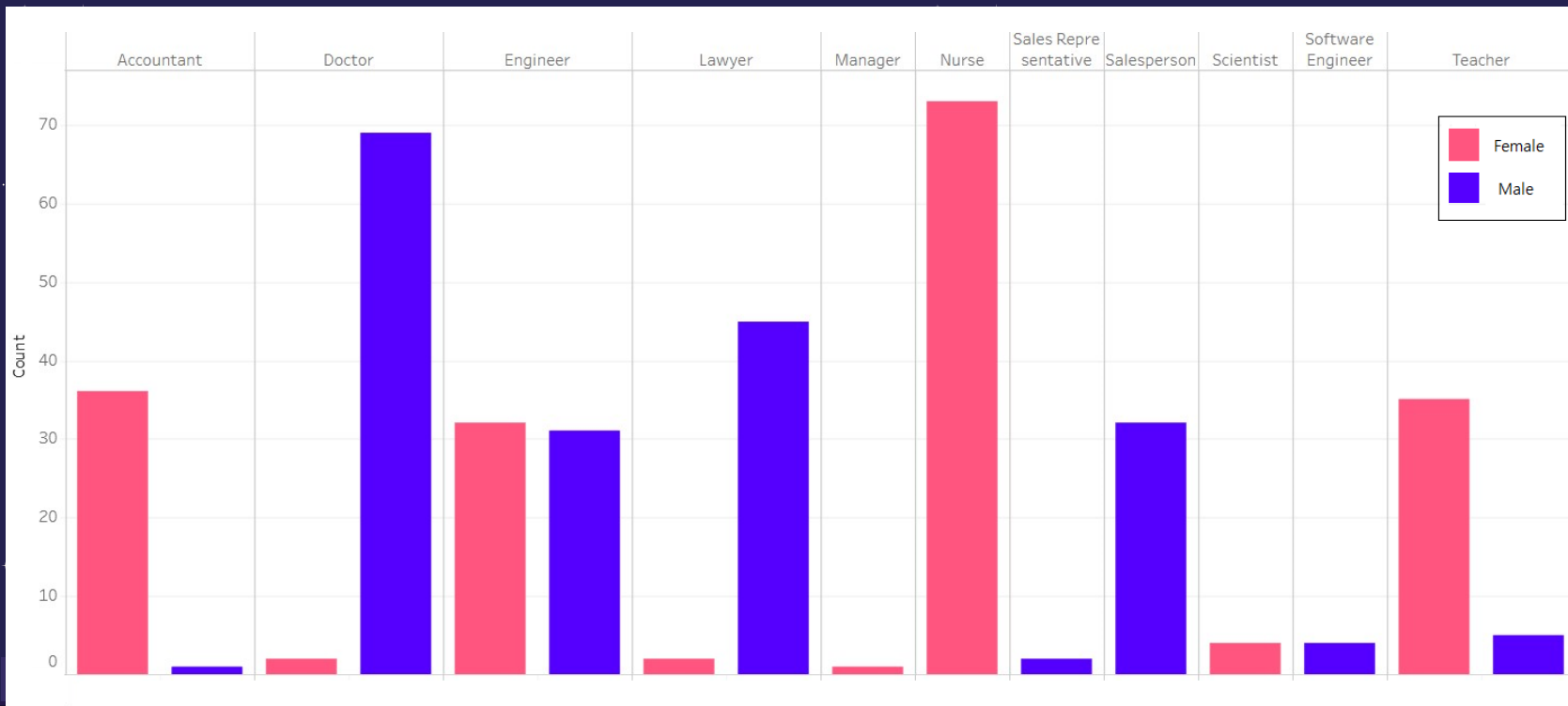
Distribution of Occupation and Gender



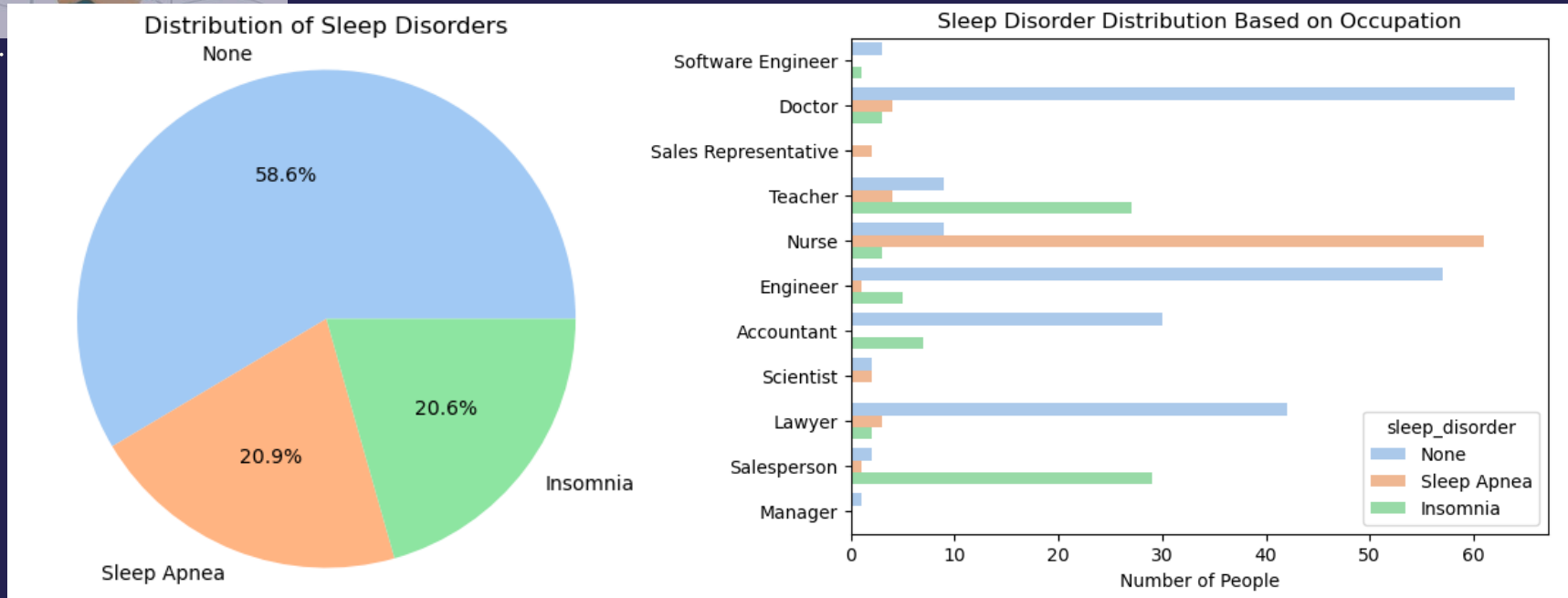
My data set consisted of various occupational groups, the most numerous of which were nurses, doctors and engineers. The least numerous groups were managers, sales representatives, scientists and software engineers. The gender distribution was almost equal for women and men.



Gender among Occupations

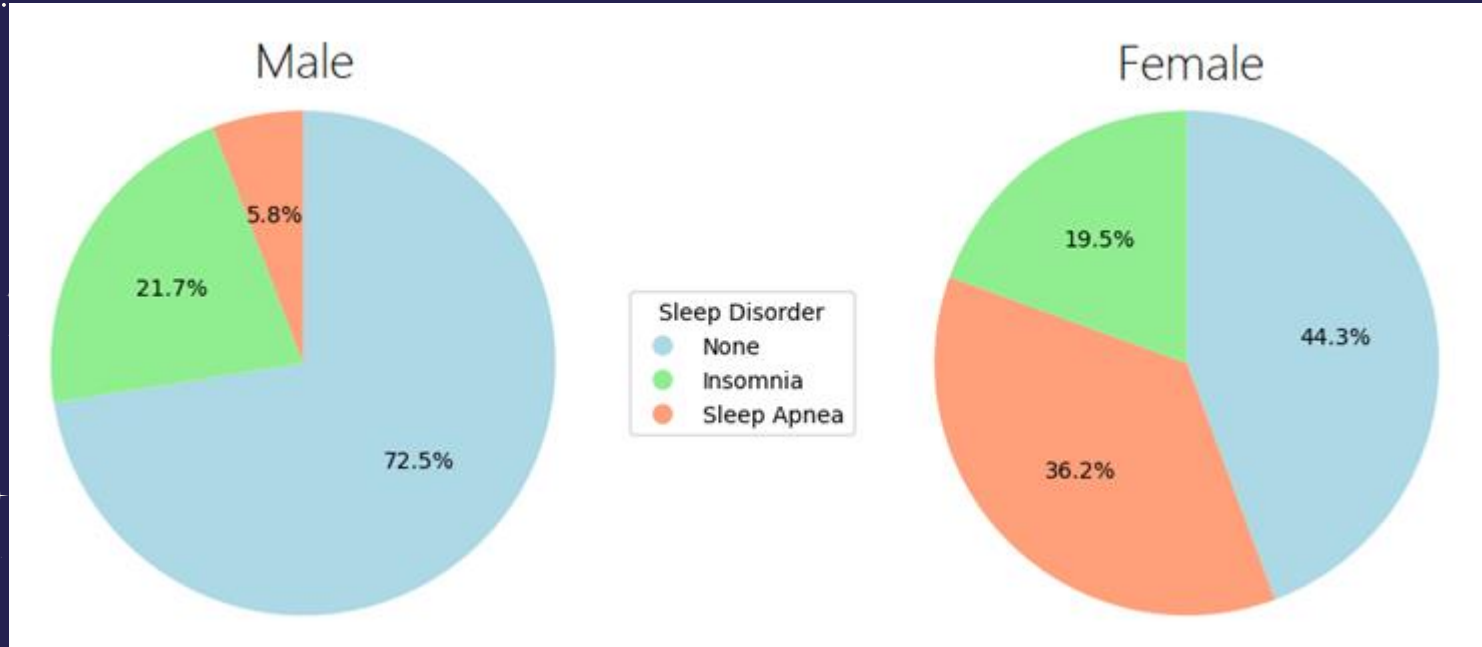


Sleep disorders among Occupations

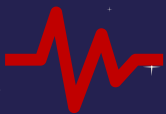


Among the professions, nurses stand out with a notable occurrence of sleep apnea, indicating a potential occupational risk or stress factor affecting their sleep. Salespeople and teachers also exhibit more instances of sleep disorders, though at a lower frequency.

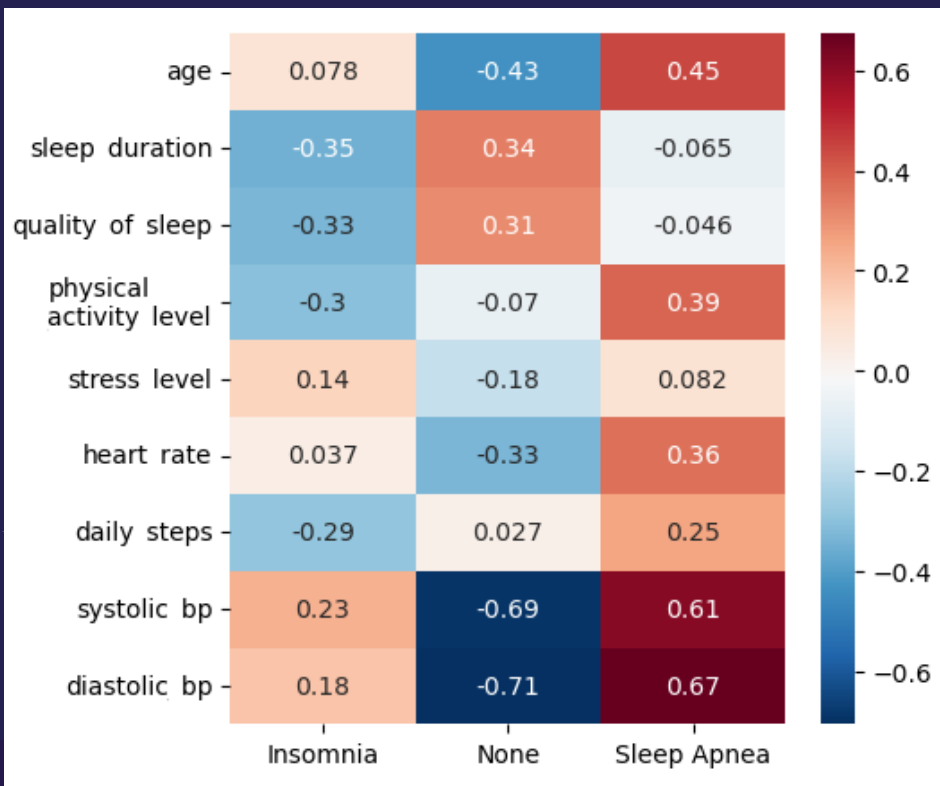
Sleep disorders and Gender



Among individuals without sleeping disorders in this dataset, men outnumber women.
Sleep apnea is more common among women than men.
Men slightly outnumber women in cases of insomnia.



Sleep disorders and other relationships



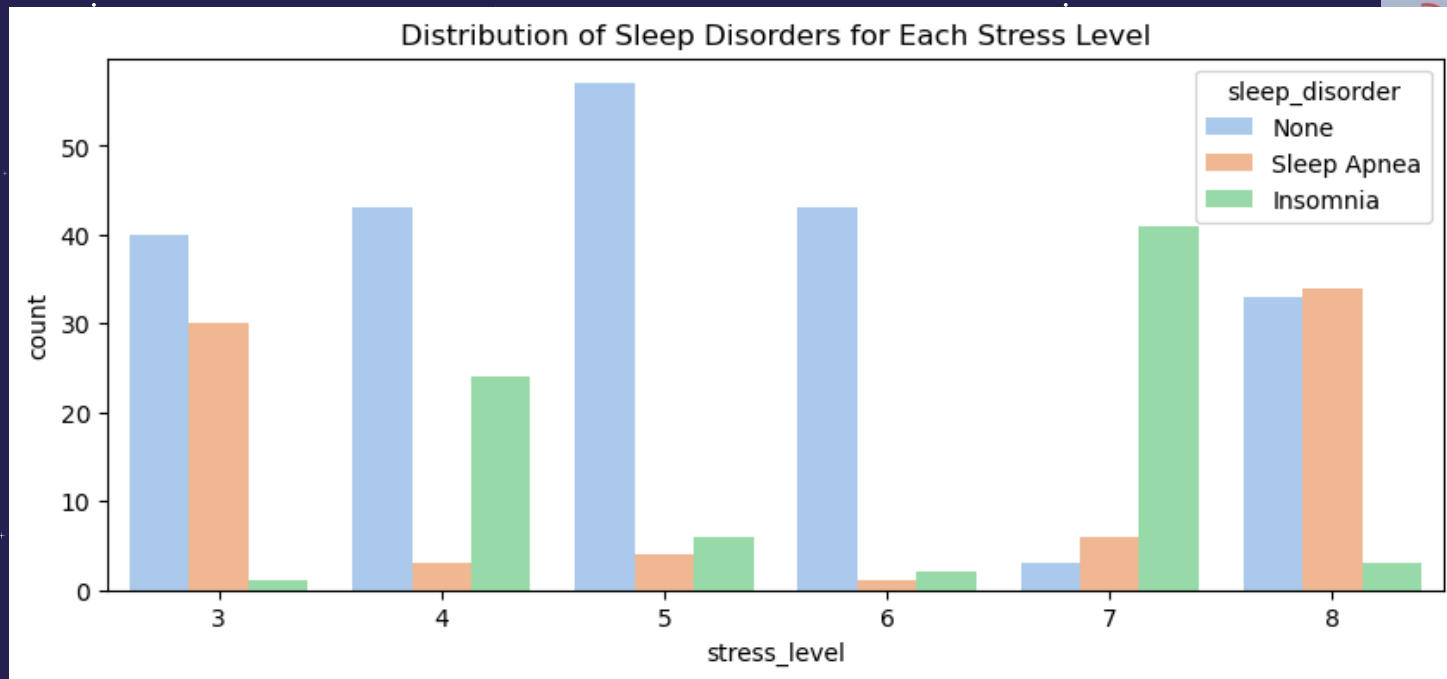
Conclusions:

Insomnia is associated with shorter sleep durations, lower sleep quality, and reduced physical activity. It also shows a weak positive correlation with stress levels and blood pressure.

Sleep apnea is correlated with higher blood pressure, older age, increased physical activity levels, and weakly associated with higher stress levels and heart rates.

No sleep disorder is linked to lower blood pressure, younger age, longer sleep durations, higher sleep quality, and slightly lower stress levels and heart rates.

Sleep disorders and Stress



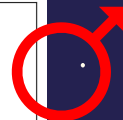
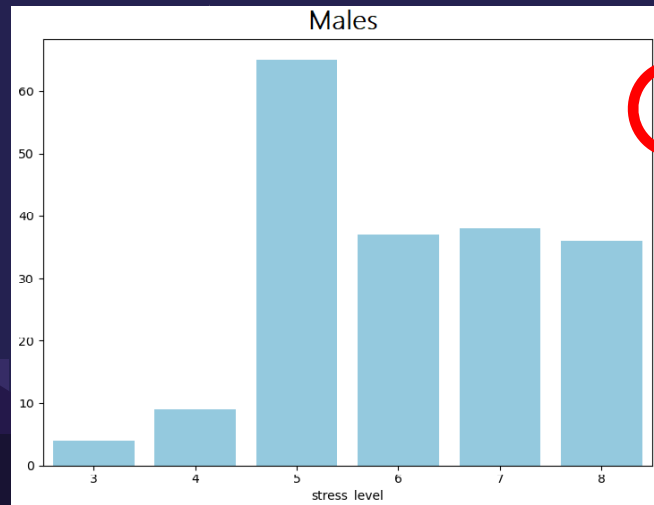
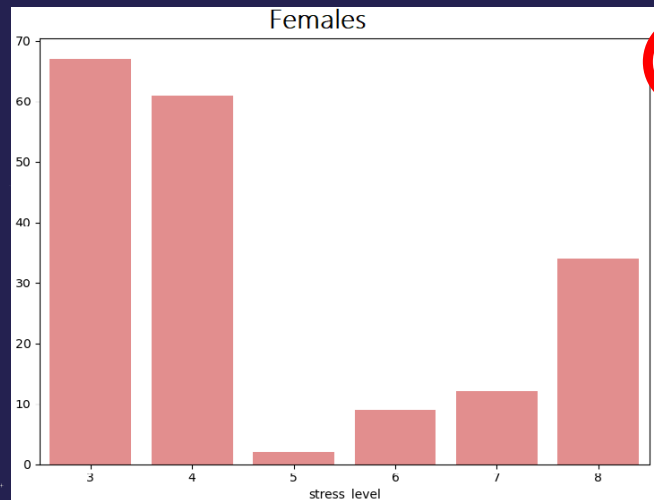
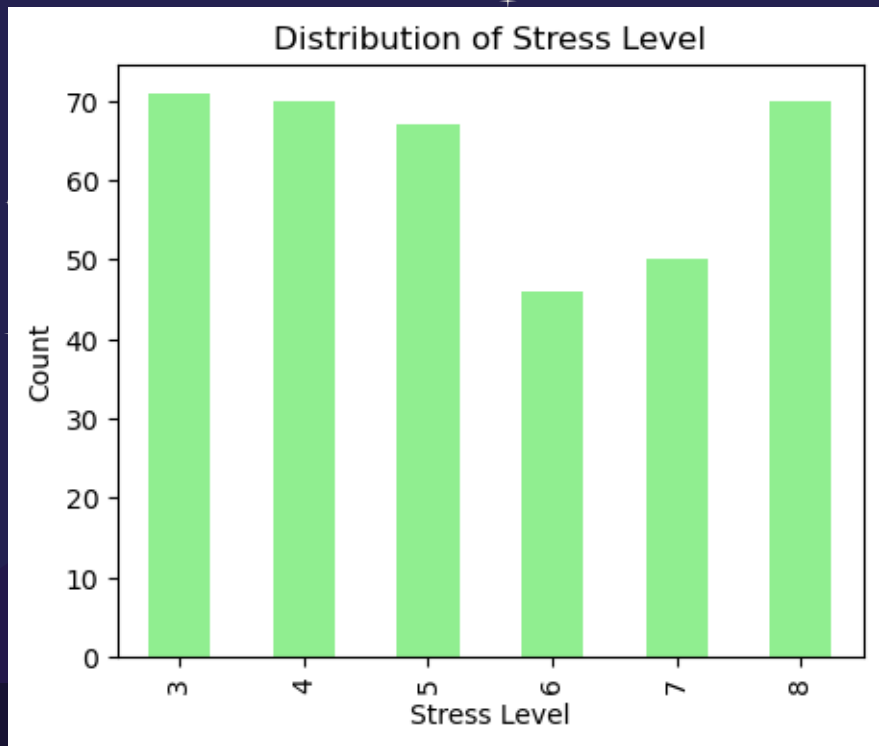
There's a small noticeable pattern between stress levels and the presence of sleep disorders.

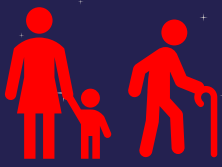
As stress levels increase, the count of individuals with sleep disorders also tends to rise.

For example, at stress levels 3 and 4, individuals without sleep disorders have a higher count compared to those with insomnia and sleep apnea. However, at stress levels 7 and 8, the counts of individuals with sleep disorders (both insomnia and sleep apnea) surpass those without sleep disorders.

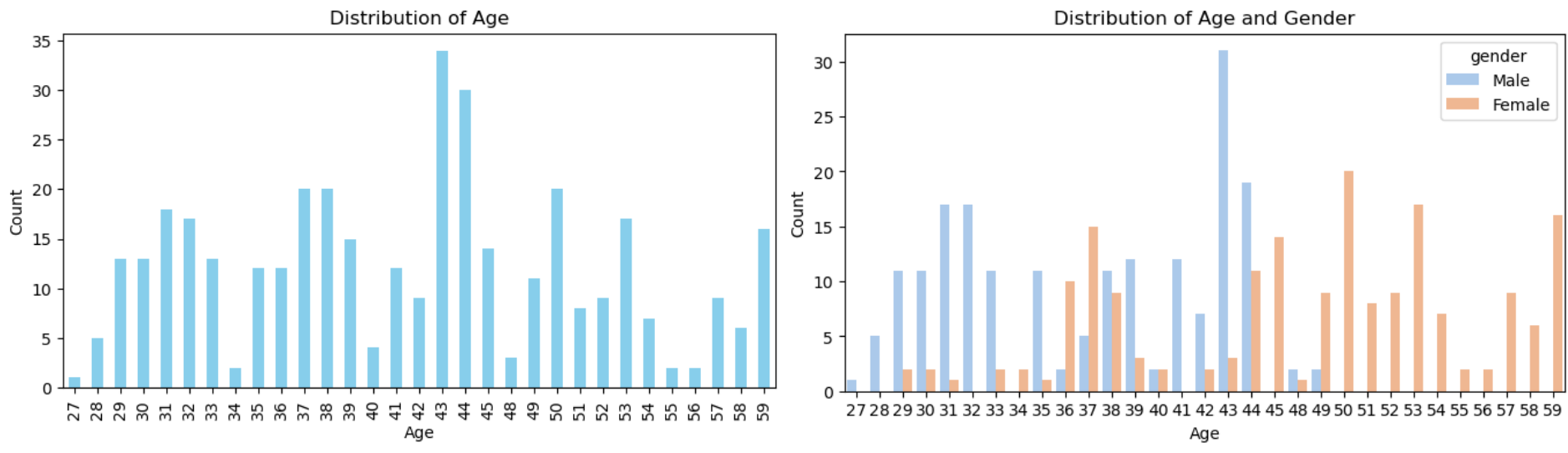


Stress and Gender



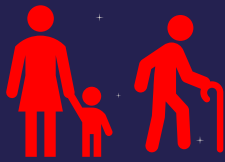


Distribution of Age and Gender

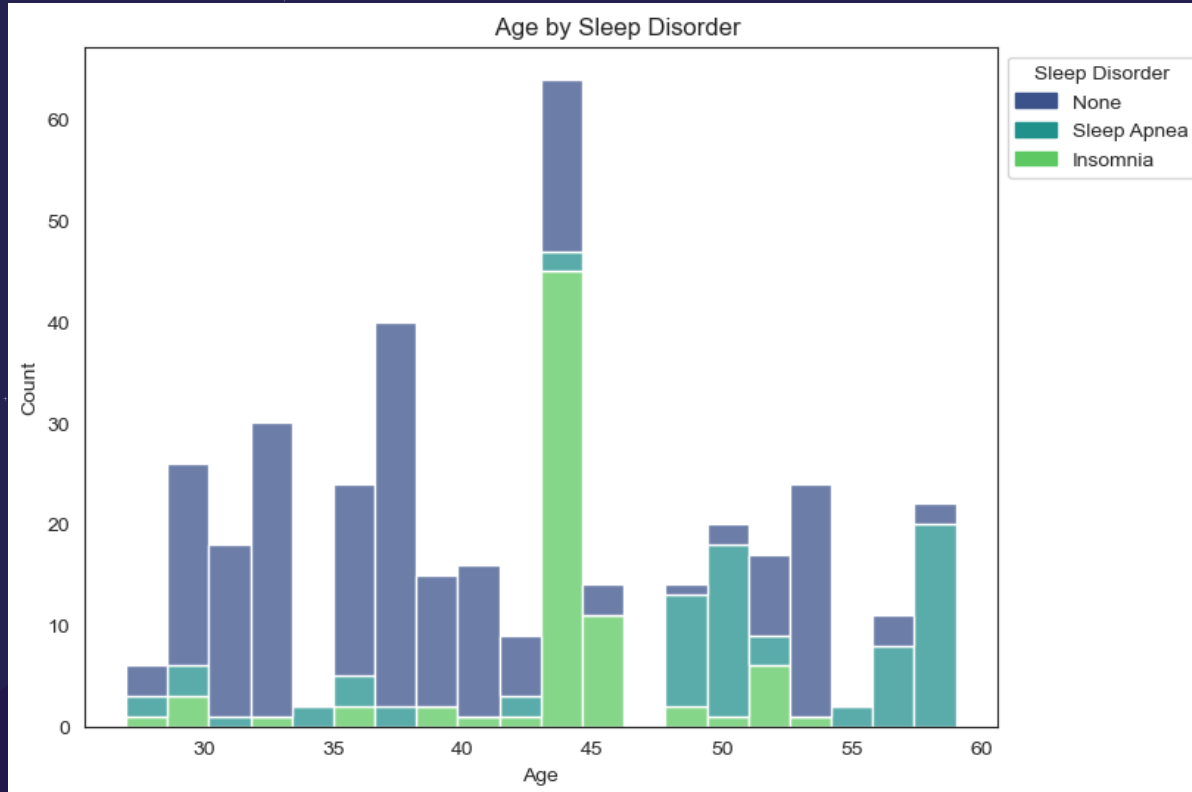


The largest age group in this dataset are people aged around 43, and the smallest is around 55.

Women dominate in the group over 50, and men predominate in the younger group.

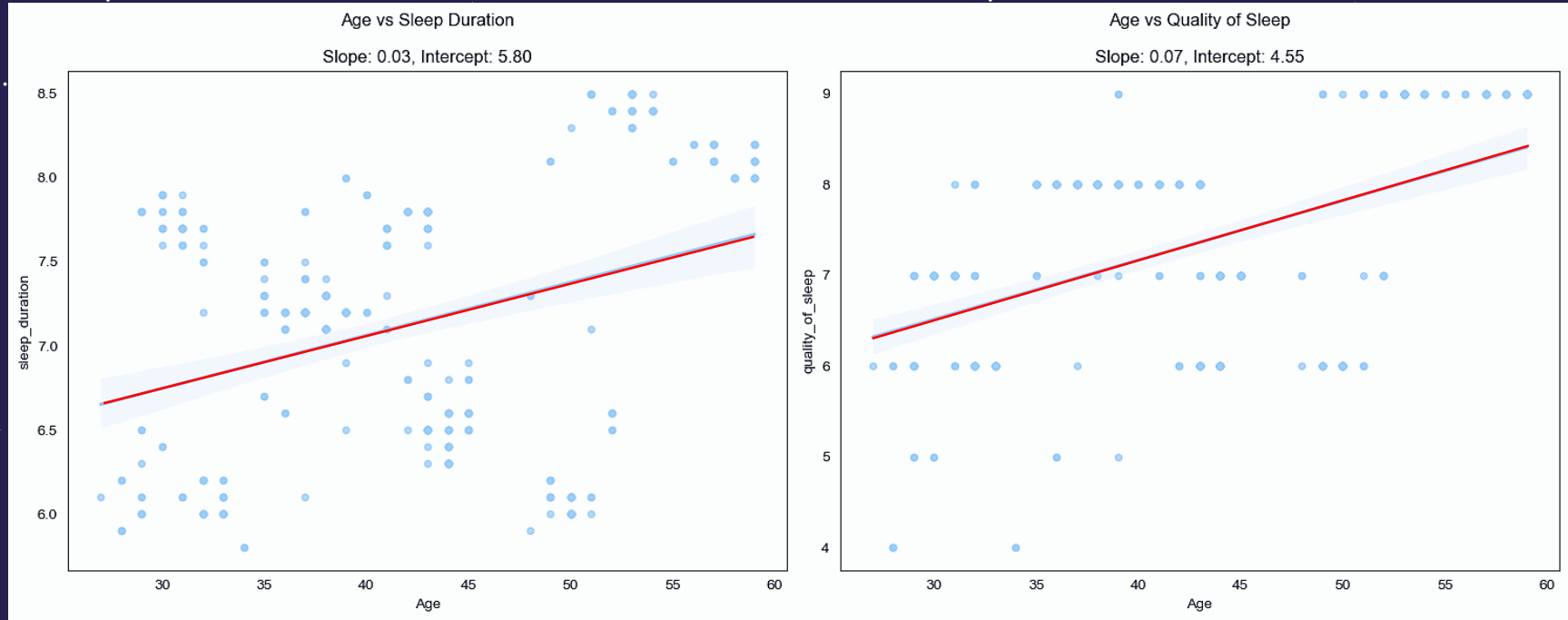


Age and Sleep Disorders



Generally, for younger people, no sleep disorders predominates, and for older people, cases of Sleep Apnea are increasing. Insomnia is present to varying degrees in most age groups, but appears to be a predominant problem in middle age.

Duration / Quality of Sleep and Age

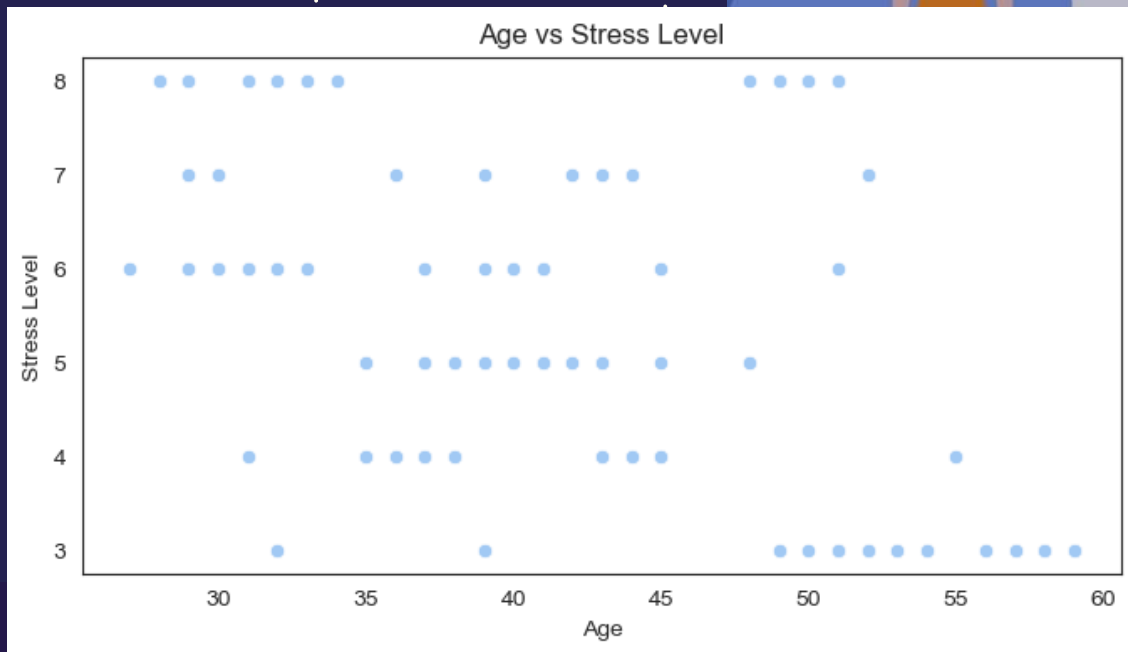


Overall, there appears to be a small positive correlation between age and both sleep duration and quality of sleep, suggesting that as individuals age, they tend to experience longer and better-quality sleep.

Age and Stress Levels

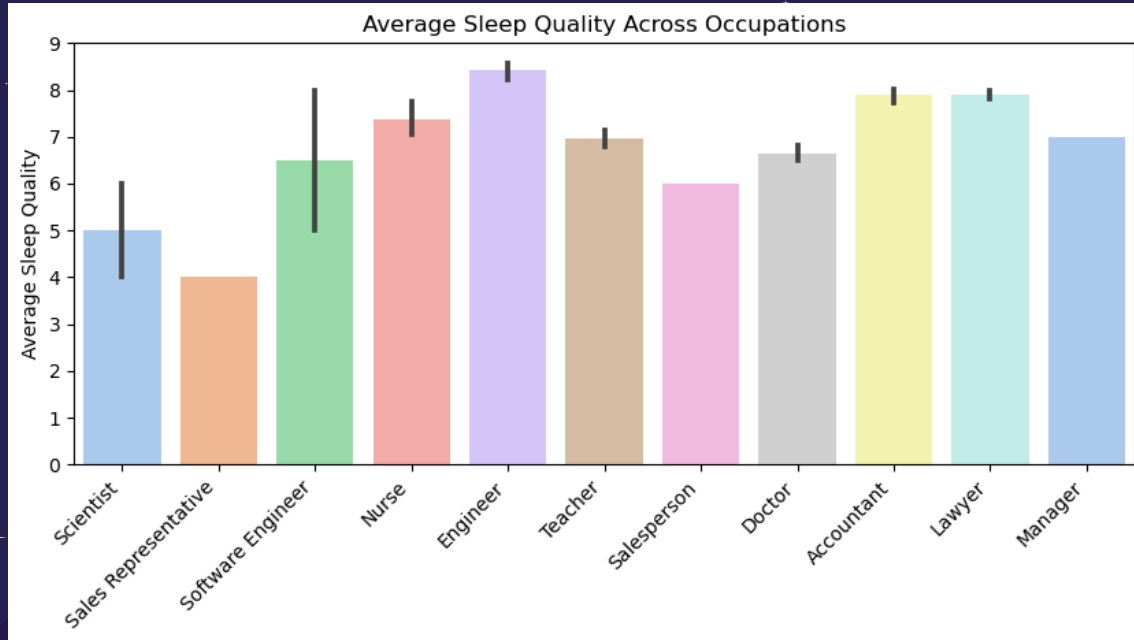


The relationship with stress levels is more complex, showing less obvious patterns. But it appears that older people report lower levels of stress. This may result from better coping mechanisms and experience, which helps to look at life situations from a greater perspective. These findings provide valuable insights into the age-related dynamics of sleep and stress in this dataset.





Occupation and Sleep Quality



Conclusions:

Engineers, accountants and lawyers seem to have the highest average sleep quality.

Sales representatives have the lowest average sleep quality compared to other occupational groups.

The average sleep quality among different occupational groups can vary, possibly due to different work-related factors and lifestyles.

Case of study

As a second case of study for my analysis,
I used SaYoPillow Dataset,
which means

SMART YOGA PILLOW

- it is a smart wearable device that
requires no user
input and is fully automated.

So, my dataset consisted of data
measured by this device while the user
was sleeping.

My analysis was intended to find the
relationships between sleep and stress.

SaYoPillow: Blockchain-Integrated Privacy-Assured IoMT Framework for Stress Management Considering Sleeping Habits

Laavanya Rachakonda, Student Member, IEEE, Anand K. Bapatla, Student Member, IEEE, Saraju P. Mohanty,
Senior Member, IEEE and Elias Kougiannos, Senior Member, IEEE.

Abstract—Considering today's lifestyle, people just sleep forgetting the benefits sleep provides to the human body. Smart-Yoga Pillow (SaYoPillow) is proposed to help in understanding the relationship between stress and sleep and to fully materialize the idea of “Smart-Sleeping” by proposing an edge device. An edge processor with a model analyzing the physiological changes that occur during sleep along with the sleeping habits is proposed. Based on these changes during sleep, stress prediction for the following day is proposed. The secure transfer of the analyzed stress data along with the average physiological changes to the IoT cloud for storage is implemented. A secure transfer of any data from the cloud to any third party applications is also proposed. A user interface is provided allowing the user to control the data accessibility and visibility. SaYoPillow is novel, with security features as well as consideration of sleeping habits for stress reduction, with an accuracy of up to 96%.

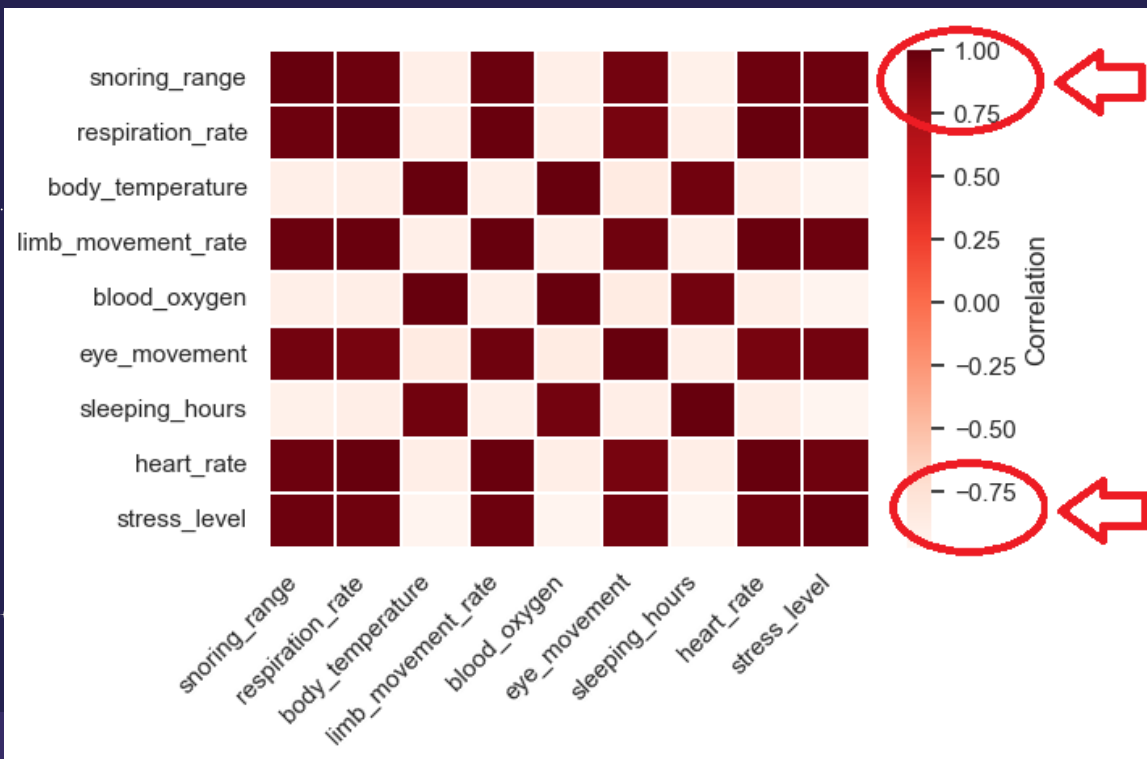
in [3] and stress in relationship to food habits in the Internet-of-Medical-Things (IoMT) has been presented by the authors [4]. As an extension to these works, we propose SaYoPillow (see Fig. 1), where we monitor and control the stress levels of a person during the sleep period.



Fig. 1. Proposed SaYoPillow as a Consumer Electronics of e-Textile based Pillow.



Correlations



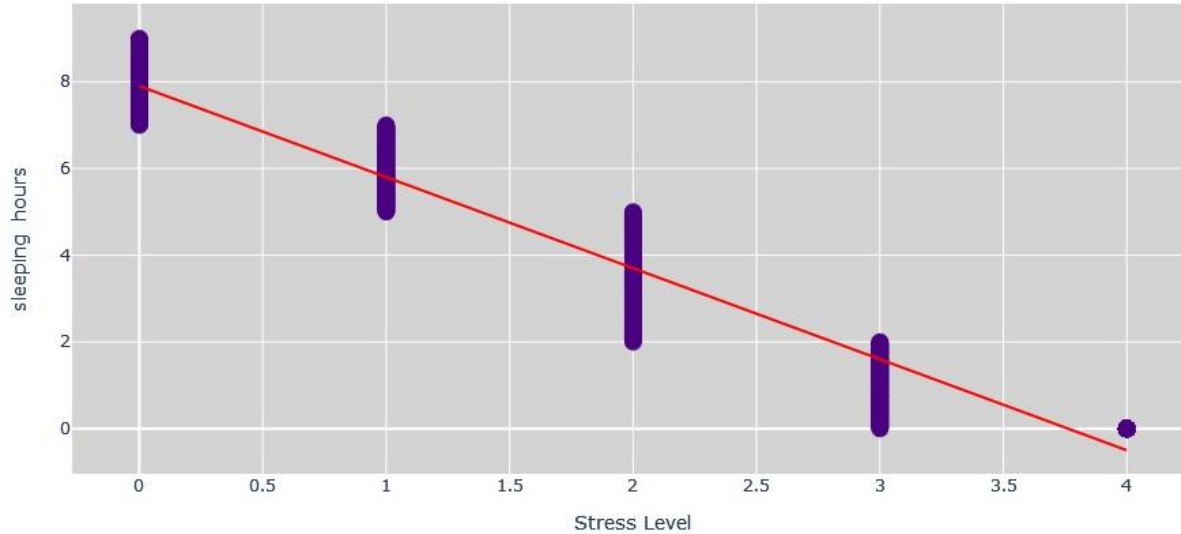
This heatmap shows that there are indeed very **strong relationships** between these variables.

A lot of correlation values are above 0.8 or below -0.8, so changes in one variable are closely related to changes in other variables.

Stress Level vs Sleeping Hours



stress level and sleeping hours

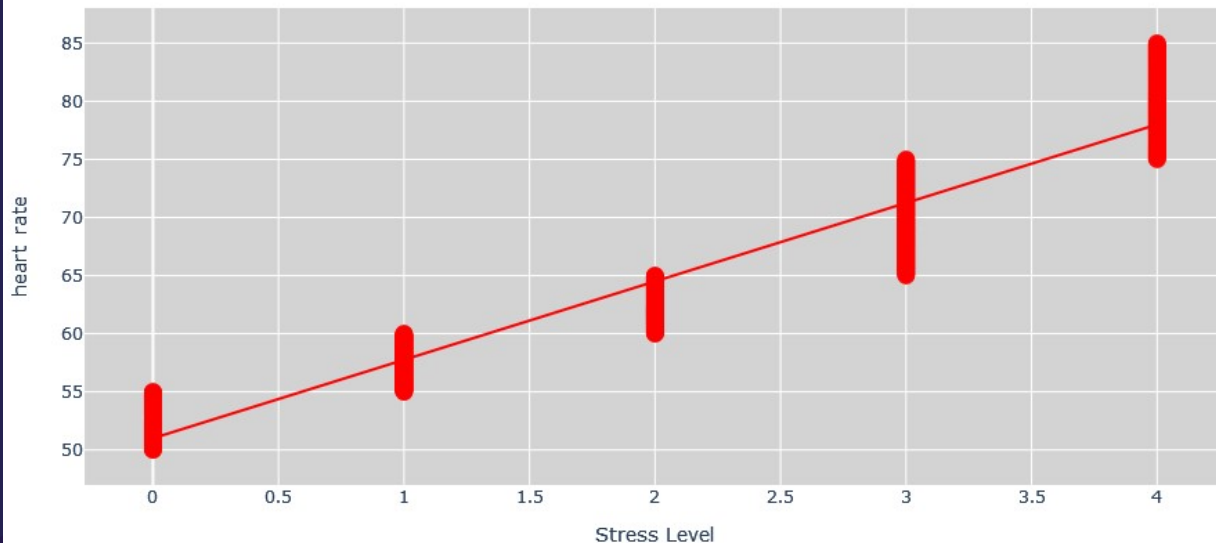


Number of hours of sleep appear to be strongly related to the level of stress the users felt, suggesting that less sleep may be associated with higher stress levels and vice versa – the higher the stress level, the shorter the sleep duration.

Stress Level vs Heart Rate



stress level and heart rate

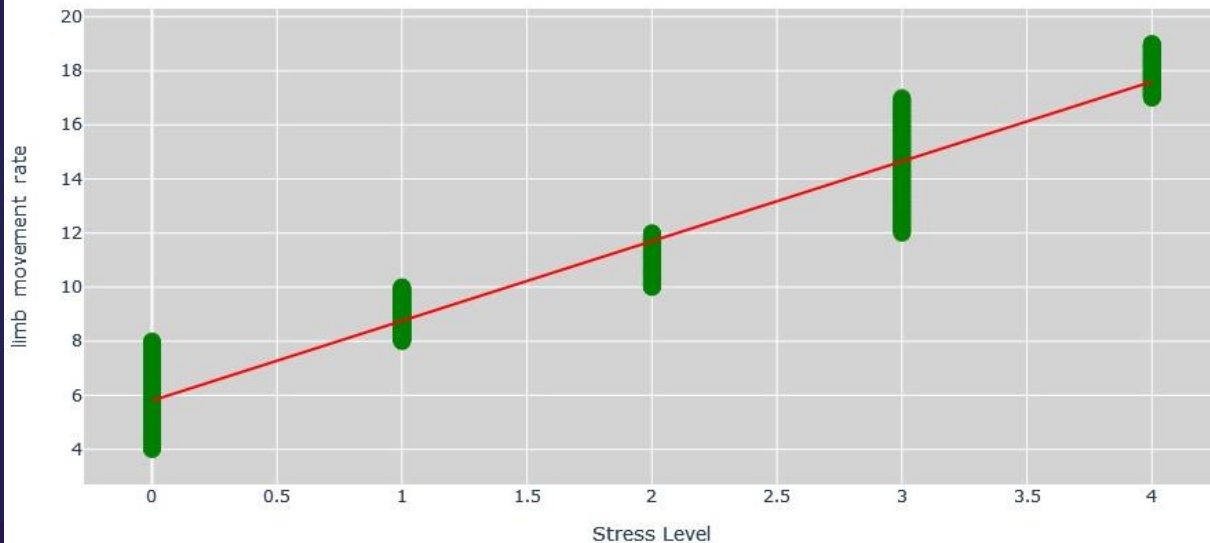


Stress level has also “positive” correlation with heart rate – it suggests that the higher the stress level, the higher the heart rate during sleep was. And high heart rate without a good cause is not a good thing...

Stress Level vs Limb Movement Rate



stress level and limb movement rate

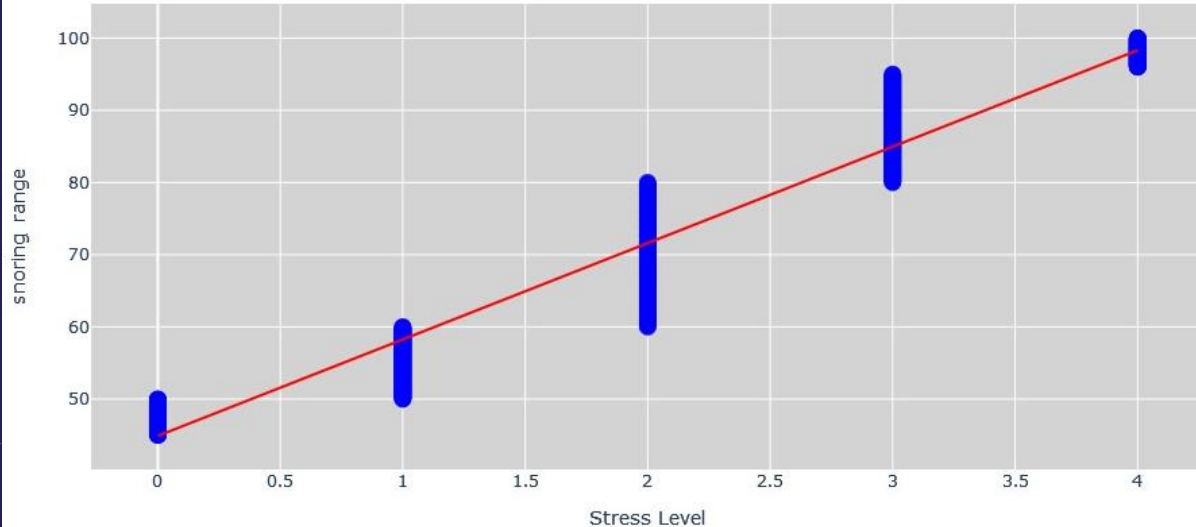


Stress can lead to muscle tension during sleep, which can trigger limb movement. Higher values of limb movement may also indicate sleep instability, which can be caused by stress. Sleep instability can also lead to higher stress levels during the day.

Stress Level vs ...Snoring Range



stress level and snoring range



Stress during the day results in the release of hormones like cortisol, GH and norepinephrine. It can cause weight gain and problems when trying to sleep. Weight gain, especially around the throat and neck will have an affect on the physical nature of snoring habits, as tissue builds up in the airways allowing vibration to occur. But snoring is also commonly a sign of poor sleeping patters, and will not allow us to receive a full night's rest. It is a self-perpetuating circle.



Findings

In summary, my analysis reveals valuable insights into the complex interactions of sleep, stress, and lifestyle factors. Occupational groups, age, and gender all play roles in shaping sleep patterns. Stress is a key factor, showing strong associations with both sleep duration and quality. The data emphasizes the need for holistic approaches to sleep health, considering individual differences and addressing stress factors. These insights pave the way for customized interventions and underscore the importance of understanding the nuanced dynamics between sleep, stress, and daily life.

Did you know that ... ?



According to statistics, as many as

25%

of traffic accidents are caused by
drivers who fall asleep at the
wheel.

source: *European Sleep Research Society*

Tips for healthy sleep

Consistent Sleep Schedule

go to bed and wake up at the same time daily to regulate your internal clock

Relaxing Bedtime Routine

wind down before bed with calming activities like reading, gentle stretching, or a warm bath

Comfortable Sleep Environment

keep your bedroom cool, dark, and quiet



Limit Screen Time Before Bed

avoid electronic devices an hour before bedtime to minimize exposure to blue light

Watch Your Diet

refrain from heavy meals close to bedtime and choose a light, sleep-friendly snack if needed

Stay Active During the Day

engage in regular physical activity



Manage Stress

practice relaxation techniques
such as deep breathing or
meditation to ease stress
before bedtime

Moderate Caffeine, Alcohol and Nicotine Intake

avoid consuming stimulants
close to bedtime







**Thanks for
attention!**

