Şahin Orkun Coşar-27977

Sleep Quality Analysis Report

Introduction

Sleep quality is a critical factor that influences overall health and well-being. This report aims to analyze the relationship between various daily habits and sleep quality. The key focus areas include screen time, stress levels, daily calorie intake, smoking, caffeine consumption, physical activity, natural light exposure, pre-sleep activities, and other factors. By identifying patterns and correlations, this study seeks to provide actionable insights for improving sleep quality.

Data Collection and Preprocessing

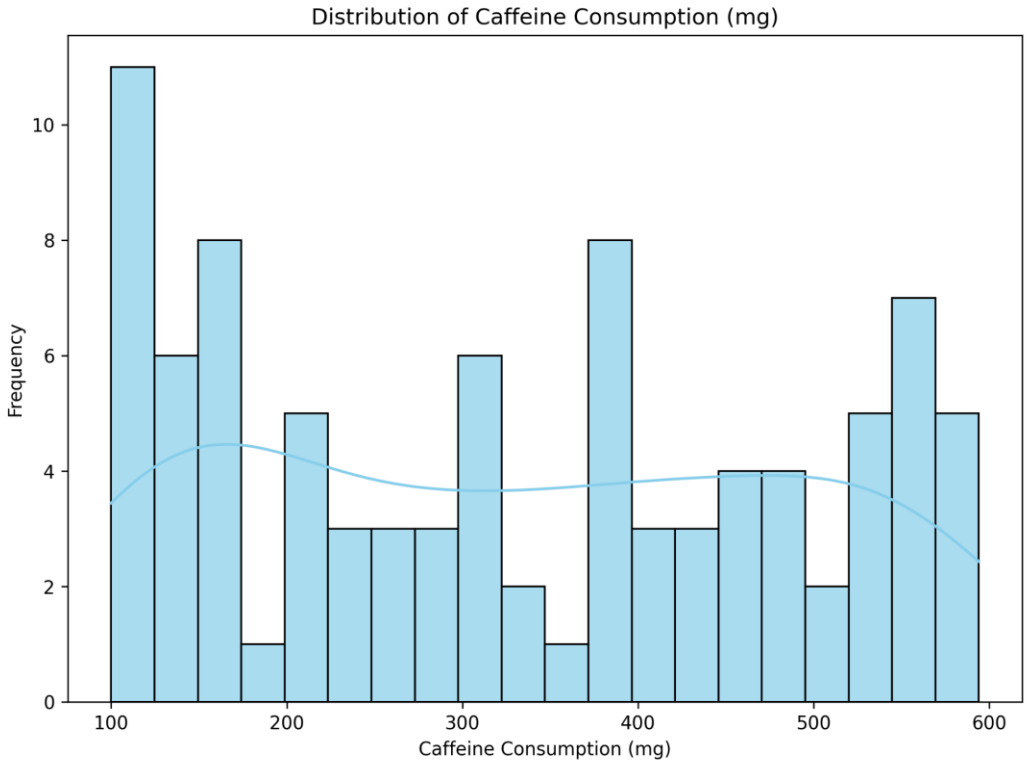
Data for this study was collected over a span of three months, capturing a diverse range of variables. The dataset includes attributes such as Screen Time (minutes), Stress Level (1-10), Daily Calorie Intake (kcal), Smoking (cigarettes), Caffeine Consumption (mg), Physical Activity (minutes), Natural Light Exposure (hours), Pre-Sleep Activities, and Sleep Quality (1-10).

The preprocessing steps involved addressing missing data through imputation techniques, normalizing continuous variables for better comparison, encoding categorical variables, and extracting features for time-series analysis. This ensured a clean and reliable dataset for exploratory and statistical analysis.

Exploratory Data Analysis (EDA)

Exploratory data analysis helps in understanding the underlying patterns in the data. In this section, we explore distributions of key variables, correlations, and trends over time. Visualizations such as histograms, scatter plots, and time-series graphs are used to support the analysis.

Visual Analysis



Distribution Caffeine Consumption (Mg)

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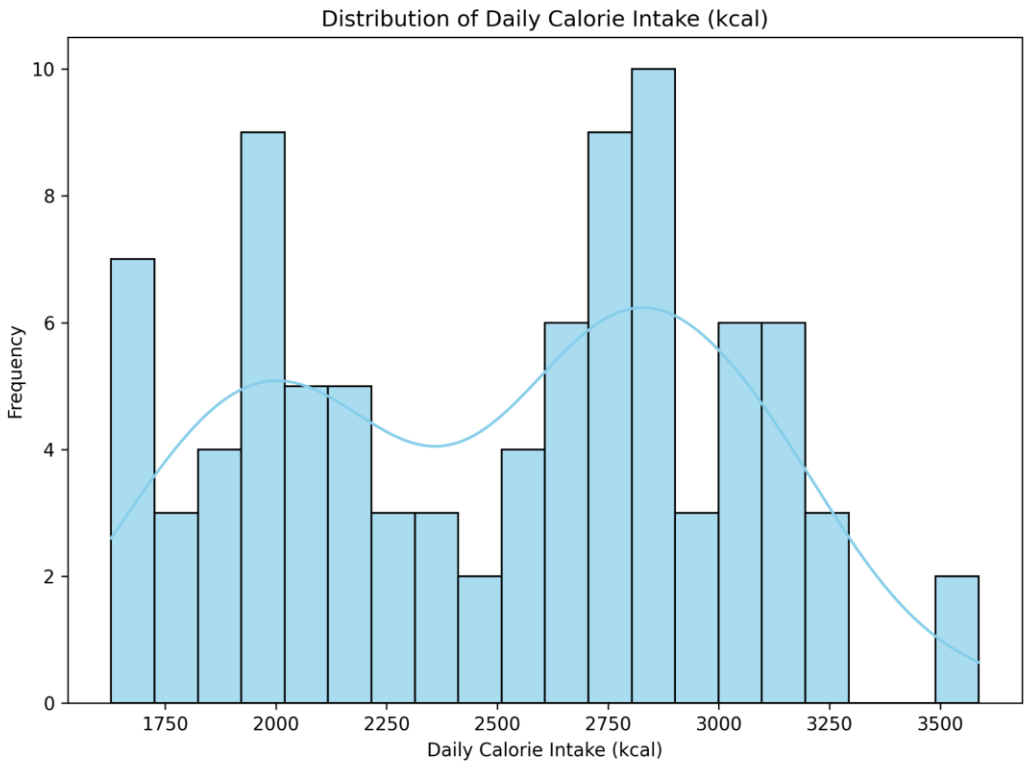

Distribution Daily Calorie Intake (Kcal)

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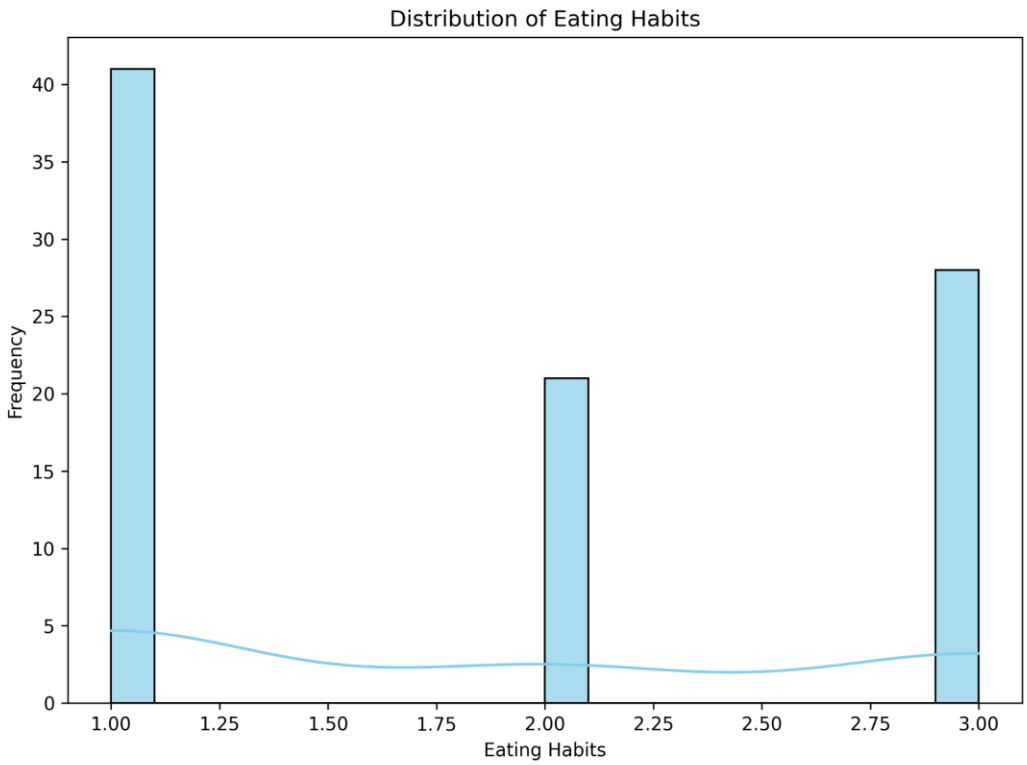

Distribution Eating Habits

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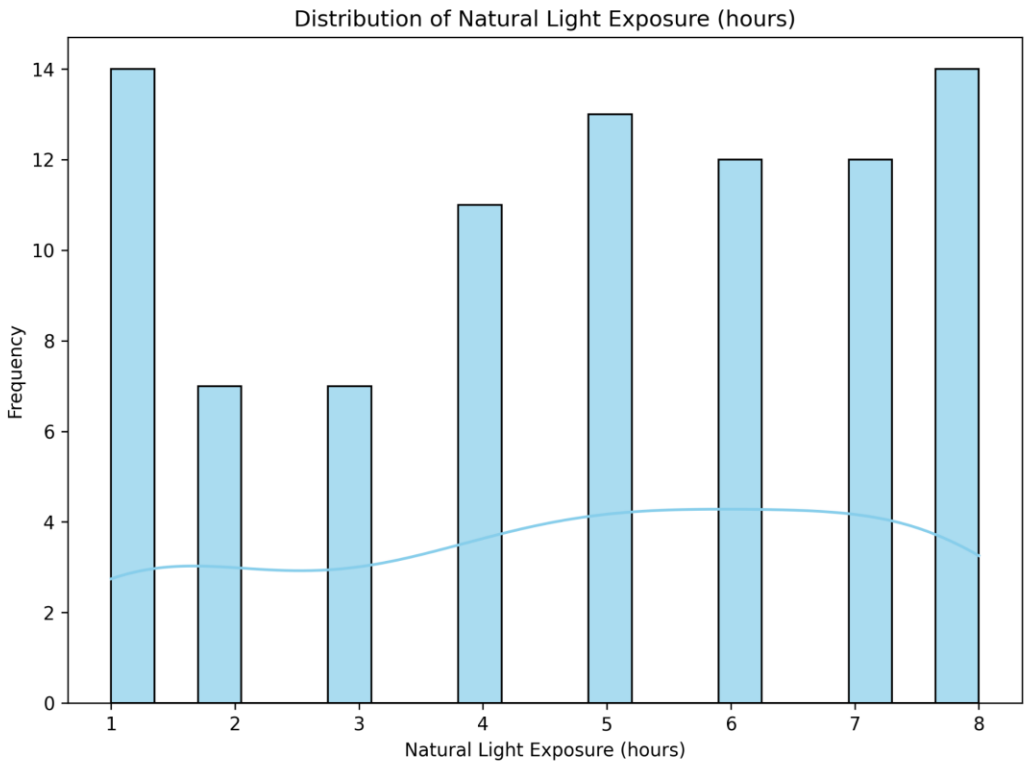

Distribution Natural Light Exposure (Hours)

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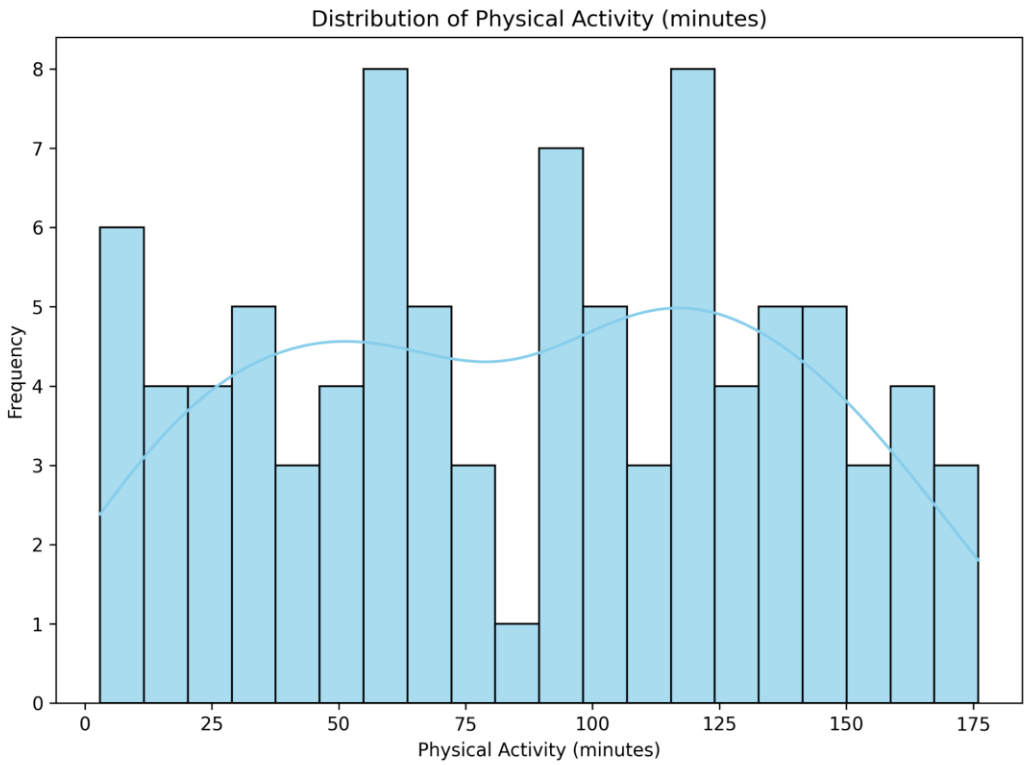

Distribution Physical Activity (Minutes)

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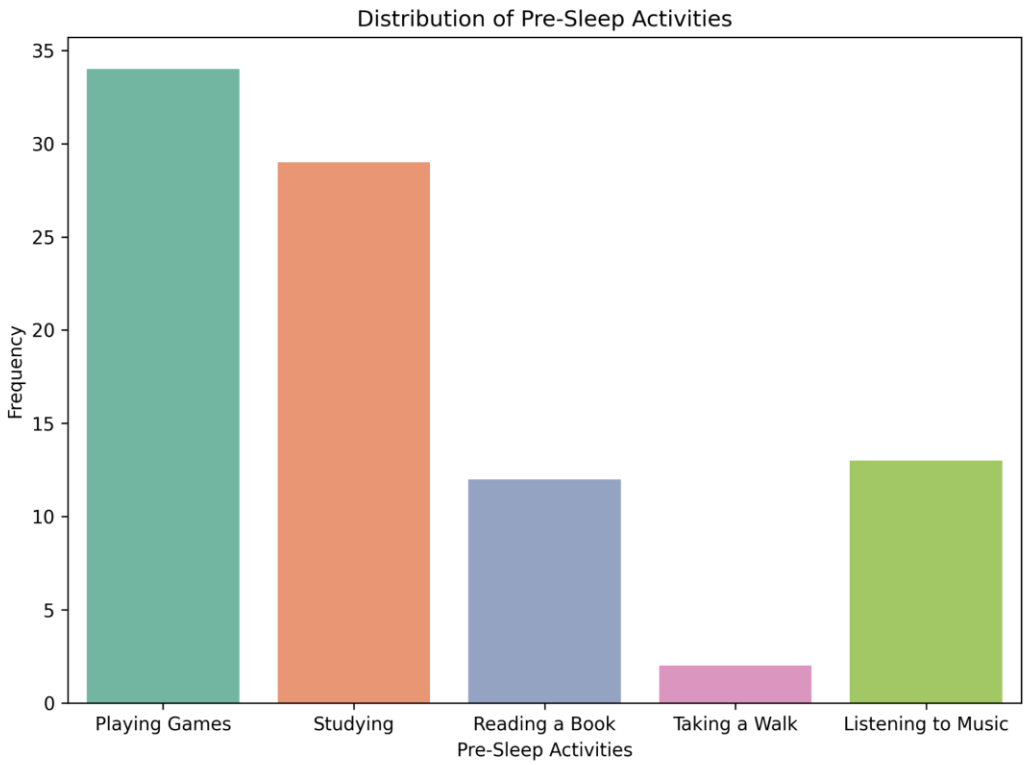

Distribution Pre-Sleep Activities

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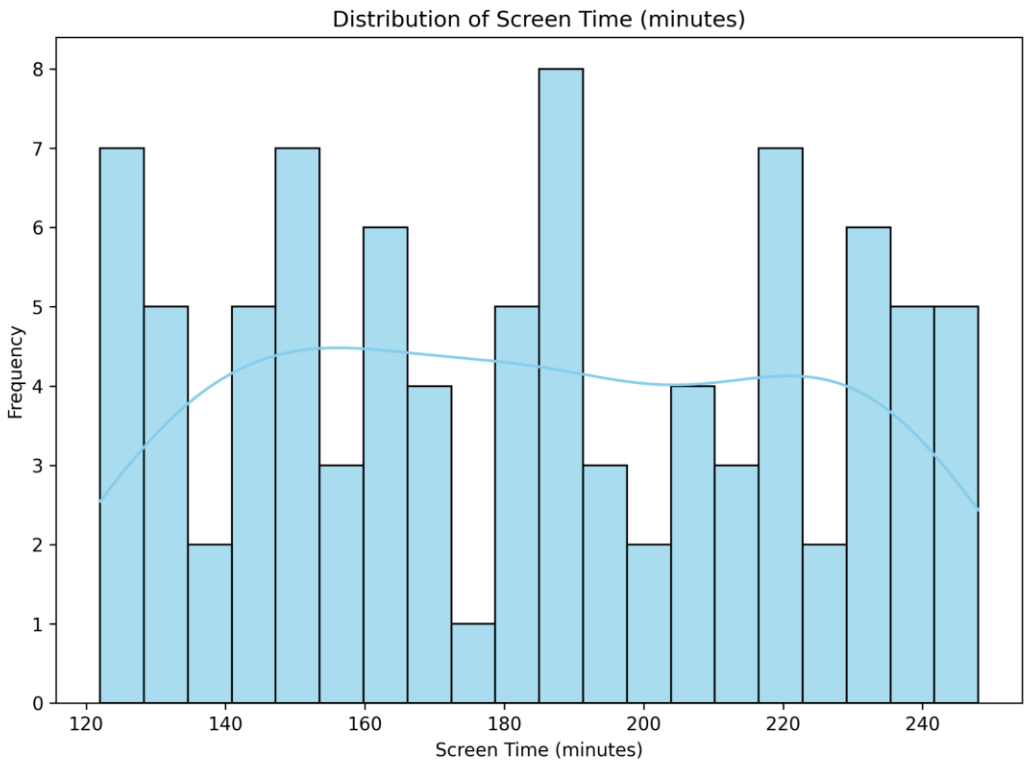

Distribution Screen Time (Minutes)

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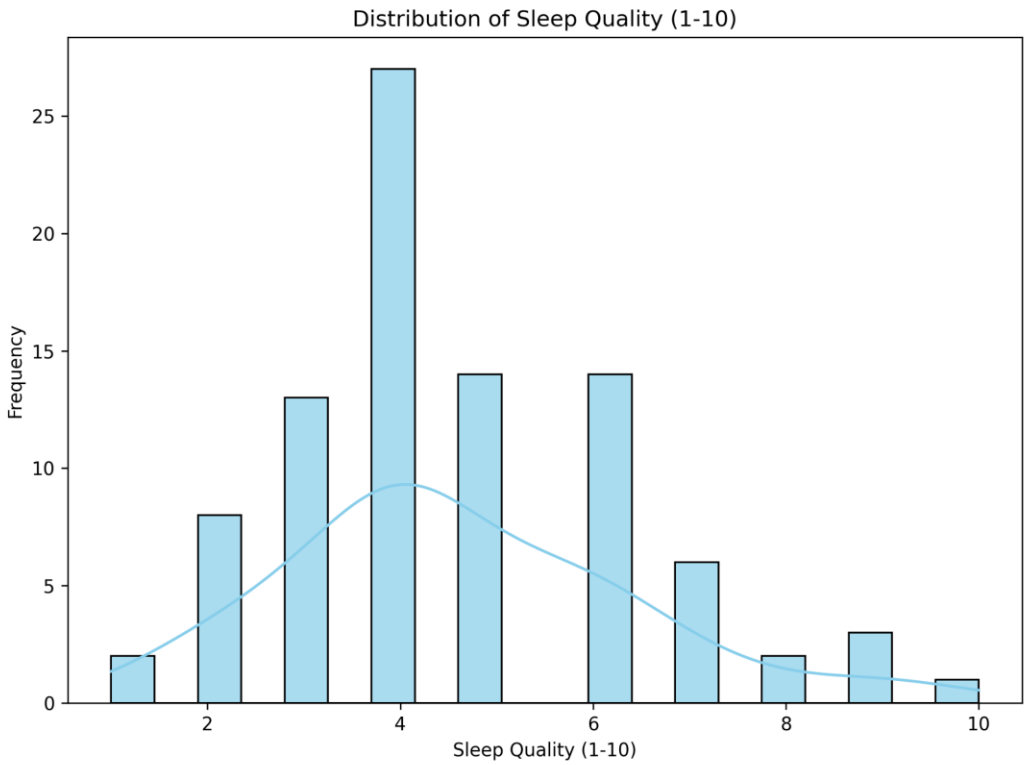

Distribution Sleep Quality (1-10)

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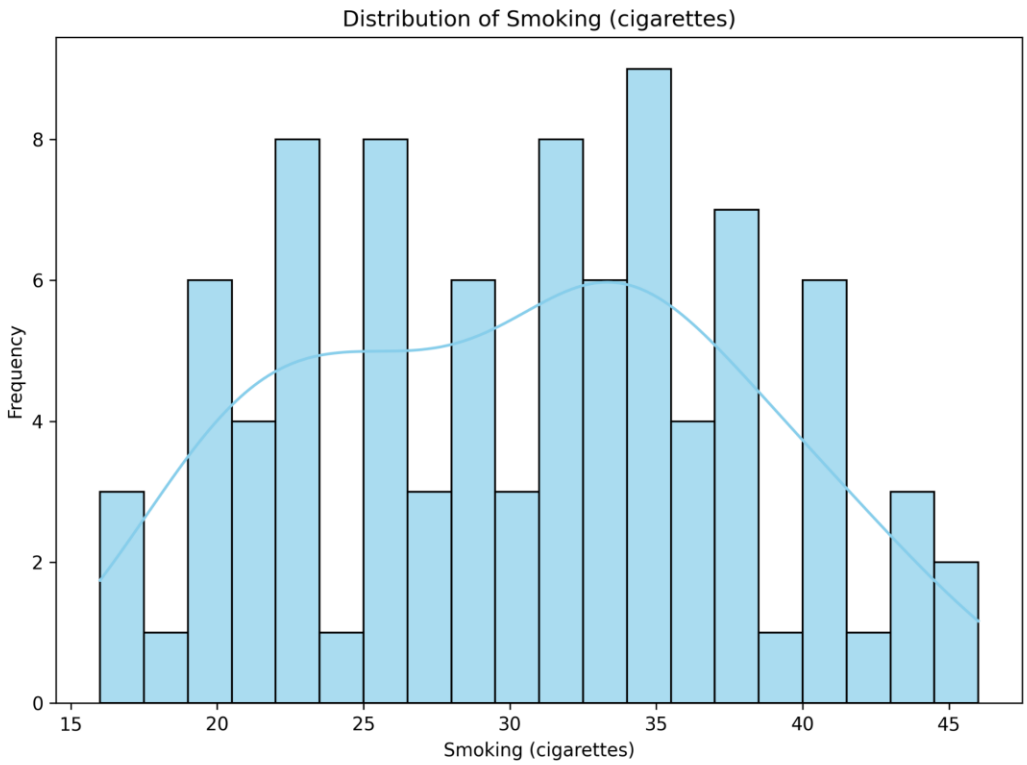

Distribution Smoking (Cigarettes)

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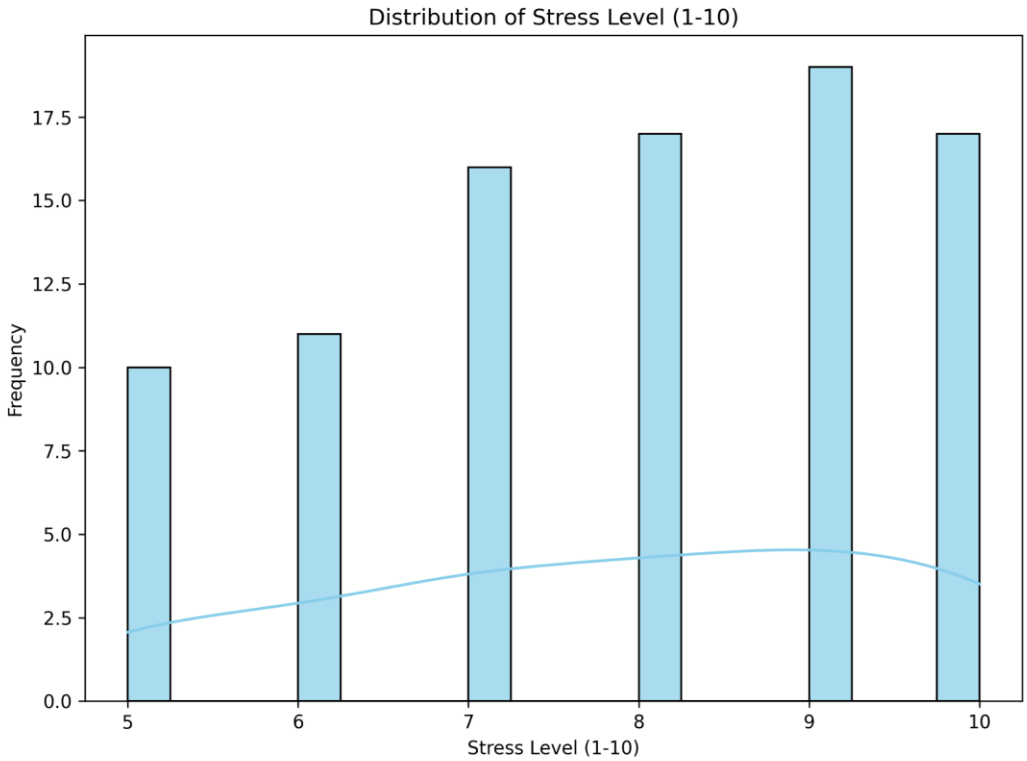

Distribution Stress Level (1-10)

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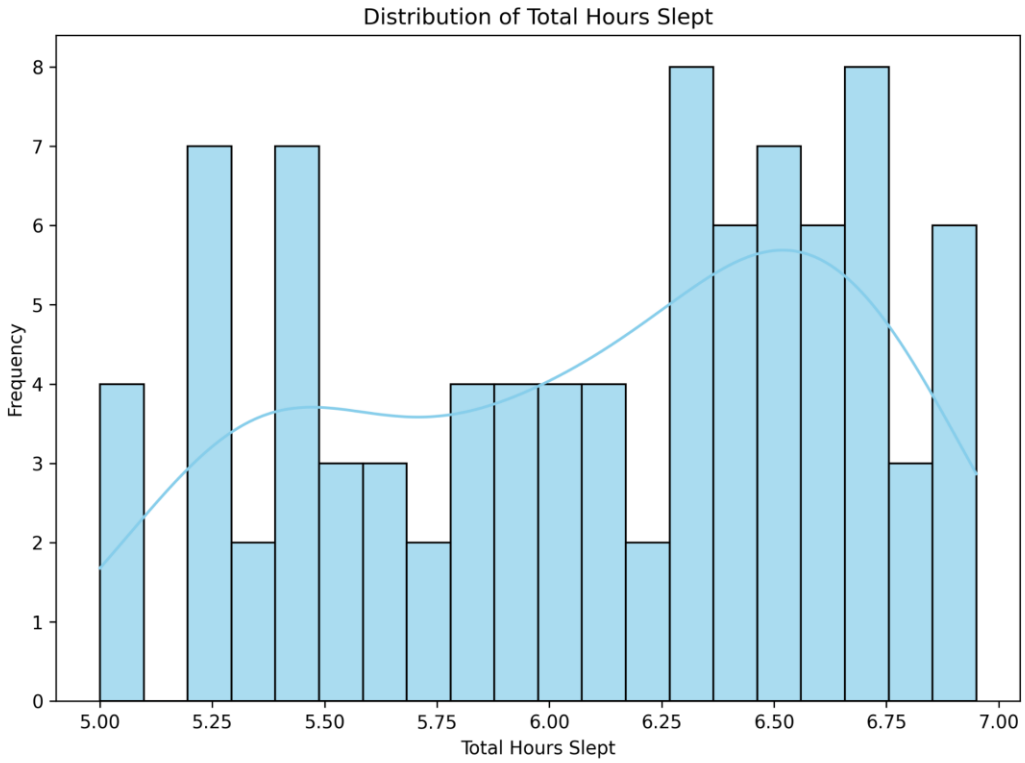

Distribution Total Hours Slept

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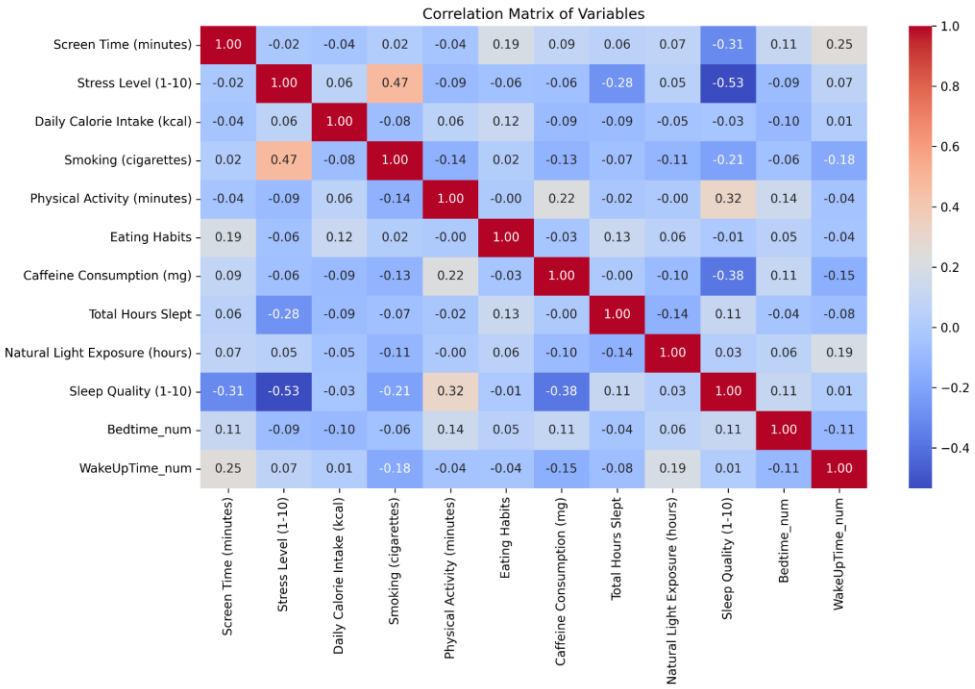

Heatmap Correlation

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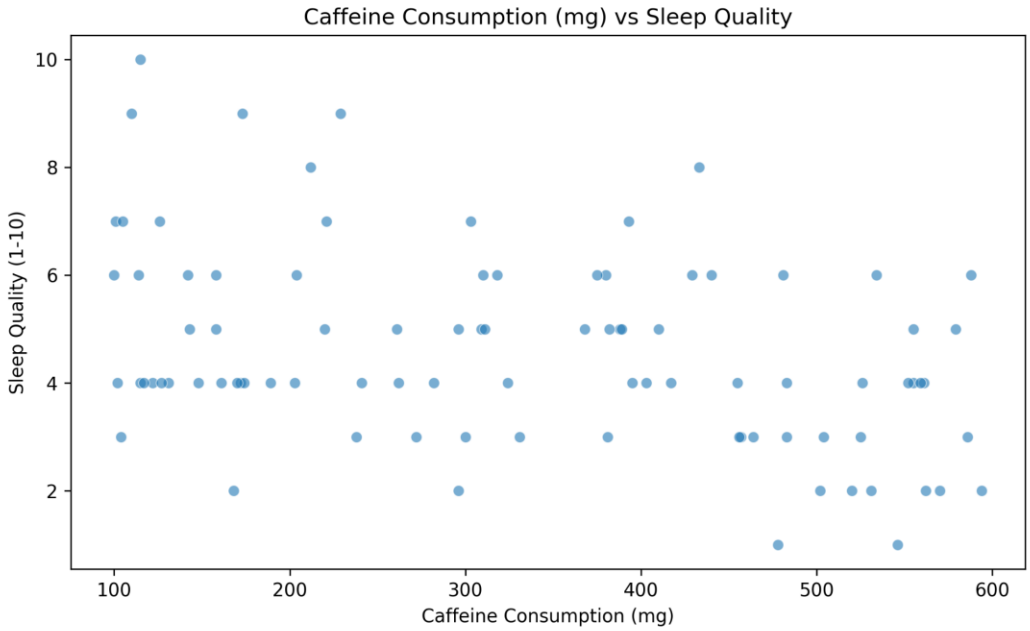

Scatter Caffeine Consumption (Mg)

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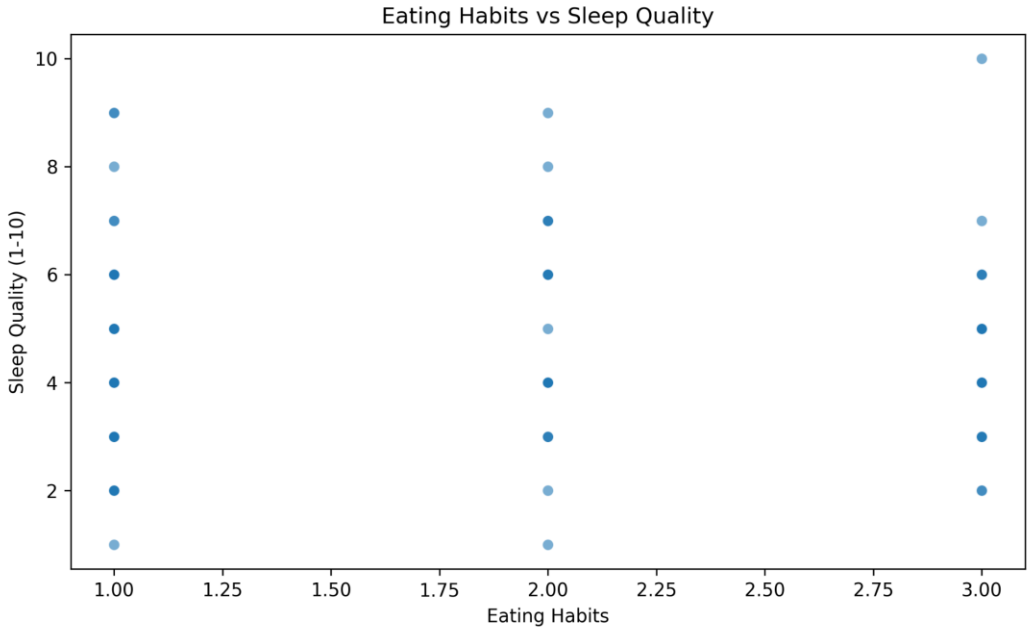

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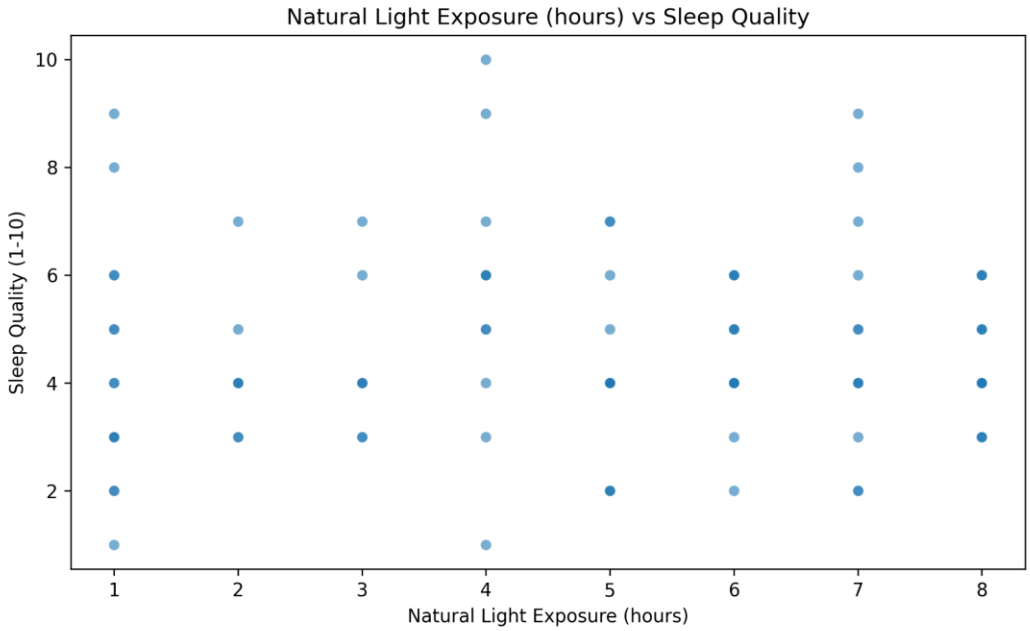

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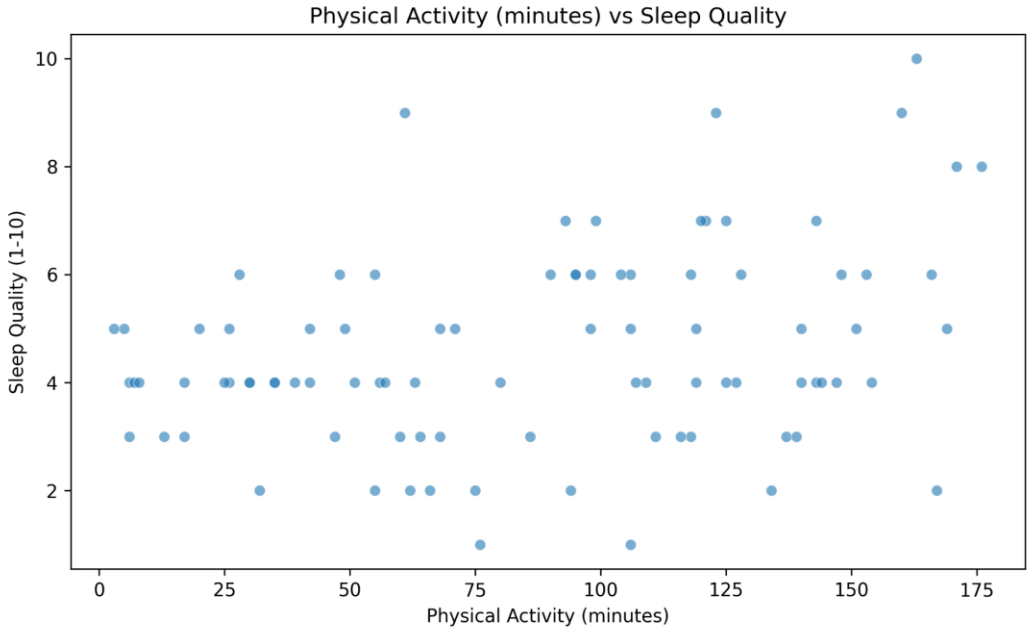

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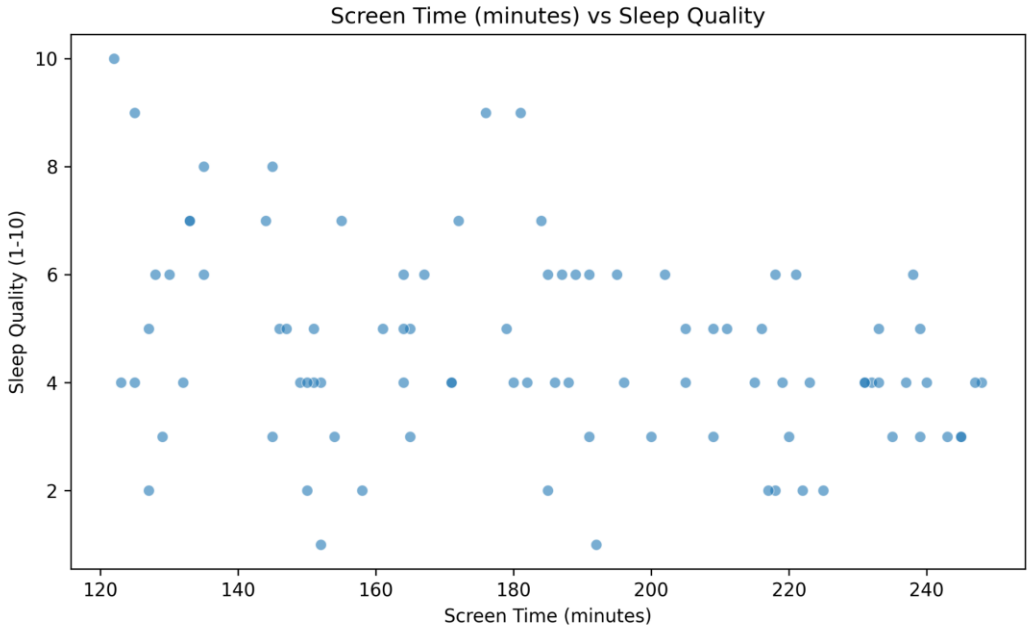

Scatter Screen Time (Minutes)

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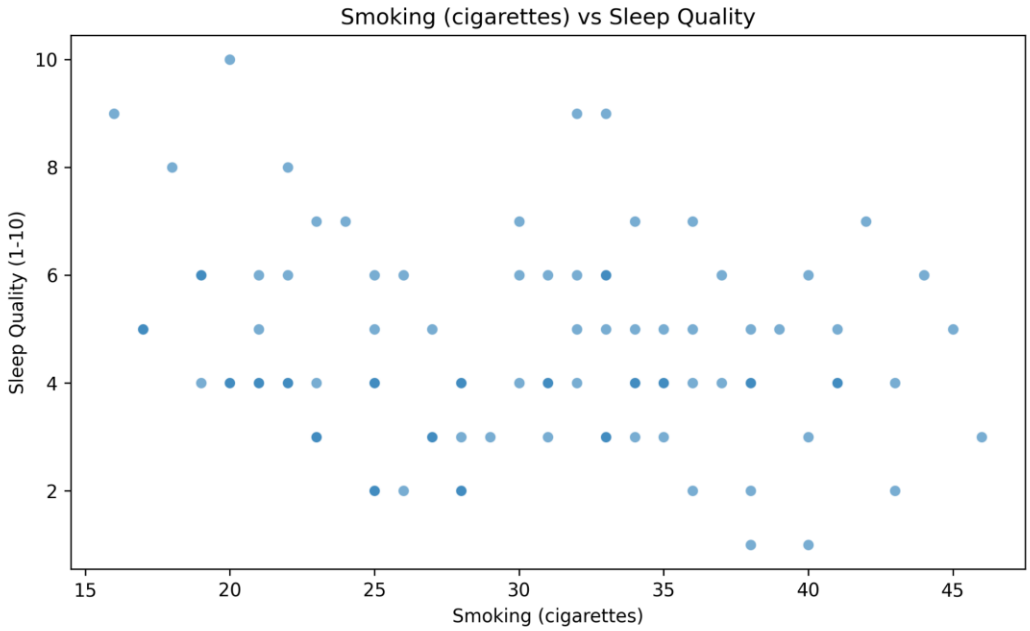

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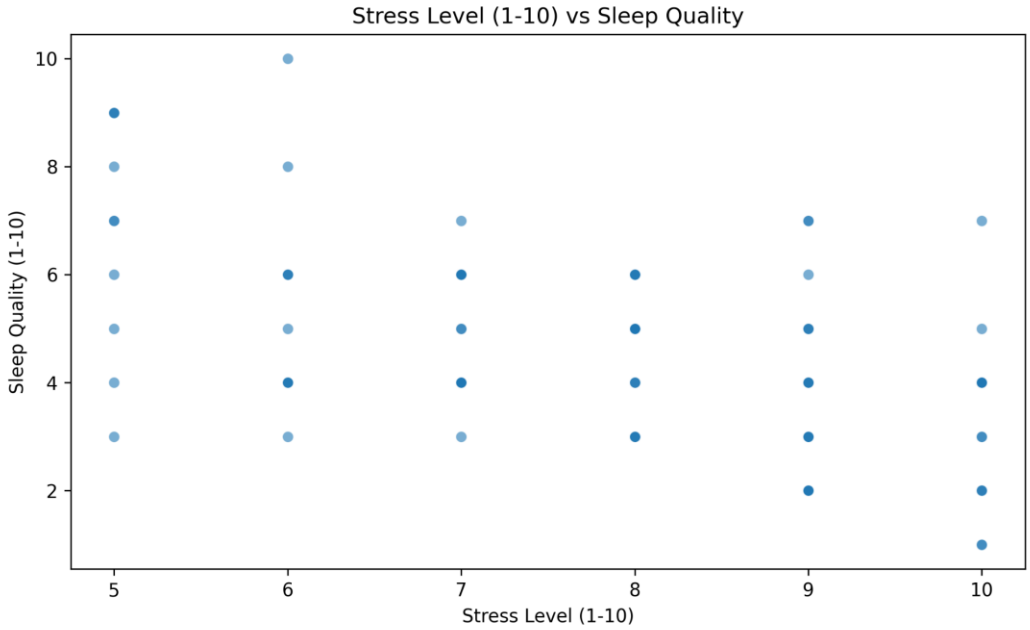

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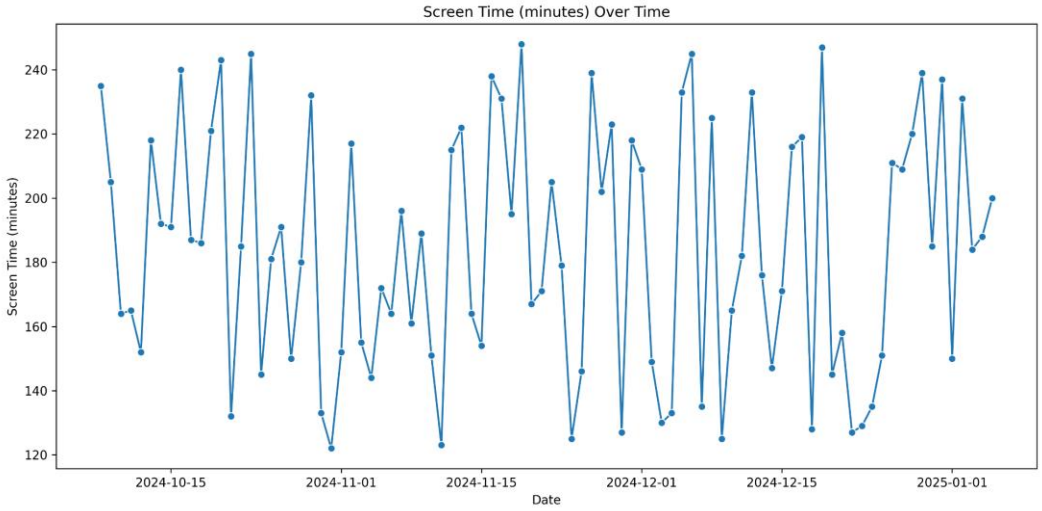

Time Series Screen Time (Minutes)

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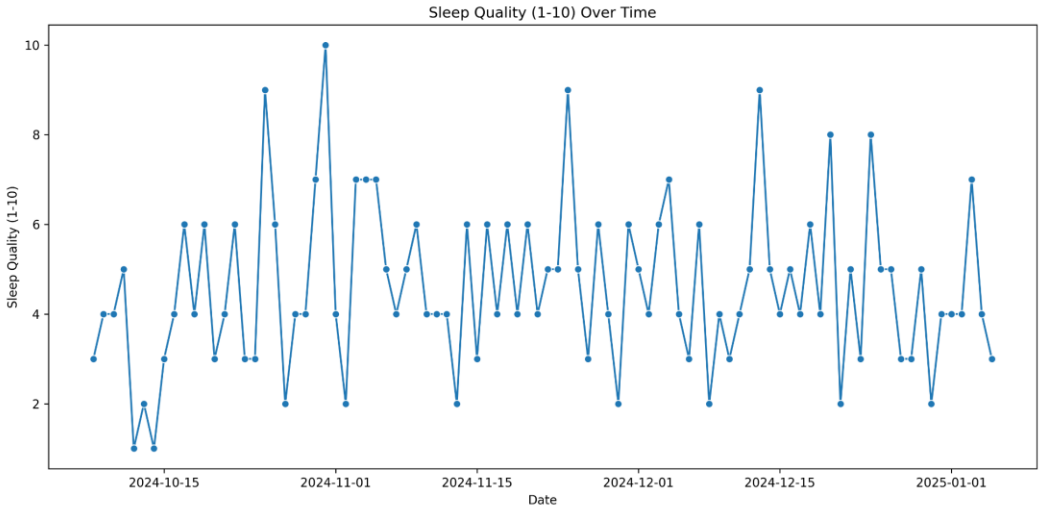

Time Series Sleep Quality (1-10)

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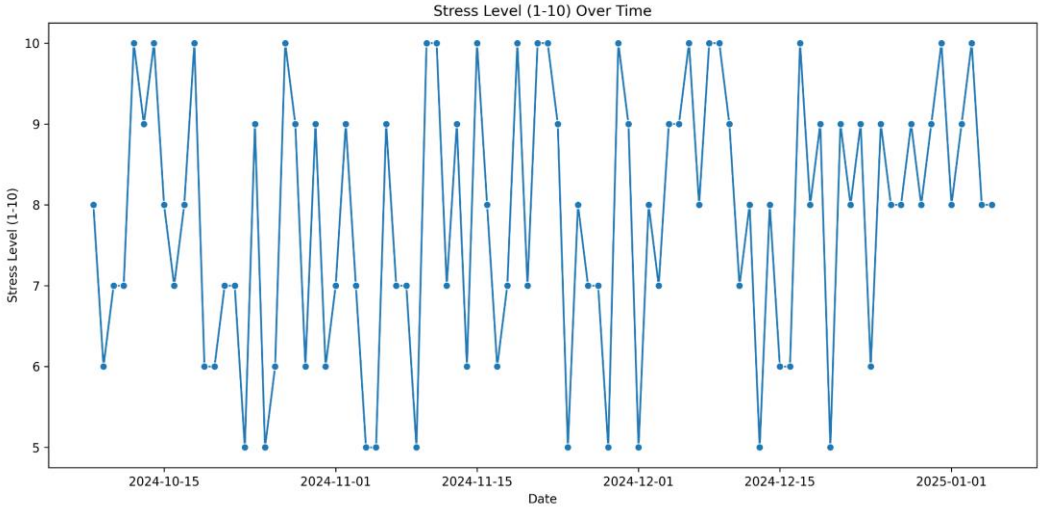

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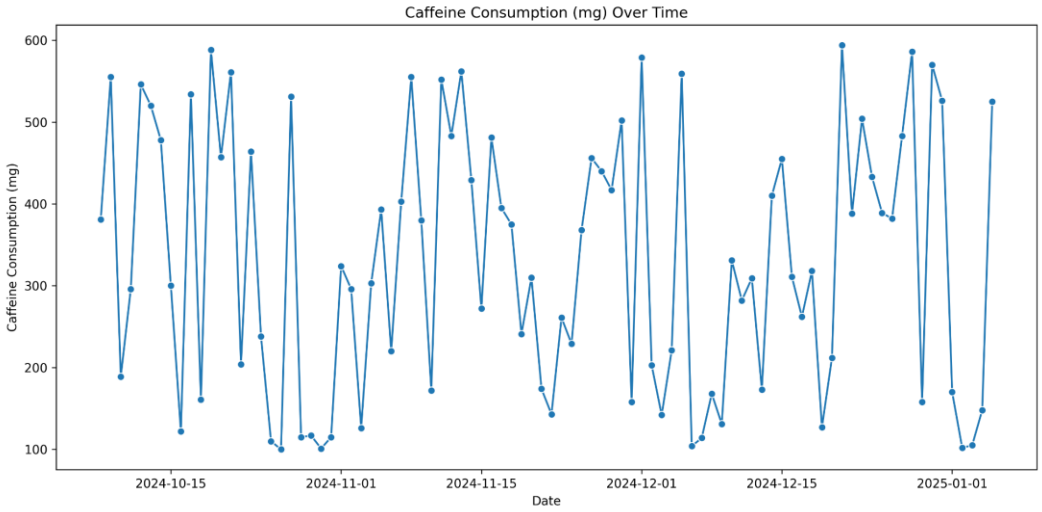

Time Series Caffeine Consumption (Mg)

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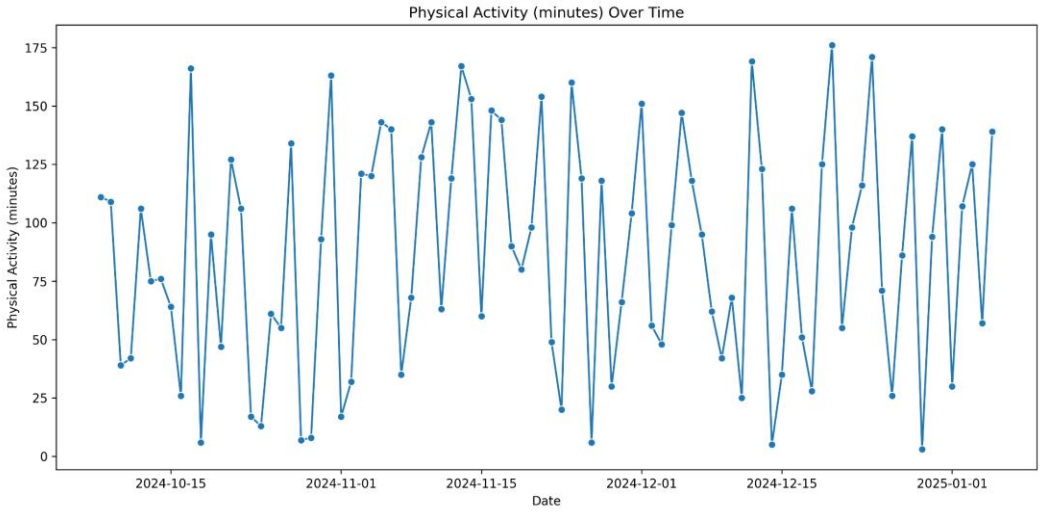

Time Series Physical Activity (Minutes)

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Statistical Analysis and Findings

The statistical analysis involved hypothesis testing and regression modeling to understand the impact of various factors on sleep quality. Key findings include:

1. Stress levels significantly affect sleep quality, with higher stress correlating with poorer sleep ($p < 0.05$).
2. Screen time before bed has a detrimental effect on sleep quality, emphasizing the need to limit electronic device usage.
3. Moderate physical activity is associated with improved sleep quality, showcasing its importance in daily routines.
4. Caffeine consumption, particularly later in the day, negatively impacts sleep, underscoring the value of mindful intake.
5. Pre-sleep activities like gaming or extensive screen usage reduce sleep quality compared to calming activities such as reading or meditation.

A detailed correlation analysis was conducted using a heatmap. The matrix revealed strong negative correlations between stress levels and sleep quality (-0.53) and moderate negative correlations between caffeine consumption (-0.38) and screen time (-0.31) with sleep quality. Positive correlations were observed with physical activity (+0.32). These insights emphasize the multifaceted nature of factors influencing sleep quality.

Conclusion

This comprehensive analysis provides valuable insights into the factors affecting sleep quality. Stress management, reduced screen time, increased physical activity, and controlled caffeine consumption emerge as key strategies for enhancing sleep quality. Additionally, engaging in calming pre-sleep activities further improves restfulness.

Future research should include a larger sample size and incorporate additional variables such as dietary composition, room conditions, and mental health factors to build a holistic understanding of sleep quality determinants.