Project Report: Analysis of Student Lifestyle Dataset

Introduction

The purpose of this project is to analyze the relationships between students' daily activities, their stress levels, and academic performance (measured by GPA). Specifically, the project aims to:
1. Examine how stress levels vary with lifestyle habits, such as hours of sleep, social activities, and physical activity.
2. Investigate the effect of stress levels on GPA.
3. Determine the relationship between GPA and predictors such as study hours, sleep hours, and physical activity hours.

Methodology

1. Dataset Preparation:
  - The dataset was cleaned by removing unnecessary columns (e.g., Student_ID).
  - Missing values were checked, and no missing data were identified.

2. Correlation Analysis:
  - A correlation matrix was computed to evaluate the relationships between numeric variables, and the results were visualized using a heatmap.

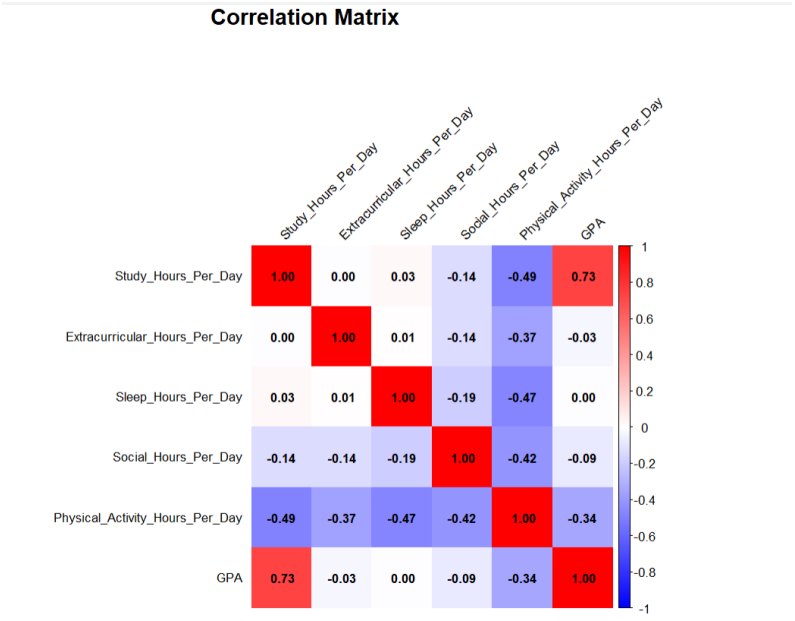
3. Statistical Analysis:
  - ANOVA was used to assess whether stress levels have a significant effect on GPA.
  - Tukey's Honest Significant Difference (HSD) test was conducted post-ANOVA to identify pairwise differences between stress levels.

4. Regression Models:
  - A multiple linear regression model was built to evaluate the relationship between GPA and lifestyle factors (study hours, sleep hours, physical activity hours).
  - Another regression model was developed to evaluate the relationship between stress levels and hours of sleep, social activities, and physical activity.

5. Visualization:
  - Boxplots and scatter plots were used to visualize the relationships between stress levels, GPA, and daily activities.

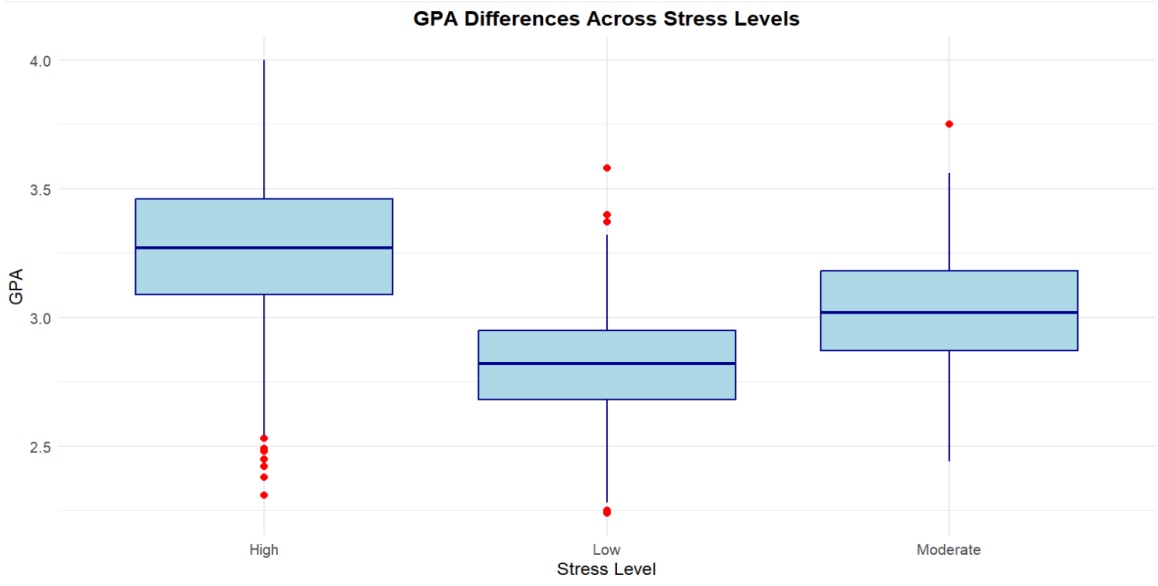
Results

1. Correlation Analysis



The correlation heatmap revealed:
- A positive correlation between GPA and study hours, indicating that more study hours are associated with higher GPAs.
- A negative correlation between stress levels and sleep hours, suggesting that higher stress is linked to reduced sleep.

2. GPA Across Stress Levels



A boxplot comparing GPA across stress levels showed:
- Students with high stress levels tend to have the highest GPAs, while students with low stress levels have the lowest GPAs.
- This trend was further validated by ANOVA results, which indicated a statistically significant effect of stress levels on GPA ($p < 0.001$).

3. Post-Hoc Analysis (Tukey's HSD)

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> TukeyHSD(anova_result)
  Tukey multiple comparisons of means
    95% family-wise confidence level

Fit: aov(formula = GPA ~ Stress_Level, data = student_lifestyle_dataset)

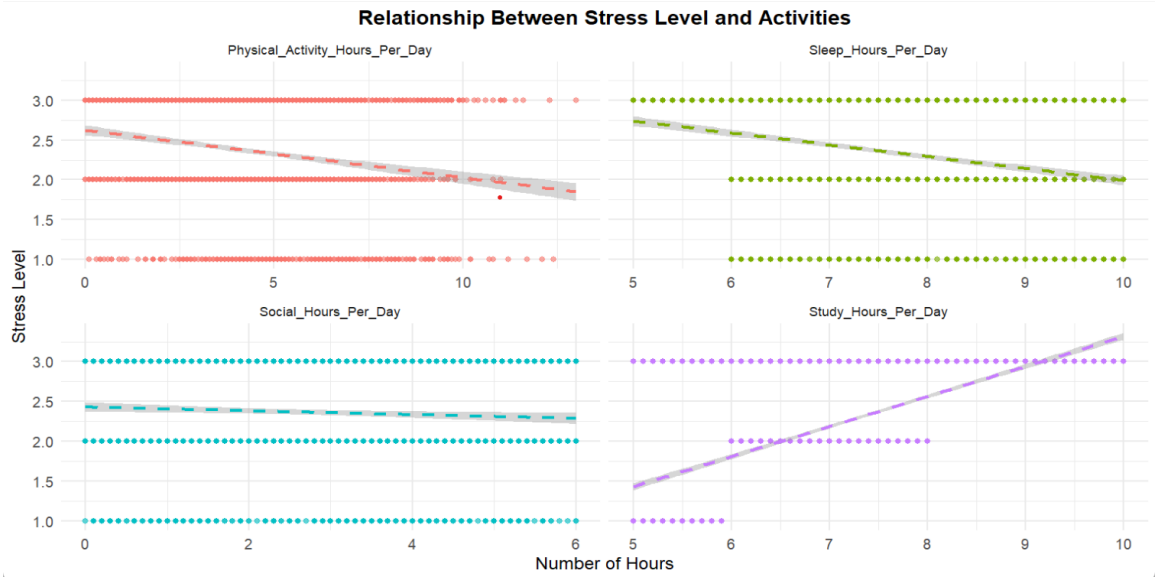
$Stress_Level
                    diff        lwr        upr p adj
Low-High      -0.4451041 -0.4836359 -0.4065723     0
Moderate-High -0.2371360 -0.2661230 -0.2081490     0
Moderate-Low   0.2079681  0.1672269  0.2487094     0
```

- Low vs. High Stress: Students with low stress have significantly lower GPAs (-0.445) compared to high-stress students ($p < 0.001$).
- Moderate vs. High Stress: Students with moderate stress also have lower GPAs (-0.237) compared to high-stress students ($p < 0.001$).
- Moderate vs. Low Stress: Students with moderate stress have higher GPAs (+0.208) than low-stress students ($p < 0.001$).

4. Multiple Linear Regression: GPA

The regression model showed:
- Study Hours ($\beta = 0.155$, $p < 0.001$) has a significant positive effect on GPA.
- Sleep Hours and Physical Activity Hours were not statistically significant predictors of GPA.

5. Multiple Linear Regression: Stress Level



The regression model revealed:

- Physical Activity, Sleep Hours, and Social Hours all exhibit negative relationships with stress levels, meaning higher engagement in these activities tends to reduce stress.
- Among these, Social Hours appear to have the strongest effect.
- Study Hours are positively correlated with stress, suggesting that more time spent studying is linked to higher stress levels

Discussion

1. Stress Levels and GPA:
 - High stress is associated with better academic performance, but this could lead to burnout in the long term.
 - Moderate stress levels appear to be a "sweet spot" where students achieve a good balance between performance and well-being.

2. Lifestyle Habits and Stress:
 - Students who sleep more and participate in social or physical activities experience lower stress levels.
 - Irregular study habits contribute to increased stress, but they may also be associated with higher GPAs for some students.

3. GPA Predictors:
 - Study hours are the strongest predictor of GPA, but other factors (e.g., stress levels, intrinsic motivation) might explain additional variance.

Conclusion

1. Key Findings:
  - Students with high stress levels perform better academically, but at the cost of potential mental health challenges.
  - Sleep, social, and physical activity hours are critical for managing stress levels.
  - Study hours significantly improve GPA, while sleep and physical activity hours show limited direct effects.

2. Recommendations:
  - Encourage students to maintain moderate stress levels by balancing academic responsibilities with self-care.
  - Promote adequate sleep and participation in social and physical activities to reduce stress and improve overall well-being.
  - Develop tailored stress management programs for high-stress students to prevent burnout.

3. Future Work:
  - Investigate additional predictors (e.g., time management, extracurricular involvement) to better understand the factors influencing GPA and stress.
  - Explore the long-term effects of stress on academic and mental health outcomes.