Analysis report for the Dataset Even

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VISUALIZING THE IMPACT OF SLEEP DURATION ON STRESS AND HEART RATE

INTRODUCTION

The dataset titled "Dataset_even.csv" contains extensive time-series health monitoring data for multiple patients, capturing a wide range of physiological and behavioral variables. For the purposes of this analysis, only a subset of relevant variables was selected to explore specific relationships between sleep duration, heart rate, and perceived stress levels. These variables were chosen due to their established links in health research and their potential to reveal insights into how sleep patterns influence both physical and psychological well-being.

METHODS

To investigate how sleep duration relates to physiological and psychological responses, the variables heart rate and stress level were scaled for comparability. Heart rate was max-scaled (values divided by the maximum observed heart rate), while stress was standardized (mean-centered and scaled by standard deviation).

Participants were categorized into three sleep duration groups: insufficient, normal, and excessive sleep. A bar plot was created to visualize the mean scaled heart rate and mean scaled stress level across these groups, with values for insufficient and normal sleep displayed side by side for direct comparison.

To test whether the differences in means were statistically significant, independent samples t-tests were performed between: (1) heart rate values of the insufficient vs normal sleep groups and (2) stress levels of the insufficient vs normal sleep groups. A standard significance level ($\alpha = 0.05$) was used to evaluate the results.

RESULTS

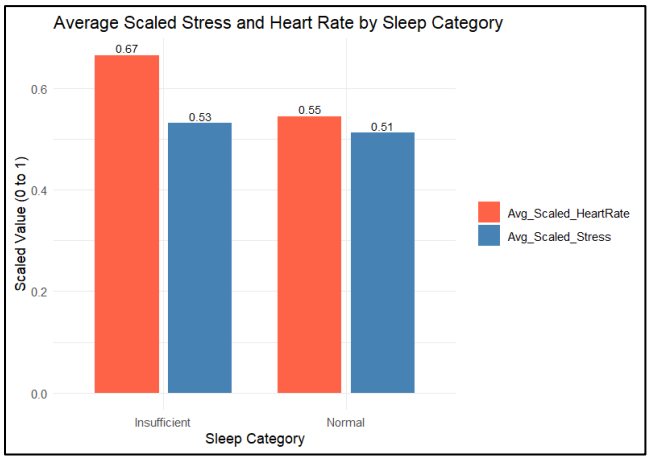

Figure 1. Average Scaled Stress and Heart Rate by Sleep Category

Figure 1. A bar plot was generated to compare the mean scaled stress and mean scaled heart rate across three sleep categories: insufficient, normal, and excessive sleep. The plot revealed that individuals with insufficient sleep had the highest mean heart rate (scaled value = 0.67), while their mean stress level was also the highest but only slightly elevated (scaled value = 0.53) compared to the normal sleep group.

To assess statistical significance, independent t-tests were performed. It was found that the difference in mean heart rates across sleep categories was statistically significant ($p < 2.2e\text{-}16$) while the difference in mean stress levels was not significant ($p = 0.4119$).

INTERPRETATION AND BRIEF CONCLUSION

The results show a clear association between insufficient sleep and elevated heart rate, suggesting a physiological response to sleep deprivation. On the other hand, stress levels, though slightly higher in the insufficient sleep group, did not differ significantly, possibly due to subjective variation in stress perception or reporting.
The strong statistical significance for heart rate supports its reliability as a biological indicator of sleep-related

strain, while stress appears to be less sensitive or more variable across sleep categories.

These findings indicate that insufficient sleep is strongly associated with elevated heart rate, reinforcing its impact on cardiovascular health. However, perceived stress does not significantly vary across sleep durations, highlighting the need for more objective or comprehensive stress measurement tools. Overall, heart rate may serve as a more consistent marker of sleep-related physiological effects than self-reported stress.