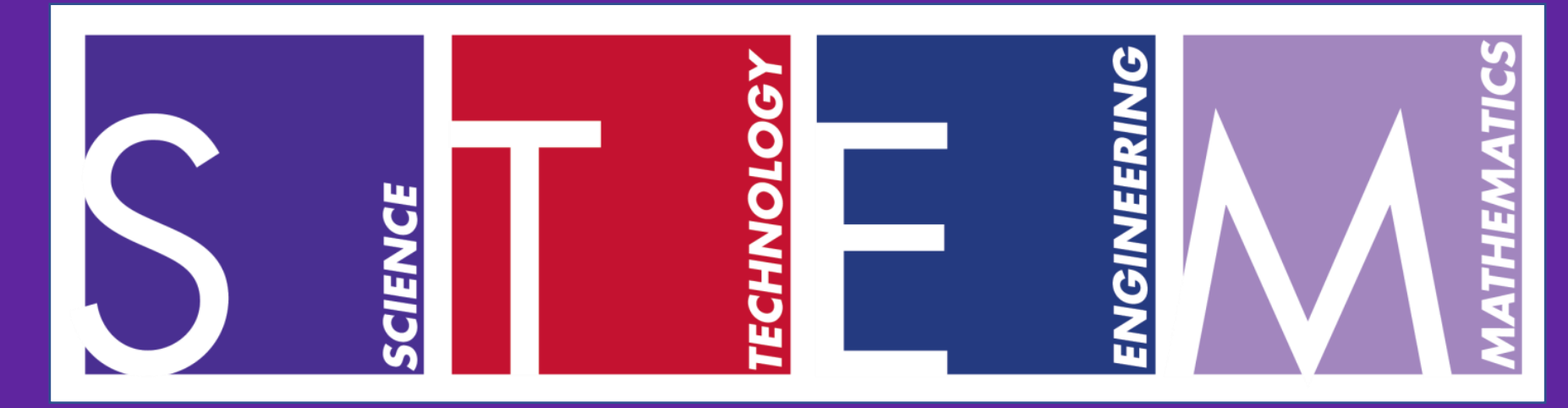# The Relationship of Caffeine Consumption to Sleep and Perceived Work Stress for Nurses at Medical City Dallas

Jennifer Janovsky, Department of Mathematics and Statistics

Assisted by: Mackenzie Berryman. Advisor: Gregory K. Miller

Abstract

Our purpose is to explain the relationship between a Medical City Dallas nurse's perceived work stress and their sleep quality/ quantity. In addition, we will explore the relationship between a nurse's job satisfaction and their sleep quality/ quantity. We will further examine if a nurse's total daily caffeine consumption significantly enhances the relationship of work stress and sleep quality/ quantity as well as job satisfaction and sleep quality/ quantity.

After multiple linear regression, the interaction term between sleep quality/ quantity and total daily caffeine intake was statistically significant. Thus, we have evidence that total daily caffeine intake is a moderator of the relationship between perceived job stress and sleep quality/ quantity. In addition, total daily caffeine intake is a moderator of the relationship between job satisfaction and sleep quality/ quantity.

However, we should take caution when interpreting our results because the overall variability is left unexplained. Thus, it is important to acknowledge that a statistically significant conclusion may or may not be considered as a significant result in a medical environment.

Introduction

Nurses employed by Medical City Dallas were surveyed concerning caffeine consumption. We hope to determine a stronger relationship between job stress and sleep quality/quantity (PSQI score) occurs when considering their total daily caffeine intake. Similarly, we will determine if the relationship between a nurse's self job satisfaction and their PSQI score strengthens when accounting for total daily caffeine intake. Ultimately, our statistical models will determine if caffeine consumption is a moderator of the relationship between perceived work stress and PSQI score as well as a moderator between job satisfaction and PSQI score.
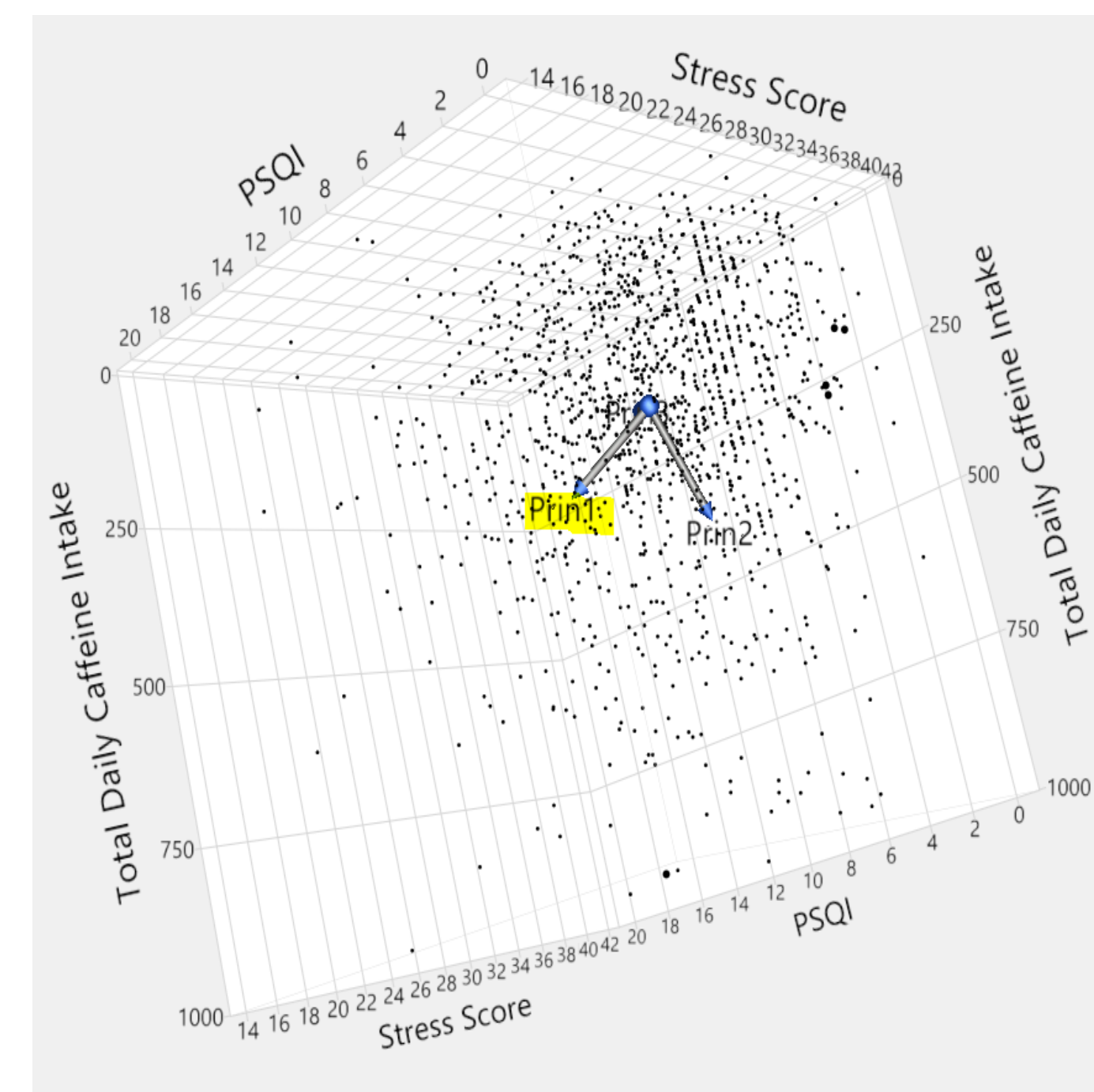

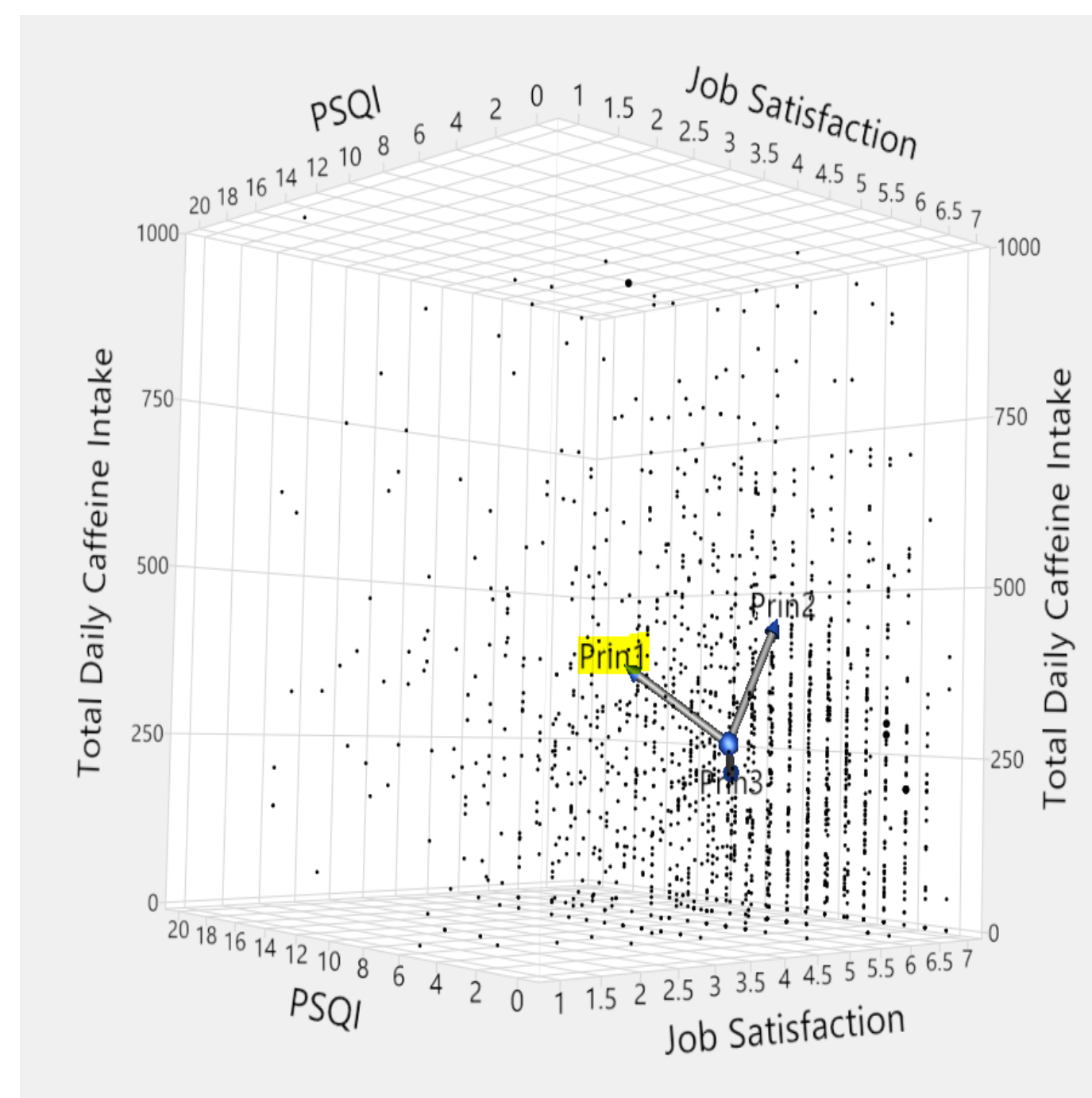**Figure 1**: 3D Scatterplot of Stress Score, PSQI, and Total Daily Caffeine Intake

Figure 2: 3D Scatterplot of Job Satisfaction , PSQI, and Total Daily Caffeine Intake

Methods

Using statistical software, simple linear regression explores the relationship between a nurse's stress level and PSQI score. In addition, regression also investigates the relationship between job satisfaction and PSQI score.

Further, multiple linear regression including a two-way interaction was used with two independent variables: PSQI score and total daily caffeine intake. Then, two models were explored using each of the two dependent variable: work stress and job satisfaction.

$$Stress = \beta_0 + \beta_1 PSQI + \beta_2 Daily\ Caffeine + \beta_3 PSQI * Daily\ Caffeine$$

$$Job\ Satisifaction = \beta_0 + \beta_1 PSQI + \beta_2 Daily\ Caffeine + \beta_3 PSQI * Daily\ Caffeine$$

Our analysis facilitated 3D plotting to visualize the relationship between job stress and PSQI score as well as job satisfaction and PSQI scores with inclusion of the moderator variable total daily caffeine intake.

400mg of Caffeine

Results

The relationship between a nurse's job stress level and their PSQI Score initially has a weak positive correlation. The analysis produced a correlation coefficient of .230 resulting in a coefficient of determination (R^2) of only .053. Then, when incorporating a nurse's total daily caffeine intake, we discover a significant increase in our value of R^2. Further, the interaction term between PSQI Score and total daily caffeine intake is significant (indicating moderation) with a p-value of .019.

The relationship between a nurse's job satisfaction and their PSQI Score has a weak negative correlation. The model showed a correlation of coefficient of -.198 resulting in a R^2 of .039. When adding a nurse's daily total caffeine intake as a moderator, the R^2 value becomes .045 and the interaction term between PSQI Score and Total Daily Caffeine Intake (with the predicted value being job satisfaction) is considered significant with a p-value of .009.
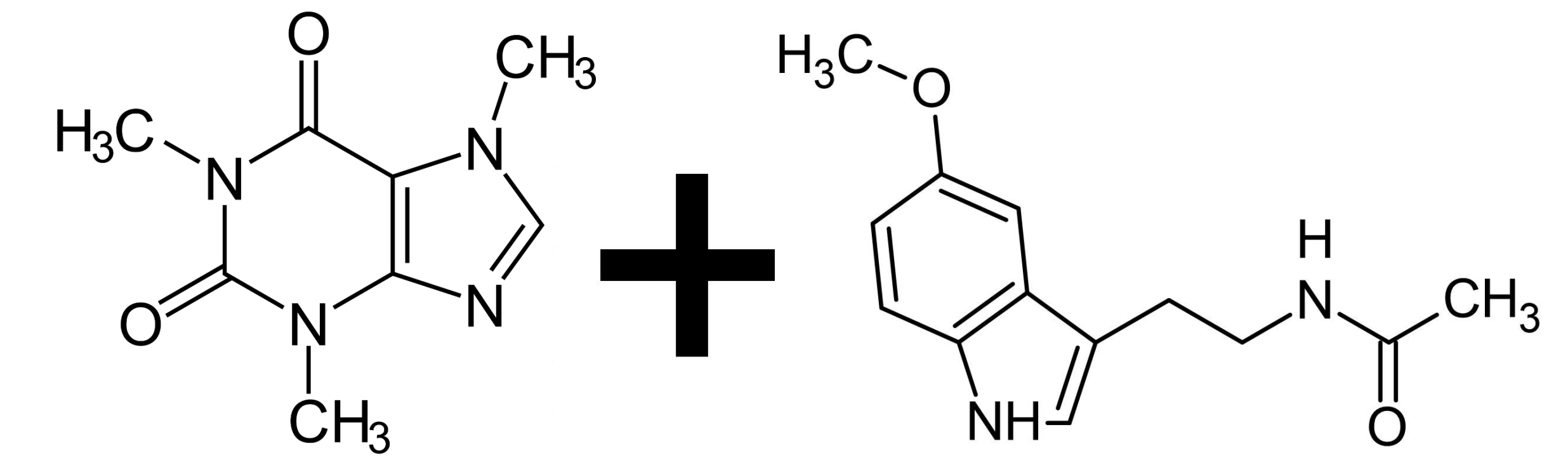

Figure 3: Caffeine Molecule plus Melatonin Molecule

Discussion

Regarding the relationship between job stress and PSQI Score with total daily caffeine intake as a moderator:

- As both the intensity of stress that a nurse experiences and their total daily caffeine intake increase, the nurse's sleep quality/quantity decreases. This can be visualized in Figure 1.
- When including total daily caffeine intake as a moderator for job stress and sleep quality/ quantity the p-value is significant. This indicates that total daily caffeine intake strengthens the relationship between a nurse's job stress and sleep quality/quantity, albeit slightly

Regarding the relationship between job satisfaction and sleep quality/ sleep quantity with total daily caffeine intake as a moderator:

- As the level of job satisfaction, a nurse experiences decreases and as their total daily caffeine intake increase, the nurse's sleep quality/ sleep quantity decreases. This can be visualized in Figure 2.
- When including total daily caffeine intake as a moderator for job satisfaction and sleep quality, the p-value is again significant. This indicates that total daily caffeine intake strengthens the relationship between a nurse's job stress and sleep quality/ sleep quantity. Again, the relationship is strengthened slightly.

Conclusions

After regressing a nurse's job stress against their sleep quality/ quantity and the moderator of total daily caffeine intake, we conclude that total daily caffeine intake is statistically significant. However, concerning a medical impact of caffeine on the relationship may not have a high impact on the nurse health.

Additionally, after regressing a nurse's job stress against their sleep quality/ quantity and the moderator of total daily caffeine intake, we conclude that total daily caffeine intake is statistically significant. On the other hand, the relationship may not be environmental significant towards the nurse's health.

Despite concluding that our two models are significantly significant, the relationship's variability remains unexplained.

Contact

Jennifer Janovsky
Stephen F. Austin State University
1411 North Street Nacogdoches TX, 75961
janovskyja@jacks.sfasu.edu

Medical City Healthcare