Sleep Deprivation and Fidgeting Behavior in College Students

Jenna C. Gilman

Department of Psychology, University of Maryland

PSYC300: Research Methods in Psychology Laboratory

Dr. Tracy Tomilson

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Anxiety is a psychological condition characterized by persistent worry, heightened nervousness, and increased physiological arousal (Baker et al., 2019). While mild anxiety can sometimes be helpful in stressful situations, chronic or severe anxiety can interfere with daily functioning, emotional well-being, and academic performance (Baker et al., 2019). Anxiety is especially common among college students because they frequently experience academic pressure, social demands, and major life transitions that can increase emotional distress (Huang et al., 2024). Symptoms of anxiety may include racing thoughts, restlessness, irritability, muscle tension, difficulty concentrating, and feeling overwhelmed (Baker et al., 2019). Because anxiety is so prevalent in young adults, it is considered one of the most important mental health concerns affecting college campuses today (Tafoya et al., 2023).

Studying anxiety is important because it impacts both students and society as a whole. Anxiety can reduce students' ability to concentrate, perform well academically, and maintain motivation, which may affect long-term educational and career outcomes (Almarzouki et al., 2022). Anxiety can also negatively influence relationships and daily functioning by increasing emotional instability and avoidance behaviors (Baker et al., 2019). In addition, mental health challenges such as anxiety are closely linked to decreased cognitive functioning and lower overall well-being in college students (Almarzouki et al., 2022). Understanding what contributes to anxiety is valuable because it can help universities improve prevention programs and create better mental health resources to support students' academic success and emotional health (Huang et al., 2024).

Many factors can contribute to anxiety, but one major factor is fatigue, particularly sleep deprivation. Sleep deprivation refers to a state in which an individual does not get enough sleep to maintain normal cognitive and emotional functioning (Griggs et al., 2022). Sleep loss can negatively affect attention, emotional regulation, and stress responses, which may increase vulnerability to anxiety symptoms (Griggs et al., 2022). When students are sleep deprived, they may feel less capable of managing daily responsibilities, which can increase feelings of worry and overwhelm. Sleep deprivation also disrupts cognitive functioning, which may contribute to increased anxious thoughts because students may feel less in control of their performance and ability to focus (Chua et al., 2017). Based on this theory, fatigue may increase anxiety because tired individuals have reduced emotional stability and greater difficulty coping with stressors (Griggs et al., 2022).

Research supports the idea that fatigue and sleep deprivation impair mental functioning in ways that could increase anxiety. Chua et al. (2017) found that total sleep deprivation significantly reduces divided attention performance, suggesting that sleep-deprived individuals struggle to manage cognitive tasks effectively. Similarly, Shenfield et al. (2020) found that sleep loss impairs sustained attention, making it harder for individuals to stay focused over time. Vargas et al. (2017) also found that sleep deprivation decreases sustained attention in young adults, further supporting the idea that fatigue disrupts cognitive control. Additionally, Schlesinger et al. (1998) found that sleep deprivation reduces postural control and attention, demonstrating that sleep loss impacts both physical and mental stability. Together, these findings suggest that fatigue can reduce attention and regulation abilities, which may make students more vulnerable to anxiety symptoms in demanding academic environments (Griggs et al., 2022).

In addition to fatigue, stress is another factor that may contribute to anxiety. Stress can be defined as the psychological response to situations that are perceived as overwhelming or difficult to manage (Huang et al., 2024). College students often experience stress due to academic workload, time management struggles, and social pressure, which may increase anxiety symptoms (Tafoya et al., 2023). Higher stress levels have been associated with poorer mental health outcomes, including greater anxiety, because stress increases emotional strain and reduces coping ability (Tafoya et al., 2023). Stress may also worsen the effects of fatigue, meaning that students who are both highly stressed and sleep deprived may experience even greater anxiety.

The present study investigates whether fatigue increases anxiety in college students and whether stress levels influence anxiety outcomes. Fatigue will be manipulated using a thought-exercise vignette. Participants in the high-fatigue condition will imagine being sleep deprived, while participants in the low-fatigue condition will imagine being well-rested. Stress will be measured as a subject variable to examine whether individual differences in stress affect anxiety scores.

This study asks: Does imagining being sleep deprived increase anxiety in college students, and does stress influence this relationship? The first hypothesis is that participants in the high-fatigue condition will report higher anxiety scores than participants in the low-fatigue condition. The second hypothesis is that participants with higher stress levels will report higher anxiety scores than participants with lower stress levels (Huang et al., 2024; Tafoya et al., 2023). The third hypothesis is that the effect of fatigue on anxiety will be stronger among participants with higher stress levels than among participants with lower stress levels, because stress may amplify the negative emotional effects of fatigue (Griggs et al., 2022).

Methods

Participants

Participants were undergraduate students at the University of Maryland. The population of interest was college students because they commonly experience fatigue and stress due to academic demands, busy schedules, and irregular sleep patterns, making them an appropriate group for studying the effects of fatigue on anxiety. The sample consisted of students enrolled in PSYC300 laboratory sections who participated in exchange for course credit. A total of N = 19 students completed the survey. Participants were recruited using convenience sampling, as they were drawn from students currently enrolled in the psychology course. Participants received course credit for completing the study after entering their full UID.

Participants were randomly assigned to one of two experimental conditions based on the last digit of their UID. Students whose UID ended in an even number (0, 2, 4, 6, 8) were assigned to Condition 1 (high-fatigue condition), while students whose UID ended in an odd number (1, 3, 5, 7, 9) were assigned to Condition 2 (low-fatigue condition).

Measures

Fatigue Manipulation

The independent variable was fatigue condition, which was manipulated using a thought-exercise vignette. In Condition 1 (high fatigue), participants imagined a time when they obtained only 3–4 hours of sleep and still had to attend class. They then described how tired they felt and how this affected their energy and focus (see Appendix A). In Condition 2 (low fatigue), participants imagined a time when they obtained 8–9 hours of sleep and felt well-rested before

class. They described how energized they felt and how this affected their focus (see Appendix B). A manipulation check was included to evaluate whether the fatigue condition successfully altered participants' perceived tiredness. Participants responded to the question, "How tired do you feel right now?" on a continuous scale from 0 (not tired at all) to 100 (extremely tired), with higher scores indicating greater fatigue.

Subject Variable Measure- Weekly Stress

The subject variable was average weekly stress, which was measured using a single self-report question: "In the past 7 days, how often have you felt stressed?" Participants responded on a 1–5 scale, with higher scores indicating higher stress levels (see Appendix C). For analysis, stress scores were later categorized into low and high stress groups.

GTA Variable Measure: Stress (Global)

The GTA variable was stress, measured using the question: "On average in the past 30 days, how would you rate your level of overall stress level?" Responses were recorded on a 1–100 scale, with higher scores reflecting greater social anxiety (see Appendix D). The second question was "How would you rate your current stress level?" to dichotomize the participants into low and high groups (see Appendix D). This variable was included for exploratory purposes.

Anxiety Symptom Questionnaire (ASQ)

Anxiety, the outcome variable in this study, was measured using a modified version of the Anxiety Symptoms Questionnaire (ASQ; Baker et al., 2019). The ASQ is designed to assess the frequency and intensity of anxiety symptoms experienced over the past week. For the purposes of this study, the scale was modified to reflect a continuous measure. The questionnaire consisted

of 10 items, and a sample item asked participants, “Using the following scale, please select how INTENSE or BOTHERSOME the symptom(s) have been in the past week” (see Appendix E).

The original ASQ has demonstrated strong psychometric properties, including high internal consistency and established construct, face, and convergent validity in both clinical and college student samples. Because the scale was adapted to a continuous format, the original reliability estimates may not fully generalize; however, the items retain strong face validity, as they clearly assess anxiety symptoms, and construct validity, as they directly measure experiences associated with anxiety.

All items were coded on a continuous scale ranging from 0 to 100, with scale labels ranging from strongly disagree to strongly agree. These labels served only as anchors, while responses were numerically coded. Items were summed to create a composite anxiety score, with possible scores ranging from 0 to 1000, where higher scores indicated higher levels of anxiety. No reverse-coded items were included. The survey was administered using Qualtrics.

Procedure

Two separate Qualtrics surveys were created, one for each fatigue condition (high-fatigue and low-fatigue). The independent variable prompts were developed as short thought-exercise vignettes designed to simulate realistic college sleep experiences. The high-fatigue vignette asked participants to imagine getting only 3–4 hours of sleep before attending class, while the low-fatigue vignette asked participants to imagine getting 8–9 hours of sleep and feeling well-rested. These prompts were written to create clear differences in perceived tiredness while still reflecting situations college students commonly experience.

A manipulation check was created to confirm whether the fatigue vignette successfully influenced participants' perceived tiredness. This was measured using the question, "How tired do you feel right now?" Participants responded on a continuous scale from 1 to 100, with higher scores indicating greater fatigue. This item was included immediately after the fatigue vignette to measure tiredness directly following the manipulation.

The subject variable question was created to measure individual differences in stress levels. Stress was assessed using a self-report item asking participants how often they felt stressed in the past 7 days. This question was included to examine whether stress moderated the relationship between fatigue condition and fidgeting.

To build the surveys, a new Qualtrics survey was created and the project file was imported. In Survey 1, the high-fatigue vignette was inserted as the manipulation condition. The dependent variable question measuring fidgeting and the manipulation check question were then added. Contact information and course/lab details were updated in the consent and debriefing sections. Survey 2 was created using the same structure, but the low-fatigue vignette was added instead of the high-fatigue vignette to serve as the control condition. Aside from the fatigue manipulation, the surveys were identical.

For data collection, the teaching assistant (TA) received both survey links and distributed them to two PSYC lab sections. Participants were randomized into conditions based on the last digit of their UID: students with an even last digit (0, 2, 4, 6, 8) were assigned to the high-fatigue survey link, and students with an odd last digit (1, 3, 5, 7, 9) were assigned to the low-fatigue survey link. After opening their assigned link, participants completed the survey in a fixed order, beginning with informed consent, followed by the fatigue vignette, the questionnaire items, the

manipulation check, and the debriefing statement. Participants entered their full UID at the end of the survey to receive course credit.

Design

This study used a 2 × 2 combined factorial design. The independent variable was fatigue condition (high vs. low). The subject variable was stress (low vs. high). The dependent variable was anxiety. This design allowed for testing the causal effect of fatigue on fidgeting while examining whether stress moderated this relationship. The design also enabled the assessment of the fatigue manipulation's effectiveness and provided control over extraneous variables, supporting the evaluation of both causal and moderating relationships.

Results

A total of N = 21 participants completed the study and took the survey. After reviewing the dataset, n = 19 responses were included in the final analyses. 2 participants were removed for having over half of their responses incomplete and unanswered.

The sample consisted of undergraduate students enrolled in PSYC300 laboratory sections at the University of Maryland. Participants were recruited through convenience sampling and participated for course credit. The subject variable, weekly stress, was divided into three levels: stress level 2 (n = 2), stress level 3 (n = 10), and stress level 4 (n = 7). Participants were randomly assigned to fatigue conditions based on the last digit of their UID, resulting in 10 participants in the high-fatigue condition and 9 participants in the low-fatigue condition.

At the variable level, the first hypothesis predicted that participants in the high-fatigue condition (sleep deprivation vignette) would report higher anxiety-related outcomes than

participants in the low-fatigue condition (well-rested vignette). The second hypothesis predicted that participants with higher weekly stress levels would report higher anxiety-related outcomes than those with lower stress levels. The third hypothesis predicted an interaction such that the effect of fatigue on anxiety would be stronger among participants with higher stress levels compared to those with lower stress levels.

Descriptive statistics indicated that participants in the high-fatigue condition reported higher anxiety-related scores (M = 62.17, SD = 12.93) than participants in the low-fatigue condition (M = 48.19, SD = 18.46). For the subject variable, weekly stress, participants in stress level 2 had a mean of 54.03 (SD = 15.99), participants in stress level 3 had a mean of 45.77 (SD = 13.96), and participants in stress level 4 had the highest mean of 69.94 (SD = 11.07). These results are displayed in Figure 1.

A manipulation check was conducted using an independent sample t-test to determine whether participants in the high-fatigue condition reported greater tiredness than those in the low-fatigue condition. There was not a significant difference between groups, $t(17) = 1.16$, $p = .130$, with participants in the high-fatigue condition reporting slightly higher tiredness (M = 67.01) than those in the low-fatigue condition (M = 53.10).

Given the design of the study, the most appropriate statistical test was a two-way ANOVA because the independent variable (fatigue condition) and subject variable (weekly stress) were both categorical (discrete), while the dependent variable (anxiety-related outcome) was continuous. This test allowed for the examination of both main effects and the interaction between fatigue and stress.

A two-way ANOVA was conducted to examine the effects of fatigue condition and weekly stress on anxiety-related outcomes. There was a significant main effect of fatigue condition, $F(1, 16) = 4.568$, $p = .048$, and a significant main effect of weekly stress, $F(2, 16) = 4.85$, $p = .043$. However, the interaction between fatigue condition and weekly stress was not significant, $F(2, 15) = 2.09$, $p = .169$. Effect size estimates indicated medium-to-large effects for fatigue ($\omega^2 = .16$) and weekly stress ($\omega^2 = .17$). These results are summarized in Table 1, which presents the full ANOVA results including main effects, interaction effects, and effect sizes.

Because the interaction was not significant, main effects were interpreted. Tukey post hoc analyses were conducted for weekly stress. The results showed that participants in stress level 4 reported significantly higher anxiety-related scores than those in stress level 3 ($p = .015$). No other pairwise comparisons were statistically significant.

In terms of statistical significance, there was a significant main effect of fatigue condition, meaning the null hypothesis for fatigue was rejected and the hypothesis was supported. There was also a significant main effect of weekly stress, so the null hypothesis for stress was rejected and the hypothesis was supported. However, there was not a significant interaction effect, meaning the null hypothesis for the interaction was retained and the interaction hypothesis was not supported.

Discussion

The purpose of this study was to examine whether fatigue condition influences anxiety scores in college students and whether weekly stress moderates this relationship. It was hypothesized that participants in the high-fatigue condition would report higher anxiety scores than those in the low-fatigue condition. It was also predicted that participants with higher weekly stress would

report higher anxiety scores than those with lower stress levels. Finally, it was expected that weekly stress would moderate the relationship between fatigue condition and anxiety, such that the effect of fatigue condition would be stronger for participants with higher stress levels.

Overall, the findings partially supported the hypotheses. The first hypothesis was supported because there was a significant main effect of fatigue condition. Participants in the high-fatigue condition reported higher anxiety scores than those in the low-fatigue condition. The second hypothesis was also supported because there was a significant main effect of weekly stress, such that participants with higher stress levels reported higher anxiety scores. However, the interaction hypothesis was not supported because the interaction between fatigue condition and weekly stress was not significant. Overall, the hypotheses for the main effects were supported, whereas the interaction hypothesis was not supported.

In terms of interpretation, the significant main effect of fatigue condition indicates that fatigue condition influenced anxiety scores regardless of stress level. Participants exposed to the high-fatigue condition reported greater anxiety than those in the low-fatigue condition, suggesting that fatigue negatively impacts emotional functioning. The significant main effect of weekly stress indicates that individuals with higher stress levels consistently reported higher anxiety scores, regardless of fatigue condition. The lack of a significant interaction indicates that fatigue condition and weekly stress operated independently, rather than interacting to influence anxiety.

One strength of this study is its experimental design. Because fatigue condition was manipulated and participants were randomly assigned to conditions, the study allows for stronger causal conclusions about the relationship between fatigue condition and anxiety scores. Another

strength is the factorial design, which allowed for the examination of both main effects and potential interaction effects between fatigue condition and weekly stress. A third strength is the inclusion of a manipulation check, which helps evaluate whether the manipulation was successful and contributes to internal validity.

However, there were also limitations in the current research. One limitation is the small sample size (n = 19), which reduces statistical power and may limit the ability to detect interaction effects. Another limitation is that the manipulation check was not significant, suggesting that the fatigue manipulation may not have been strong enough to produce a clear difference in perceived tiredness between conditions. Additionally, the study relied on self-report measures, which may introduce response bias and may not accurately reflect actual anxiety experiences.

Future research should address these limitations in several ways. First, future studies should use a larger and more diverse sample by recruiting participants from multiple universities, which would improve generalizability and increase statistical power. Second, future research should strengthen fatigue manipulation by using more immersive methods such as actual sleep restriction or sleep tracking, which would improve internal validity. Finally, future studies could incorporate behavioral or physiological measures of anxiety, such as heart rate monitoring, to provide more objective data and reduce reliance on self-report measures.

In conclusion, the findings suggest that both fatigue condition and weekly stress independently contribute to anxiety scores in college students. However, weekly stress did not moderate the relationship between fatigue and anxiety. These results highlight the importance of both sleep and stress as separate factors influencing mental health in college populations.

References

Almarzouki, A. F., Mandili, R. L., Salloom, J., Kamal, L. K., Alharthi, O., Alharthi, S., Khayyat, N., & Baglagel, A. M. (2022). The impact of sleep and mental health on working memory and academic performance: A longitudinal study. *Brain Sciences, 12*(11), 1525. https://doi.org/10.3390/brainsci12111525

Baker, A., Simon, N., Keshaviah, A., Farabaugh, A., Deckersbach, T., Worthington, J. J., Hoge, E., Fava, M., & Pollack, M. P. (2019). Anxiety Symptoms Questionnaire (ASQ): Development and validation. *General Psychiatry, 32*(6), e100144. https://doi.org/10.1136/gpsych-2019-100144

Chua, E. C., Fang, E., & Gooley, J. J. (2017). Effects of total sleep deprivation on divided attention performance. *PLoS ONE, 12*(11), e0187098. https://doi.org/10.1371/journal.pone.0187098

Griggs, S., Harper, A., & Hickman, R. L., Jr. (2022). A systematic review of sleep deprivation and neurobehavioral function in young adults. *Applied Nursing Research, 63*, 151552. https://doi.org/10.1016/j.apnr.2021.151552

Huang, Y., Yang, L., Liu, Y., Chen, X., & Zhang, H. (2024). Effects of perceived stress on college students' sleep quality: A moderated chain mediation model. *BMC Psychology, 12*, 476. https://doi.org/10.1186/s40359-024-01976-3

Schlesinger, A., Redfern, M. S., Dahl, R. E., & Jennings, J. R. (1998). Postural control, attention and sleep deprivation. *NeuroReport, 9*(1), 49–52. https://doi.org/10.1097/00001756-199801050-00010

Shenfield, L., Beanland, V., Filtness, A., & Apthorp, D. (2020). The impact of sleep loss on sustained and transient attention: An EEG study. *PeerJ, 8*, e8960. https://doi.org/10.7717/peerj.8960

Tafoya, S. A., Aldrete-Cortez, V., Tafoya-Ramos, F., Fouilloux-Morales, C., & Díaz-Olavarrieta, C. (2023). Sleep and perceived stress: An exploratory mediation analysis of the role of self-control and resilience among university students. *International Journal of Environmental Research and Public Health, 20*(16), 6560. https://doi.org/10.3390/ijerph20166560

Vargas, I. P., Aguiar, S. A., & Barela, J. A. (2017). Effects of sleep deprivation on sustained attention in young adults. *Brazilian Journal of Motor Behavior, 11*(1), 1–9. https://doi.org/10.20338/bjmb.v11i1.96

Appendix A

Condition 1: High-Fatigue Vignette / Thought Exercise

It's 8 AM, and you've barely slept, only getting 3–4 hours. Your head feels heavy, like it's stuffed with fog, and your eyelids droop despite your efforts to stay awake. Your thoughts are sluggish and scattered, making it nearly impossible to follow along in class. Your hands fidget nervously, your body shifts constantly in the chair, and every movement feels like a struggle as you fight to stay alert.

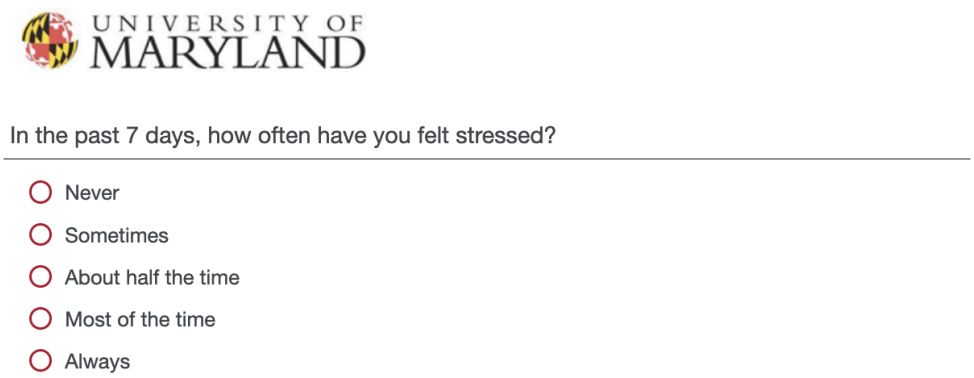
Appendix B

Condition 2: Low-Fatigue Vignette / Thought Exercise

It's 8 AM, and you've just woken up after a full 8–9 hours of sleep. You feel refreshed and clear-headed, as if your mind is running smoothly and effortlessly. Your body feels light and energized, moving easily without tension. Focusing on the lecture feels natural, and your thoughts flow clearly, allowing you to engage fully with the material.

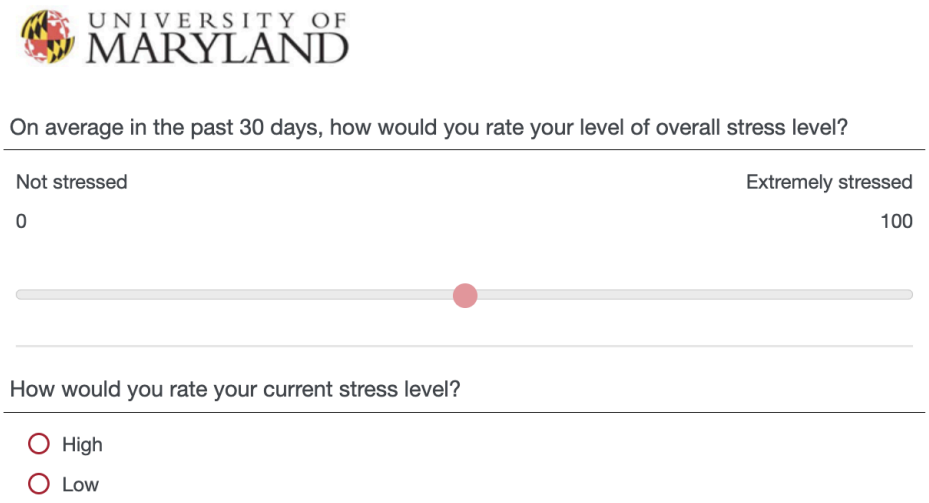
Appendix C

Subject Variable Measure: Stress



Appendix D

GTA Variable Measure: Stress



Appendix E

Anxiety Symptoms Questionnaire (ASQ) (Baker, Simon, Keshaviah, Farabaugh, Deckersbach, Worthington, Hoge, Fava, & Pollack, 2019)

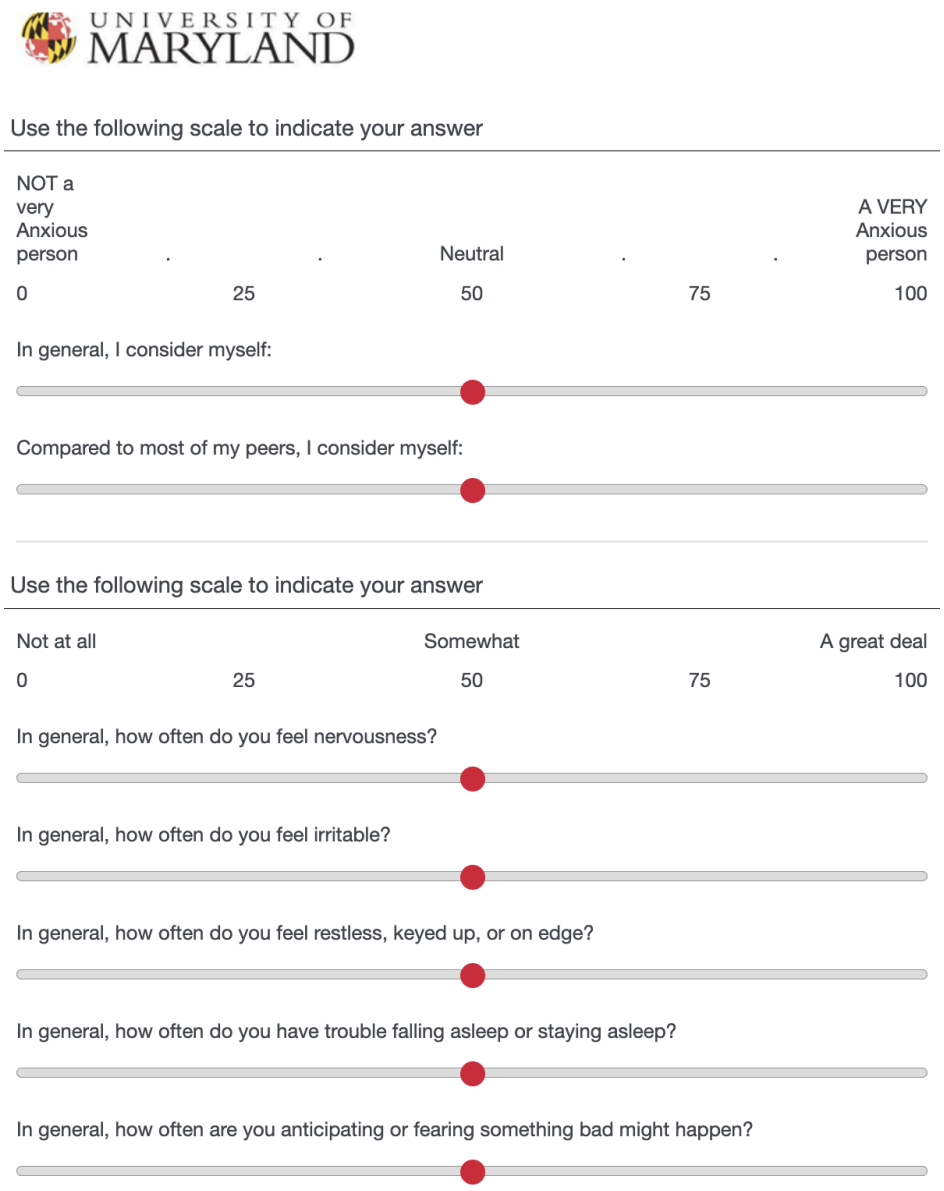


Table 1

Table 1A. Manipulation Check Comparing Reported Tiredness Across Fatigue Conditions

```
        Two Sample t-test

data:  dataname$Manipulation.Check_4 by dataname$Condition
t = 1.1635, df = 17, p-value = 0.1303
alternative hypothesis: true difference in means between group 1 and group 2 is greater than 0
95 percent confidence interval:
 -6.889193       Inf
sample estimates:
mean in group 1 mean in group 2
       67.00900        53.09556
```

Table 1A presents the manipulation check for fatigue. An independent-samples t-test showed no significant difference between conditions, $t(17) = 1.16$, $p = .130$. Participants in the high-fatigue condition reported higher tiredness ($M = 67.01$) than those in the low-fatigue condition ($M = 53.10$), but the difference was not statistically significant.

Table 1B. Two-Way ANOVA Interaction Model Testing Fatigue Condition × Weekly Stress Predicting Anxiety

```
                       Df Sum Sq Mean Sq F value Pr(>F)
Condition               1  926.8   926.8   4.878 0.0432 *
Weekly.stress           1  983.8   983.8   5.178 0.0380 *
Condition:Weekly.stress 1  396.4   396.4   2.086 0.1692
Residuals              15 2849.9   190.0
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Table 1B presents the two-way ANOVA testing whether weekly stress moderated the effect of fatigue on anxiety. The interaction was not significant, $F(2, 15) = 2.09$, $p = .169$, indicating that stress level did not significantly change the relationship between fatigue condition and anxiety.

Table 1C. Two-Way ANOVA Main Effects Model Testing Fatigue Condition and Weekly Stress Predicting Anxiety

```
              Df Sum Sq Mean Sq F value Pr(>F)
Condition      1    927   926.8   4.568 0.0484 *
Weekly.stress  1    984   983.8   4.849 0.0427 *
Residuals     16   3246   202.9
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Results showed a significant main effect of fatigue condition, $F(1, 16) = 4.57$, $p = .048$, with higher anxiety in the high-fatigue condition than the low-fatigue condition, supporting Hypothesis 1. There was also a significant main effect of weekly stress, $F(2, 16) = 4.85$, $p = .043$, indicating that anxiety differed across stress levels and supporting Hypothesis 2.

Table 1D. Omega-Squared (ω^2) Effect Sizes for Fatigue Condition and Weekly Stress Predicting Anxiety

```
# Effect Size for ANOVA (Type I)

Parameter     | Omega2 (partial) |       95% CI
-------------------------------------------------
Condition     |             0.16 | [0.00, 1.00]
Weekly.stress |             0.17 | [0.00, 1.00]

- One-sided CIs: upper bound fixed at [1.00].
```

Table 1D shows omega-squared (ω^2) effect sizes for fatigue condition and weekly stress. The effect size for fatigue was $\omega^2 = .16$, and the effect size for weekly stress was $\omega^2 = .17$. Both values are considered large effects because they are greater than .14.

Figure 1

Mean Anxiety Scores by Fatigue Condition and Weekly Stress Level

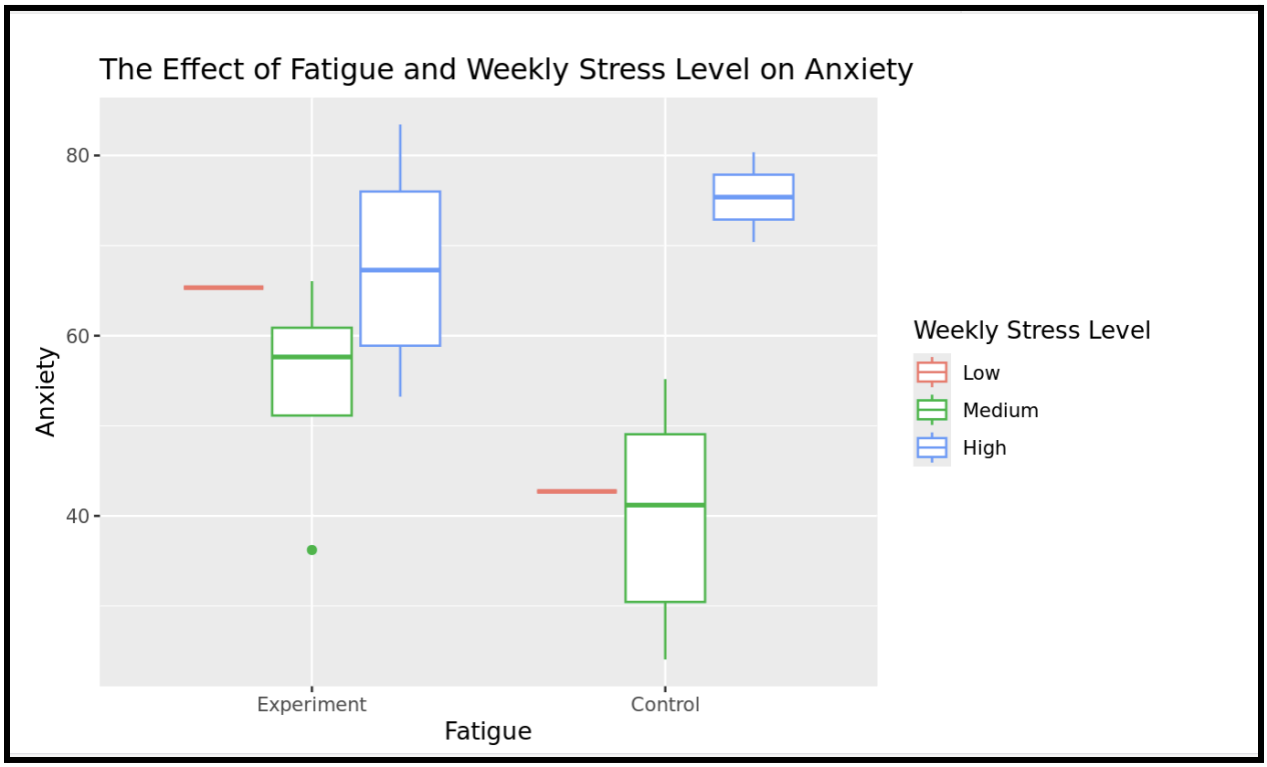


Figure 1 shows that participants in the high-fatigue condition reported higher anxiety scores *(M = 62.17, SD = 12.93)* compared to participants in the low-fatigue condition *(M = 48.19, SD = 18.46)*. This suggests that imagining sleep deprivation was associated with higher anxiety.

Across stress levels, participants in weekly stress level 4 reported the highest anxiety *(M = 69.94, SD = 11.07)*, while stress level 3 reported the lowest anxiety *(M = 45.77, SD = 13.96)*. Stress level 2 fell in between *(M = 54.03, SD = 15.99)*. Overall, anxiety appeared to increase as weekly stress increased.