

**The Relationship Between Sleep, Engagement in Class, and Mood After Class in
Undergraduate Students**

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Abstract

With the growing levels of depression and anxiety among undergraduate college students, it is important to learn what factors may be contributing to post-class mood. This study aims to investigate how students feel after class based on the quality and quantity of sleep and engagement in class. Using a survey that consisted of three questionnaires, we predicted that both sleep and engagement in class would have positive implications on students' post-class emotions. While we found insignificant results between both the effects of sleep on post-class mood and the effects of engagement in class on post-class mood ($p = 0.08$), past literature indicates that these factors do play a significant role in students' feelings. Despite our study not showing significant results, these findings can be applied to help increase sleep quality and engagement in class even under stress, so that undergraduate students leave school with a positive mood.

The Relationship Between Sleep, Engagement in Class, and Mood After Class in Undergraduate Students

As undergraduate students go through college, they experience the rigor of school alongside their commitments. Academic success and mood can greatly influence the future of an undergraduate student, so it is important to consider what factors can play a role in academic achievement. Throughout the different stressors of college, a lack of sleep can decrease focus and sequential thinking, while increasing poor-decision making and irritability, ultimately resulting in a significant decrease in GPA (Creswell et al., 2023). Sleep cannot only affect academic performance but also affect a student's engagement in class, which can also affect their mood. Previous research has observed that poor sleep quality and sleep debt can influence mood through an increase in the risk of depression and anxiety as well as a lack of involvement in college courses (Baroni et al., 2018). The impact of sleep deprivation on both mood and academic performance poses a negative risk to students' safety enough to continue the research on the topic in hopes that students find ways to manage their time and leave class with positive emotions.

There is a disconnect in the research of both sleep and engagement in class on post-class emotions, so the purpose of this study is to combine the research on sleep effects and engagement in classes specifically with post-class mood among undergraduate students. In recent years, there has been a significant increase in anxiety and depression among college students and a lack of sleep (Baroni et al., 2018). This increase in negative moods and sleep deprivation can be attributed to many factors such as an increase in social media use and more prominent stresses among college students. A decrease in academic engagement can be tied to social media use

which is aggravated by poor sleep (Zhuang et al., 2023). Furthermore, there are unclear causes for poor sleep quality, causing a decrease in academic engagement and an increase in negative moods. Because of the unknown causes of sleep deprivation and an increase in stressors, students can struggle to manage their time and workload while maintaining positive mental health.

This study is important in understanding the effects of poor sleep quality and engagement in class on post-class mood changes in college students so that students can prepare better and gain resilience to changes in mood and internal feelings. To study the relationship between sleep, engagement in school, and post-class mood, there were three bounds of measurement to try to determine their link. The first measure that was found looked directly at sleep quality. The decrease in sleep quality and quantity can be attributed to stressful life events and their rumination (Li et al., 2019). Next, the second measure focused on student engagement, which was tied to mood after class. Students often use caffeine products and have an inconsistent sleep schedule, which can cause negative behaviors in sleep patterns and poor sleep quality (Baroni, et al., 2018). Individual students must then hold themselves accountable to improve their sleep quality, which can be difficult under the stress of college courses. Furthermore, negative sleep quality can cause a decrease in positive feelings and an increase in anxiety and depression. Mood is the final measurement to connect all three measurements.

We want to examine the relationship between these three domains. Those who suffer from sleep deprivation have a higher likelihood of developing anxiety and depression and are less engaged in classes, resulting in lower grades. We want to measure if certain sleep quality is associated with a certain level of engagement in class and overall mood. We hypothesize that good sleep quality and positive engagement in classes will predict more positive moods. This

information is important to determine because it has been found that bad sleep quality is associated with lower engagement and lower grades (Creswell et al., 2023). If a significant correlation exists, universities can provide support and more resources for students suffering from negative moods and attempt to prevent poor sleep quality by providing information to students.

Method

Participants

The participants were 50 students (33 women, 17 men, $M_{age} = 20.32$ years, age range: 18-28 years) attending Baylor University and were asked to participate in an online survey. For ethnicity, 64% identified themselves as Caucasian, 4% as African American, 2% as Asian, 18% as Hispanic, 2% as Middle Eastern, and 10% as “other.” Among them, there were four Freshman, 19 Sophomores, 20 Juniors, and 7 Seniors.

Measures

The scale used to measure sleep was the Sleep Quality Scale (Shahid et al., 2011). The scale used to measure engagement in class was the Student Engagement in Schools Questionnaire (Hart et al., 2011). The scale used to measure mood was the MOOD Questionnaire (Plumed et al., 2013) which was adapted from the original Spanish MOOD Questionnaire containing 20 items with a three-level response scale (Rieffe et al., 2004).

Sleep Quality Scale

The Sleep Quality Scale (SQS; Shahid et al., 2011) is a measure of sleep quality across six domains, evaluating how often participants exhibit specific sleep behaviors. Items include, “I have difficulty falling asleep” (Shahid et al., 2011, Pg. 346). Each item was answered on a

four-point scale ranging from rarely (*none or one to three times a month*), to almost always (*six to seven times a week*). The alpha reliability coefficient was considered to be adequate with an alpha level of $\alpha = .81$. There was an internal consistency of $r = .92$. The scores of the insomnia sample were significantly higher than the scores of the controls, which represents good construct validity (Shahid et al., 2011).

Student Engagement in Schools Questionnaire

The Student Engagement in Schools Questionnaire (SESQ; Hart et al., 2011) is a Linkert-type, self-reporting scale that studies student engagement. Items include, “I try hard to do well in school” (Hart et al., 2011, Pg. 73). Each item was answered on a 5-point scale ranging from one (*never*) to five (*always*). The alpha reliability coefficients for this study were set at $\alpha \geq .70$, representing consistency in the behavior in the measures. The items of the measure were taken from existing research, which increased the content validity of the measure (Hart et al., 2011).

MOOD Questionnaire

The MOOD Questionnaire (Plumed et al., 2013) measures the frequency of certain moods such as happiness, fear, sadness, and anger. Items include, “I feel frightened” (Plumed et al., 2013, Pg. 253). Each item was answered on a three-point scale ranging from never to often. The alpha reliability coefficient was considered to be adequate with an alpha level of $\alpha > .77$. There were significant correlations between all dimensions. Convergent validity was adequate, with a significant correlation between the items of the scale and the variable they were supposed to measure (Plumed et al., 2013, Pg. 255).

Procedure

The requirement to participate in this study was enrollment as an undergraduate student at Baylor University. Participants were recruited through text messages, emails, social media direct messaging, and in-person conversations. The survey was given to the participants through an electronic device where they can complete the survey online.

Qualtrics, an online questionnaire platform, was used to create and perform the study. Potential participants were sent the link to the questionnaire by one of the three researchers on the team. Upon clicking on the link, the first screen informed potential participants that there were no risks to taking the survey, their responses would be completely anonymous, there was no compensation for taking the study, and that the study should take around 10 minutes to complete. Participants were then given informed consent, in which they could accept or decline to participate in the study, and the contact information of the student researchers as well as the overseeing researcher in case participants had questions. Consenting to the survey also disclosed that the participant was above 18 years of age. If the participant agreed to consent, they were taken first to the Sleep Quality Scale questionnaire where they filled out the 28-item scale, then the MOOD Questionnaire where they filled out the 16-item scale, and finally the Student Engagement in Schools Questionnaire where they filled out the nine-item scale. All questions had to be answered before moving on to the next phase of the questionnaire. After finishing all three scales, participants were asked to provide their assigned sex at birth, age, ethnicity, current class status, and major. After completing the questionnaire, participants were provided with the researchers' contact information. These responses were analyzed and calculated through the Qualtrics database to give each participant a total score. Finally, the results of the questionnaire

were inputted into the RStudio program where a multiple regression analysis between the three scales was examined.

Results

A multiple linear regression test was performed in RStudio to examine the relationship between post-class mood with sleep quality ($M = 61.36$, $SD = 8.80$), and engagement in class ($M = 3.54$, $SD = 0.28$) among the eligible participants. Throughout the study, 59 students started the study and 50 participants fully completed each of the questions. A total of nine participants were removed from the study because they either did not consent or were missing data. The multiple regression analysis found that there was no significant difference in sleep scores or engagement scores for post-class mood, $R^2 = .06$, $F(2, 47) = 2.603$, $p < .05$, referenced in Table 1. The p -value was greater than .05 which indicates that sleep and engagement in class accounted for about 10% of the variance in mood. Further, the insignificant p -value indicates that our original hypothesis was incorrect and that sleep and engagement in class do not have a significant effect on post-class emotions.

Table 1

Multiple Regression of Engagement and Sleep on Post-Class Emotion

| | <i>M</i> | <i>SD</i> | <i>F</i> | <i>df</i> | <i>p</i> |
|------------|----------|-----------|----------|-----------|----------|
| Predictor | | | 2.603 | 1 | 0.0847 |
| Engagement | 3.54 | 0.28 | | | |
| Sleep | 61.36 | 8.80 | | | |

Note. n = 50

Discussion

The results do not support the original hypothesis. The results are not significant enough to support the original hypothesis that sleep and engagement in class have a positive effect on post-class emotions. The relationship between sleep and post-class emotion was a better predictor than engagement in class as the predictor of positive post-class emotions. has more of an effect on post-class mood in comparison to engagement in class

The results of similar studies do not align with the results of this study. In the study of Baroni et al. (2018), it was found that poor sleep quality and sleep deprivation can increase the risks of depression and anxiety and decrease involvement in class among college students. This study differed in the amount of college students studied as well as the lack of a student engagement measure across all courses. Their results found that through a sleep education course, lack of sleep can lead to depression and anxiety, but the teachings of the course and the knowledge of cognitive behavioral skills can rid students of these problems. Furthermore, Baroni et al. (2018) also found that despite there being no significant difference in total sleep time in sleep logs, students who took a sleep education course increased their sleep time by around 20 minutes which improved their sleep hygiene, advanced sleep phase, and decreased sleep latency, compared to those who did not. These results suggest that education of sleep has a significant effect on the resulting mood of college students. Another study, by Li et al. (2019) concludes that stressful life events cause worse sleep quality among college students and can indirectly worsen sleep quality through rumination. The results of Li et al. (2019) have further ramifications on the study of sleep quality and mood among college students. This study differed in the sleep quality scale used, as well as the addition of rumination as an indirect factor of stress. The results found

that individuals with high levels of rumination can increase cognitive arousal and lower sleep quality in the “emotional flow” theory which are the emotions that consecutively follow a stressful event (Li et al., 2019). Furthermore, Li, et al (2019) found that resilience can help students moderate their emotions, resulting in a better sleep quality score. This provides an implication for future studies of the effects of sleep on mood and its inverse effects among college students. In another study by Li et al. (2023), it was found that problematic smartphone usage could predict significant differences in school engagement and disengagement. Further, sleep was found to be able to mediate the effects of problematic smartphone usage (PSU) on student engagement (Li et al., 2023). PSU led to a lower quality of sleep, which in turn resulted in less school engagement, showing that previous studies were correct that sleep does tend to affect academic engagement and school-related emotions. Li et al. (2023) also state that through the self-regulatory theory, it can be difficult for young students to maintain positive emotions throughout their day without adequate sleep, resulting in higher levels of PSU and lower levels of engagement. The results of these studies remained consistent, indicating that sleep does tend to have a significant effect on engagement and post-class mood.

In a study conducted by Kneissl et al. (2023), undergraduate veterinary students learned in a flipped classroom environment in which they learned course material on their own time and completed homework during class time. The study concluded that a flipped classroom design showed higher test scores, more positive emotions, and an increase in engagement in class in comparison to the traditional classroom design. Students from both the flipped classroom design and the traditional classroom design completed a questionnaire at the end of the semester in which it was found that flipped classroom learners had overwhelming positive emotions and put

in more effort than those in the traditional classroom (Kneissl et. al, 2023). This study connects to a study conducted by Zhou, 2023, in which studies showed that students in a flipped classroom have higher motivation to participate in in-class discussions than students in a traditional classroom. This motivation stems from higher student satisfaction, self-efficacy, and emotion regulation (Zhou, 2023). These studies provide evidence that the implementation of certain styles of learning can have a positive effect on students' engagement in classroom learning, resulting in an increase in positive emotions both during and after class.

The study faces threats to its validity through the use of different measures. The SESQ may not be an accurate reflection of students' engagement in their current classes, the MOOD Questionnaire might not correctly measure a student's post-class mood, and the SQS may not accurately assess a student's sleeping habits, considering that each individual must self-report these measures. The results of this study may also contain threats to reliability due to post-class mood being affected by outside domains such as emotional awareness, somatic complaints, depression, anxiety, or academic and social adjustment (Plumed et al., 2013). This study used the combination of the three measures on whatever day the participant chose to take the study and not over a long period of time, so there was no control for the fluctuations of post-class mood. Further, this study contains more limitations in the methods of collection. No attention checks were added throughout the survey to test if participants were answering honestly, the wording of questions could have confused participants, a low number of participants, and sleep quality can be affected by numerous outside factors, contributing to bias scores.

The results of this study are relevant to the population of undergraduate students. An understanding of how sleep and engagement in class affect post-class mood could help students

understand effective sleep hygiene and quality, take stress off of students, and set students up to feel good after class. Considering that the three measures are interlinked, maintaining a healthy and consistent sleep schedule and participating in class can positively affect an individual's overall mood. The results of this study can be generalized to a larger population such as those in graduate school or those with a job, but the small sample size and the differences in ways of life among students and those not in school limit this particular study. In future studies, evaluating information such as grades, attendance in class, and other contributing factors to stress and sleep quality could raise the validity of these results.

Future investigations of the effects of sleep and engagement in class on post-class mood could help find healthy ways for students to maintain healthy sleep schedules, and engage in class significantly more, resulting in better post-class moods. Future studies should be designed with a larger group of participants, both male and female. Multiple further studies of larger sample sizes, extended demographics, and the study of grades should be conducted, allowing for more variables to be controlled.

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