# Exploring Sleep Health in Construction Students: A Pilot Study

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Research shows that an adequate and healthy sleep routine has a significant impact on general health and performance. Yet, the importance of sleep health is often underestimated in educational settings, as some courses may demand long hours of preparation and out-of-class work. This is especially evident in courses with physical work or laboratory activities where a set amount of time is not allocated for educational activities, and students may have to spend significant time outside typical working hours. Moreover, industry work norms can foster misconceptions about work-hour expectations that don't align with sleep hygiene recommendations. To explore students' awareness of their sleep routines, a study was conducted at (deidentified) University. This paper reports on the second phase of the study, in which a sample of students from various majors participated and shared their perceptions, opinions, and expectations about sleep-related factors. A quantitative methodology was employed to encompass a broader range of students. A survey was conducted using various recruitment methods in Fall 2023, and the responses were analyzed both within and between majors. This paper emphasizes findings about construction students. The results indicate that the circadian rhythm is not in sync with class schedules and internship experiences. The results also show that construction students generally expect above-average working hours upon graduation. This paper contributes to the body of knowledge by highlighting the importance of healthy sleep norms for construction students, an aspect sometimes overlooked in construction education planning and execution.

**Keywords:** Construction, Engineering, Education, Sleep, Circadian Rhythm

## Introduction

College students suffer from various sleep problems including sleepiness, sleep deprivation, and irregular sleep time. Sleep-related issues have been studied for years in different capacities, yet the problem is still impacting students' physical and mental health. The problem is exacerbated when it is combined with the lack of awareness from students. The issue is worse in some majors like construction due to the common practices in the industry. To understand the drivers for the sleep problem and its impacts on students' performance, a study was designed and developed. The current paper presents a portion of the study conducted in Fall 2023 and Spring 2024 in which students from construction participated in the data collection process. The findings of this study contribute to the body of knowledge by providing insight into the current status of construction student sleep patterns and their expected sleep patterns in their professional careers.

## Background

Sleep-related issues including sleepiness, sleep deprivation, and irregular sleep time are among the challenges that students at the college level are overwhelmingly dealing with during their studies as 50% report daytime sleepiness and 70% do not gain sufficient sleep time [1]. Jalan, Priya, and G. R [2] explored sleep awareness among college students and concluded that the majority of college students are suffering from sleep deprivation. Xu et al. [3] explored the effect of physical exercise on sleep quality and the mediating effect of smartphone use behavior among Chinese college students which they conducted a cross-sectional study design with 5,075 college students. They found a significant correlation existed between sleep quality, physical exercise, and mobile phone addiction. Similarly, Pham Chuang, Kuo, Yeh, and Liao [4] investigated the associations between electronic device use before bedtime and sleep quality among college students in Vietnam in which 369 participants were recruited to respond to a self-report survey. They concluded that electronic device use near bedtime was significantly associated with poorer sleep quality. They also showed that lack of exercise, alcohol consumption, and coffee intake after 4 pm was also associated with poor sleep quality. Mbus, Nili, Mohamed, and Dwibedi [5] explored the association between mental health and insomnia among 330 college students at two large midwestern universities and found an association between insomnia and mental health conditions such as depression and AHDH and emphasized prevention programs to enforce sleep education interventions. Schlarb, Friedrich, and Claßen [6] explored sleep problems in university students in a pre–post-design study with Twenty-seven students and showed that 74 percent of students reported symptoms of an insomnia disorder and more than half of them met the criteria of an insomnia disorder. Their findings showed that treatment programs such as “Studieren wie im Schlaf” (SWIS - studying in your sleep) are effective tools for sleep problems in college students.

Okano, Kaczmarzyk, Dave, Gabrieli, and Grossman [7] investigated the connections between sleep and cognitive function in a study in which 88 college students were provided with wearable activity trackers. The measurement tools provided multiple sleep measures to be correlated with in-class performance on quizzes and midterm examinations and concluded that in general, higher performance, exhibited in better grades, was correlated with better quality, longer duration, and greater consistency of sleep. Yun and Greenwood [8] explored the relationship between stress, sleep quality, and academic performance among domestic and international students and found that perceived stress negatively correlates with sleep quality and thus recommended academic administrators focus on effective stress to ameliorate sleep quality. Guadiana and Okashima [9] explored how sleep deprivation impacts college students, especially physiological health, psychological health, and cognitive function through the review of the literature and reported that sleep deprivation can negatively affect academic and clinical performance. In addition, it can generate problems, such as an increase in medication and procedural errors among medical students. Chiang, Arendt, Zheng, and Hanisch [10] investigated the impact of Sleep on Academic Performance and Job Performance among 172 undergraduate students through an online survey and archival GPA data. Their results were consistent with delayed sleep phrase syndrome, which is a prevalent sleep problem among college students. They also reported that sleep quality was significantly correlated with job performance and sleep latency and sleep medicine were negatively correlated with academic performance. Kim [11] also explored the effects of sleep deprivation on the academic performance of college students in a study in which daytime sleepiness was measured by the Epworth Sleepiness Scale (ESS) and sleep quality was investigated by the Pittsburgh Sleep Quality Index (PSQI) in 117 college students. The results indicated that

students with better performance -higher GPA - reported a higher average sleep time, lower levels of daytime sleepiness, and better sleep quality.

In particular, construction professionals are continuously subjected to irregular work hours, leading to insomnia and poor sleep quality, which directly impacts their cognitive and rational behavior. The relationship between sleep duration and fatigue has been reported in several studies [12]. Powell and Copping [13] explored the effects of poor sleep habits in construction and reported that there was an average increase in the risk of accidents was 9% pertaining to sleep issues. The percentage was even higher (10.1%) for the field workers. Sathvik, Krishnaraj, and Irfan [14] explored the quality and duration of sleep among construction workers who performed based on a shift schedule and stated rotational shift workers encountered more sleep difficulties, particularly in the second week of the experiment. Kim et al. [15] investigated factors associated with poor quality of sleep in construction workers in a cross-sectional study with 206 participants aged over 19 years who worked at construction sites for more than 6 months. They showed majority of participants had poor quality of sleep which in turn resulted in a short duration of sleep before the working day, higher levels of daytime dysfunction and discomfort in daily life, and more chronic disease, depressive symptoms, and higher physical fatigue. Chandra, Loganathan, Awuzie, and Wang [16] investigated the association between sleep quality and cognitive behaviors and rational abilities in a randomly selected sample of 575 and 310 construction workers in the initial and secondary phases of a study and reported a negative correlation between shift work and both the early and late phases of rational abilities. They also stated that there was a transient relationship between insufficient sleep and the ability to make rational decisions.

## Methodology

The main objective of the study was to understand how students in different majors are impacted by the lack of sufficient sleep time and as a result, to what extent students' performance is affected. A literature review was conducted to investigate prior studies and a collection of interest points was prepared. In the next step, a quantitative method was identified suitable to gather a wide range of responses. Based on the research scope and noticeable points from prior studies, a series of questions was designed, which ultimately, converted to a survey instrument. To ensure that the process complies with applicable regulations, meets commonly accepted ethical standards, follows institutional policies, and adequately protects research participants, IRB approval was obtained for the study. To obtain data, a convenient sampling approach was employed, and participants were recruited through various campus classrooms and student events at XXX University (de-identified). The current paper reports on the second phase of the study which was conducted in the Fall 2023 and Spring 2024 semesters. Participants were first asked to do the Morning Evening Questionnaire (MEQ) test. The MEQ is a self-assessment survey developed primarily for monitoring respondents for sleep-related experiments to perform a quick assessment of circadian rhythm and sleep rhythm patterns in individuals. Having the MEQ result recorded, students continued with the main survey in which they responded to a series of demographic, self-report sleep habits, and perceived career-related questions. In this phase, a total of 152 construction students participated in the study. The data were coded, cleaned, and modeled in statistical software.

## Results

The first section of the survey consisted of demographic questions, in which 88% of respondents were male and the rest 12% were female which was slightly above the female gender rate for the construction program. Also, junior (47%) and sophomore (44%) students comprised the majority of participants, followed by freshman (7%) and senior (2%) level students. In the next question, participants were asked to report their GPA. The pre-defined categories were 2.00-2.49, 2.50-2.99, 3.00-3.49, 3.50-3.99, and 4.00 and the corresponding percentages were 4%, 29%, 41%, 34%, and 1%, respectively. In addition, participants were asked to report their work experience and provided categories were 3 months or less, 4-6 months, 7-12 months, 13-24 months, and 25 months or more, and the percentage of each category was 17%, 23%, 24%, 18%, and 18%, respectively.

In the next question, participants were asked to report their MEQ scores which generally have a range of 16-86. The standard pre-defined categories of MEQ based on the score include 16-30 as "definite evening", 31-41 as "moderate evening", 42-58 as "intermediate", 59-69 as "moderate morning", and 70-86 as "definite morning". The reported scores were categorized based on five category' intervals. Based on the reported scores, the majority of participants (79%) were identified as "Intermediate". The percentage of each category is shown in Figure 1.

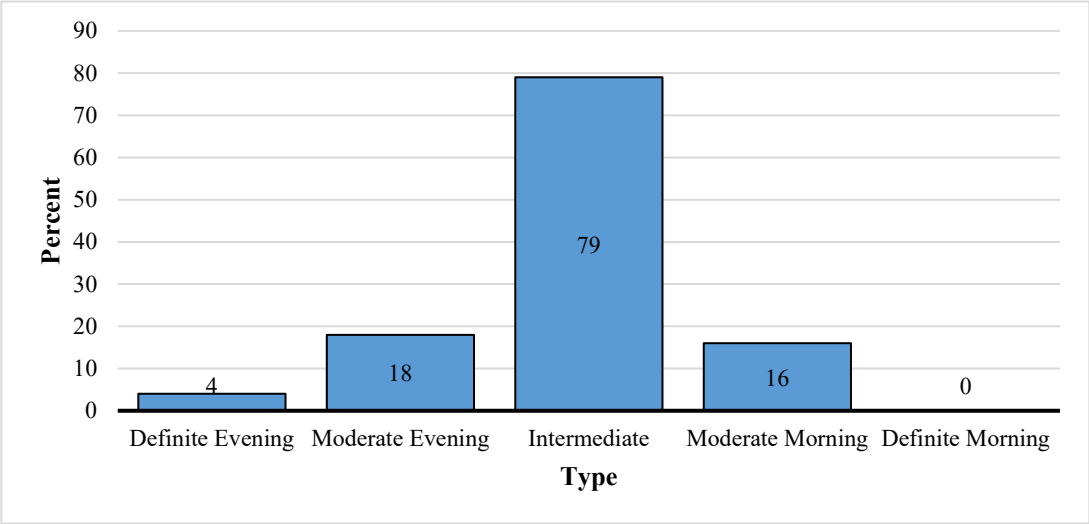


Figure 1. MEQ types

In the next question, participants were asked to report the number of hours per week they generally spent for their courses inside and outside class (total). The reported study hours are shown for each group in Figure 2.

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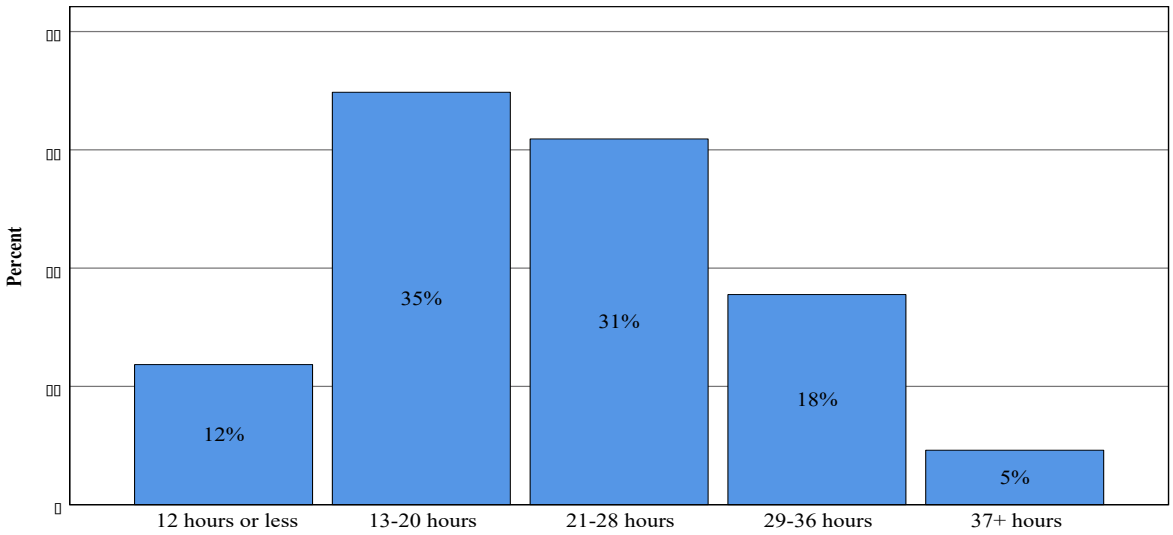


Figure 2. Reported class and study hours

In the next section, participants were asked to specify which class period they preferred to have and in which they had higher efficiency. Table 1 shows the percentage of each class period in response to these two questions.

Table 1. Class period preference and higher efficiency

| Item | 8am – 10am | 10am-12pm | 1pm-3pm | 3pm-5pm |
|---|---|---|---|---|
| Preference | 32 | 59 | 8 | 1 |
| Higher Efficiency | 29 | 57 | 11 | 3 |

In addition, participants were asked to report in which time interval they performed better in individual and group settings. Table 2 shows the percentage of each time interval as reported by participants.

Table 2. Class period preference and higher efficiency

| Work Setting | 6am – 10am | 10am-2pm | 2pm-6pm | 6pm-10pm | 6pm-2am | 2am-6am |
|---|---|---|---|---|---|---|
| Individual work | 5 | 19 | 27 | 39 | 9 | 1 |
| Group work | 3 | 35 | 39 | 20 | 3 | 0 |

In the next section, participants were also asked to report the amount of sleep time that they generally had in a 24-hour interval on working days as well as weekends. The percentage of each group is shown in Table 3.

Table 3. Reported sleep time

| Day | Less than 4 h | 4-5 h | 6-7 h | 8-9 h | 9 h and more |
|---|---|---|---|---|---|
| Workdays | 1 | 16 | 69 | 13 | 1 |
| Weekends | 1 | 7 | 28 | 53 | 11 |

In the next questions, participants were asked what the likelihood was of changing their sleep time to get an ideal one if external factors and conditions allowed. A 5-level Likert scale was used to quantify the responses, including “Very Low”, “Low”, “Moderate”, “High”, and “Very High”. The percentage of these categories was 3%, 13%, 56%, 24%, and 4%, respectively.

The next section of questions covered participants’ perceptions about their expected career time. First, participants responded to the question “how many hours should a fresh graduate of your major at the beginning of their professional career expect to spend for their work per week?”

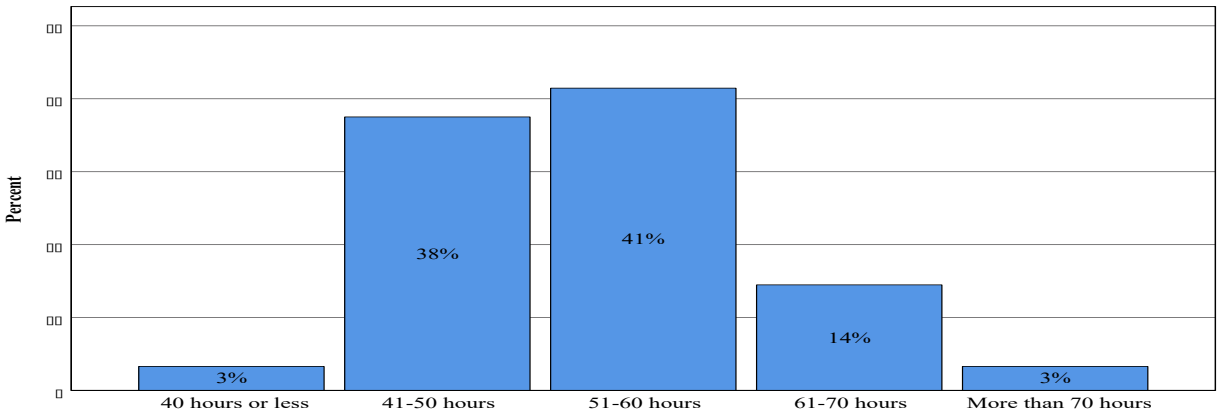


Figure 3. Expected working hours in professional career

The next two questions asked participants to express their expected number of sleep hours and ideal sleep hours when graduated. The first question stated, “On average, how many sleeping hours should a fresh graduate of your major at the beginning of their professional career expect to get in a 24-hour interval on working days?” and the second one asked, “What is an ideal sleeping time for a professional in a 24-hour interval on working days?”. Table 4 shows the percentage of four intervals.

Table 4. Professional expected and ideal sleep time

| Status | 4-5 h | 6-7 h | 8-9 h | 9 h and more |
|---|---|---|---|---|
| Expected | 13 | 62 | 24 | 1 |
| Ideal | 4 | 43 | 52 | 1 |

Also, participants were asked to rate the level of sleep time for employees in construction, compared to other industries. A 5-level Likert scale was used to categorize the perceptions, including “Very Low”, “Low”, “Moderate”, “High”, and “Very High”. The percentage of levels was 8%, 54%, 36%, 2%, and 0%, respectively.

The next section examined the perception of participants about the importance of a series of factors in depriving construction professionals (employees) of getting enough sleep time. A series of pre-defined factors were provided to be rated by a 5-level Likert scale, including “Very Low”, “Low”, “Moderate”, “High”, and “Very High”, which were quantified into 1 to 5 for mathematical calculation. Then, the average score (out of 5) of each factor was calculated for comparison, as shown in Figure 4.

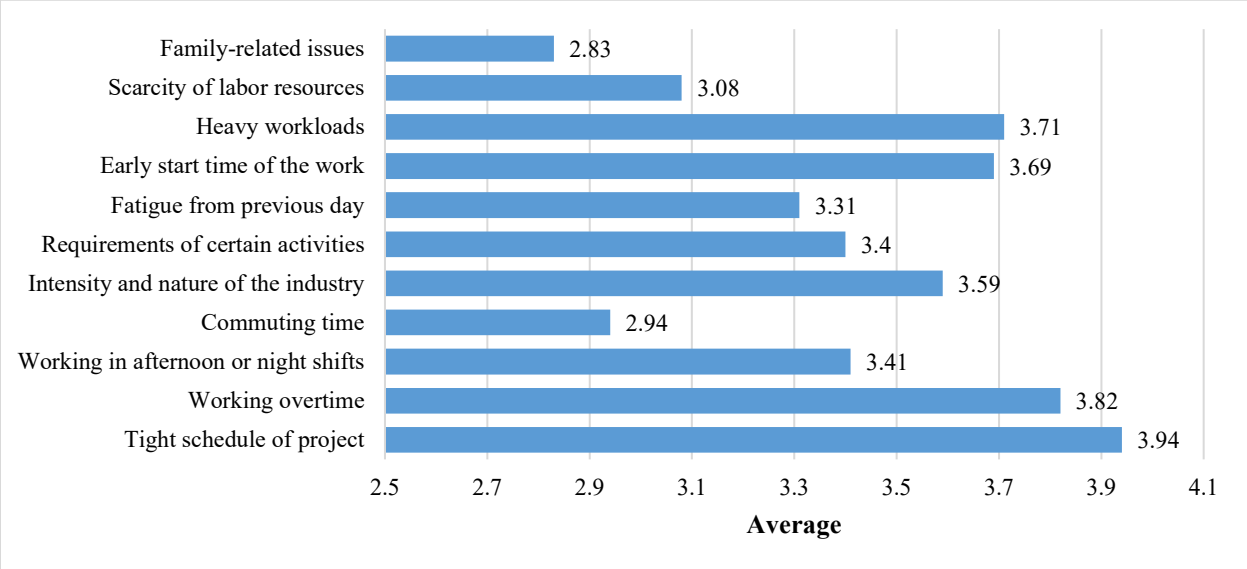


Figure 4. Weight of factors impacting sleep deprivation

Similarly, the effect level of sleepiness on a list of negative consequences among construction professionals was rated. The average of each item (out of 5) is shown in Figure 5. Participants were also asked to rate to what extent, sleepiness/sleep deprivation was an issue in construction,

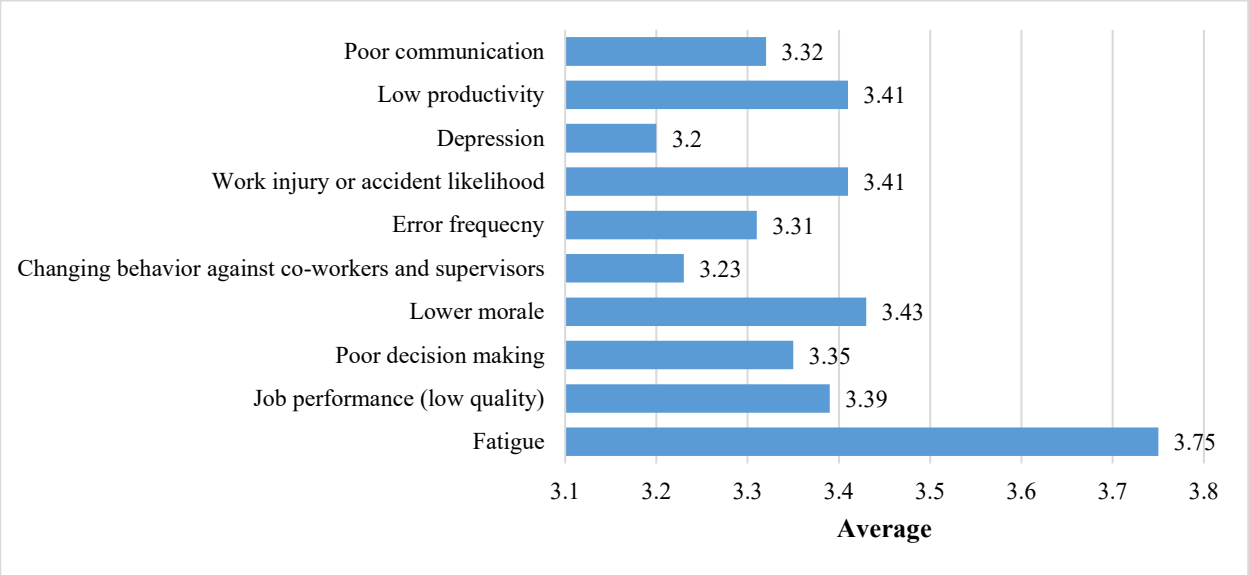


Figure 5. Effect level of sleepiness

using a 5-level Likert scale (Very Low, Low, Moderate, High, and Very High). The response group included Low: 3%, Moderate: 38%, High: 48%, and Very High: 11%.

Finally, participants were asked to rate to what extent, they thought that their required courses were available and offered in different time slots so that they could register for sections that they preferred most. Similarly, a 5-level Likert scale, including "Very Low", "Low", "Moderate", "High", and "Very High" was used in which the percentages were 19%, 26%, 43%, 11%, and 1%, respectively. The percentages indicated a low level of course availability that fit students' preferences.

## Discussion

The review of the results obtained from the analysis of responses reveals noticeable points. While the generalization of these points requires further and more comprehensive studies, it lays a base for thorough discussions among construction scholars and administrators. The first point is the sleep type of participants, derived from the MEQ test. As depicted in Figure 1, the sleep type of participants, on average, was intermediate, with a slight leaning toward evening. This indicates construction administrators can balance morning and evening classes while scheduling. This, on average, may include a wider range of students and respond to their sleep type. The next point is the consistency between preferred class time and perceived higher efficiency. As shown in Table 1, the percentages of various class times in the preference and higher efficiency are consistent which highlights the fact that in the preferred class time, participants perceived a higher quality of performance. The next noticeable point is the differences between the preferred individual work time in comparison with group work time. The highest percentage in the individual work time group was 6 pm to 10 pm, while in the group work time, 2 pm to 6 pm gained the highest percentage. This fact underscores providing opportunities for students to work together in the

afternoon. This can be done in various forms, including a strategic plan to offer lab or studio-based courses, making physical spaces available in the afternoon for students to convene and work in their groups, and holding fewer lecture classes in the afternoon. The reported sleep time during weekdays and weekends was another point that highlights the inconsistencies between sleep habits and time among students. Participants clearly expressed a different sleep duration between working days and weekends. If the amount of sleep during weekends is assumed to be less impacted by external factors, and hence, more self-controlled, students received meaningfully fewer sleep hours during working days. This issue stems from various sources. Nonetheless, the problem with the lack of sufficient sleep time exists, which has consequences on students' performance. These effects are studied and summarized in the literature section. This is aligned with the question on the likelihood of changing sleep time in possible, which was above average. Another notable point is the expected working hours for professionals in the construction industry. The reported hours indicate that the educational system – deliberately or unintentionally – shapes the mindset of students to work 51-60 hours (41%) or 61-70 hours (14%), as reflected in Figure 3. This trend is consistent with the numbers reported for the expected and ideal sleep time in the construction industry, as reflected in Table 4. Finally, another point worth mentioning is the statement about sleepiness/sleep deprivation as an issue in construction, which received a considerable approval rate (High: 48%, and Very High: 11%) against disapproval (Very Low: 0% and Low: 3%). This statement underscores the existence of sleep adequacy and habit issues in the construction industry which should be further explored and alleviated.

## Conclusion

This paper reported on the second phase of a study focusing on the sleep patterns and habits among construction students. The results of a survey collected from 152 construction students revealed that, like many other majors, construction students suffered from a lack of sufficient and proper sleep time. This issue appeared to be worse in some situations, as construction professionals, especially the junior ones after college graduation, tend to spend a higher number of hours per week in their professional careers. This tendency may mask sleep deprivation among young professionals. While this study employed an adequate sample of students, the generalization of findings is not warranted. A larger sample and different situations and conditions make the research design more reliable. The next phase of this study will include the recruitment of subjects from various majors and using discerning factors to reveal interdependencies between subgroups.

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