



**Comparative Analysis of Sleep Patterns: Commuters Versus On-Campus UBC Students**

Course Instructor: Dr. Andrea Bundon ([andrea.bundon@ubc.ca](mailto:andrea.bundon@ubc.ca))

Project Partner: UBC Recreation

Group 24 - Project C

KIN 464: Health Promotion & Physical Activity

School of Kinesiology, University of British Columbia

April 12, 2024

Caroline Do

Melissa Hamilton Sheldon

Sienna Parmar

Igor Strbac

Elle Wruck

***Disclaimer: UBC SEEDS Sustainability Program provides students with the opportunity to share the findings of their studies, as well as their opinions, conclusions and recommendations with the UBC community. The reader should bear in mind that this is a student research project and is not an official document of UBC. Furthermore, readers should bear in mind that these reports may not reflect the current status of activities at UBC. We urge you to contact the research persons mentioned in a report or the SEEDS Sustainability Program representative about the current status of the subject matter of a report.***

## Executive Summary

Sleep plays a crucial role in undergraduate students' academic performance, overall well-being, and quality of life (Schlarb et al., 2017). Understanding the factors influencing sleep patterns and barriers to sleep is essential for developing targeted interventions to enhance sleep quality and promote student success. This study focused on exploring sleep patterns and barriers among current UBC undergraduate students, with a focus on comparing commuters versus on-campus residents.

The primary objective of this research is to investigate sleep patterns and barriers among UBC undergraduate students to identify areas for improvement and develop targeted interventions to enhance sleep quality and overall well-being. By understanding the unique challenges faced by commuters and on-campus residents, this study aims to provide valuable insights into the factors influencing sleep quality and barriers among UBC undergraduate students.

The inclusion criteria for our study involved all commuters and on-campus residents from any faculty and year of undergraduate study. We utilized a mixed-methods approach, incorporating both quantitative and qualitative questions to gather comprehensive self-reported data on sleep patterns, barriers, and related factors among UBC undergraduate students. Data was collected using a Qualtrics survey over a three week period from March 13 to April 3, 2024. The survey was distributed through word of mouth and various social media platforms, such as Instagram and Facebook.

Our findings suggest stress is a key barrier influencing undergraduate UBC students' ability to sleep. Other factors influencing sleep quality patterns include technology/screen time, mental health and school/work/commute pressures. On average, UBC undergraduate students sleep 6 hours and 40 minutes. For sleep quality, close to 45% of UBC undergraduate students either report having fairly bad or very bad quality of sleep. On average there were minimal differences found between students living on campus and commuters. It is important to note that all students who reported having very bad sleep quality were commuters.

Based on the findings, several recommendations are proposed to provide better sleep resources for the UBC campus community. These include implementing sleep education programs, expanding wellness initiatives, and offering free or low-cost exercise classes and beginner physical activity options.

To conclude, this study highlights the importance of addressing sleep patterns and barriers among UBC undergraduate students to promote academic success and overall well-being. By understanding the connectivity of factors influencing sleep health, physical activity promotion initiatives could be developed as target interventions to support enhancing students' quality of sleep and fostering a healthier campus environment.

## Introduction

Sleep impacts individuals' overall health and well-being, including cognitive function and emotional regulation (Zee, 2006). A study done with Canadian university students by Galambos and colleagues (2009) found that better sleep habits lead to decreased negative health behaviours, such as stress and anxiety, and increased productivity in schoolwork. As of 2024, the Canadian Society for Exercise Physiology (CSEP) guidelines identify sleep as a key contributor to achieving health benefits and improving quality of life. It is recommended that every Canadian receives between seven to nine hours of sleep each night with routine bed and wake times (CSEP, 2024). In their research, Lund et al. (2010) noted that insufficient sleep and irregular sleep-wake patterns are alarmingly present in the university student population due to emotional and academic distress. Additionally, individuals with longer commute times due to their occupation or schooling are shown to have an increased likelihood of sleeping problems (Kim et al., 2019). Despite these findings, the current sleep behaviours and patterns of undergraduate students at the University of British Columbia (UBC) remain unknown and lack thorough research. To address this gap, our study aims to provide insight into the sleep behaviours of UBC undergraduate students.

Our project partner, UBC Recreation, is particularly interested in exploring various sleep behaviours such as bedtime consistency, pre-sleep screen time, sleep duration, sleep quality, and other related factors. Both our research group and UBC Recreation aim to understand the sleep behaviours and patterns of UBC students and support them by considering new resources that can promote improved sleep behaviours and habits. Through a greater understanding of the sleep patterns of UBC undergraduate students, strategies and accommodations can be created to ensure students are within the recommendations of the CSEP's guidelines concerning sleep. This study aims to provide a foundational understanding of sleep behaviors and patterns among UBC undergraduate students who are commuters or

living on campus, which could then be used to create recommendations for UBC Recreation to help promote the well-being of students.

## **Literature Review**

### **Overview of Current Literature**

In a cross-sectional study by Lund and colleagues (2010), the researchers examined the sleep patterns and predictors of disturbed sleep in 1125 undergraduate university students. Sleep patterns refer to the habitual timing and duration of sleep, as well as the organization of sleep stages throughout the night (Lund et al., 2010). The researchers found that 70% of undergraduate students were sleeping under eight hours, which falls below the recommended guidelines in this study, with 25% of students reporting sleeping under six and a half hours a night and only 29% of students reporting eight or more hours of sleep (Lund et al., 2010). Furthermore, 38% of students also exhibited poor sleep quality measured with the Pittsburgh Sleep Quality Index (PSQI) (PSQI score  $>7$  indicated poor sleep quality) (Lund et al., 2010). The main contributing factors to poor sleep quality include long sleep latencies, total sleep time, and low enthusiasm (Lund et al., 2010). In this study, poor sleep quality has been linked to negative mood and health outcomes among undergraduate students (Lund et al., 2010). These negative health outcomes include social, psychological, physical, and mental issues such as anxiety, depression, and somatic pain (Lund et al., 2010). These four issues that are affected by lack of sleep are also a part of the determinants of health in individuals (WHO, 2024). Moreover, students with poor quality of sleep also reported higher negative moods, an increase in physical illnesses, and increased substance use of prescription/recreational drugs (Lund et al., 2010). This study concluded that stress levels were one of the greatest determinants of sleep behaviors among university students (Lund et al., 2010). Additionally, university students displayed a higher tendency to have a score greater than seven on the PSQI scale, which will impact mood and health-related outcomes (Lund et al., 2010).

In another study, Schlarb and colleagues (2017) used an online survey to examine the prevalence of sleep disturbances and mental strain in undergraduate students from two European countries; Luxembourg and Germany. Sleep disturbances refer to any disruptions or abnormalities in typical sleep patterns (Schlarb et al., 2017). These disturbances can affect the duration, quality, or timing of sleep, leading to difficulties in falling asleep, staying asleep, or experiencing restorative sleep (Schlarb et al., 2017). As explained by Schlarb and colleagues (2017), mental strain is a state of heightened cognitive and emotional pressure experienced by an individual. It is characterized by the perception of excessive demands or challenges that tax one's mental resources and coping mechanisms beyond normal levels (Schlarb et al., 2017). The findings of this study showcased an alarming level of sleep disturbances, which lead to an increase in emotional stress with an elevated mental strain found in undergraduate students.

The two studies previously discussed by Lund et al. (2010) and Schlarb et al. (2017) highlight that university students are more susceptible to lack of sleep, respectively. Following this, Owens et al. (2017) conducted a review where they observed the biological, environmental, and technological factors that affect sleep behaviors in college students. The findings from their review suggest that young adults' melatonin levels peak during later hours and also experience changes in their homeostatic drive to sleep (Owens et al., 2017). Melatonin is a hormone that your brain produces in response to darkness, which helps with sleep duration and quality (Owens et al., 2017). Homeostatic drive refers to the pressure to sleep; the pressure gets stronger the longer a person stays awake and decreases after a full night of good-quality sleep (Owens et al., 2017). These changes impact sleep behavior as they result in later sleep times and inhibit college students from getting the recommended seven to ten hours of sleep required for maximum health (Owens et al., 2017). The researchers also found that the transition to college introduces significant environmental and

social influences on students' sleep behaviors (Owens et al., 2017). This could include lifestyle choices and behavioral changes which are influenced by the lack of parental guidance and independent decision-making (Owens et al., 2017). In addition, environmental factors such as noise disturbances in dormitories, heavier course workloads, economic stressors, and social activities often lead students to sacrifice sleep (Owens et al., 2017). To cope with these demands, students often turn to energy drinks, unaware of their potential to disturb sleep (Owens et al., 2017). The researchers also discovered that smartphone use and social media have contributed to delayed sleep times and poor sleep habits (Owens et al., 2017). As such, the use of smartphones stimulates the brain, hindering the onset of sleep and disrupting sleep quality (Owens et al., 2017). After discovering the academic and health-related consequences of sleep insufficiency, the review suggests the need for more comprehensive sleep assessments in healthcare settings to reduce the negative outcomes of sleep insufficiency and promote a healthy lifestyle for college students (Owens et al., 2017).

To overcome and identify the barriers to proper sleep requirements in young adults, Paterson et al. (2019) aimed to determine what changes, if any, young adults are willing to make to their sleep behaviors. They conducted a qualitative investigation that surveyed Australian young adults, aged 16-25. Their findings indicated that young adults want to change their sleep behaviours but appear to have little success implementing solutions on their own (Paterson et al., 2019). The researchers reported that 71% of their participants were involved in work and school, with time demands identified as a common barrier to improving sleep behaviors (Paterson et al., 2019). Additionally, participants were reported to have biologically delayed sleep schedules, due to the demands of their school and work schedules. Paterson et al. (2019) identified four common barriers in their research that prevent participants from getting good sleep: time demands, technology use, difficulty switching off (feeling of being “programmed to be constantly doing something”) and having unpredictable

routines. The researchers emphasized the pressing need for enhanced sleep education and effective strategies to mitigate the adverse effects of using social networks before and during bedtime (Paterson et al., 2019). Moreover, Paterson et al. (2019) underscored the necessity for interventions that recognize young adults' biologically delayed sleep schedules.

### **Limitations in the Existing Knowledge**

With the existing knowledge, there is a gap within the literature that does not specifically address the vast differences in sleep quality and behaviors between undergraduate students who commute and those who live on a university campus. Furthermore, there is a lack of knowledge surrounding the variability in the challenges faced by commuters including how their wake and sleep times are affected by the demands of their commute. Therefore, when deciding on our target population, our focus lies on comparing and contrasting the barriers to sleep among undergraduate UBC students who commute and those who live on campus. This is especially critical to examine given the unique makeup of UBC's undergraduate body, which comprises 48,000 students, while campus housing is accessible to only 13,000 occupants (University of British Columbia, n.d.).

Additionally, with the acquired data from the UBC undergraduate population, we will be able to provide UBC Recreation with specific recommendations on how to improve the sleep behaviours of undergraduate students. Although there are many findings for sleep disturbances related to mental health, such as academic stress (Lund et al., 2010; Owens et al., 2017), there are limitations to the relevancy of this existing data as the population of those studies may not translate to UBC undergraduate students. Sleep disturbances in undergraduate students are often influenced by confounding variables such as caffeine intake, screen time, academic workload, overall stress, and mental health issues. This limits the control for these variables which can be a challenge and may affect the interpretation of other study findings.



By recognizing the current limitations in research, our study will be effective in aiming to understand the barriers to sleep faced by undergraduate students at UBC; thereby, overcoming these limitations.

### **Purpose of the Study**

The purpose of this study is to identify and understand the barriers to sleep experienced by UBC undergraduate students, comparing and contrasting the challenges faced by commuters and those who reside on the Vancouver campus. The research questions our study aims to address are as follows: 1. What are the differences in sleep quality between undergraduate students who commute to campus compared to those who reside on campus? 2. What are the most prevalent factors that influence sleep patterns? 3. How do commuters and on-campus undergraduate students differ in their sleep duration, wake times and bedtimes? Lastly, this study aims to shed light on the disparities in sleep quality among the UBC population, specifically focusing on commuters and on-campus undergraduate students. By analyzing the factors influencing sleep patterns and identifying the barriers to good sleeping habits amongst these two groups, our objective is to provide valuable insights to the Physical Activity Unit of UBC Recreation so they can guide specific interventions and support strategies to improve the overall sleep quality and well-being of UBC's diverse student population.

## **Methods**

### **Study Design**

Our study used a mixed-methods approach to collect our research exploring both qualitative and quantitative measures of sleep. This was done through the use of Qualtrics surveys. As such, we crafted a comprehensive questionnaire encompassing various factors known to influence sleep quality. Our research aimed to investigate the following topics which include the variance in sleep quality between undergraduate students who commute to

campus and those who reside on campus. We also wanted to identify the primary factors influencing sleep patterns among undergraduate students and explore potential disparities in sleep duration and bedtime routines between commuters and on-campus residents. The survey examined participants' daily routines, stress levels, living conditions, and commuting distance and schedules, aiming to provide a thorough understanding of the multifaceted aspects impacting their sleep patterns. Additionally, we ensured that the survey captured essential demographic information, including students' faculty, year of study, and commuting status. By incorporating these demographic details, we were able to contextualize and analyze the responses to discover any potential differences or correlations between various groups within the undergraduate student population.

Buysse and colleagues (1989) developed the Pittsburgh Sleep Quality Index, which is an instrument to measure sleep quality. We used aspects of the Pittsburgh Sleep Quality Index to determine sleep quality. We also used both open-ended and closed-ended questions as well as using Likert scales to obtain different measurements of responses. We utilized quantitative questions to measure variables and seek numerical data as responses such as 'How many hours of sleep do you typically get per night?'. Lastly, before the survey was released to the public, we tested its validity amongst our research team to identify any potential issues and made the necessary adjustments.

At the beginning of our survey, we also included an informed consent procedure to ensure participants understood the purpose of the study, their rights, and how their data would be used and protected.

### **Study Population**

The inclusion criteria of our study was any undergraduate student who was enrolled at the UBC Vancouver Campus.

## **Participant Recruitment**

We used social media platforms such as Instagram and Facebook to distribute survey links to recruit participants. In addition, we distributed survey links through word of mouth to others (see Appendix A). We also highlighted the recruitment message to specifically target both commuters and on-campus residents. To boost participation rates, we used incentives such as the opportunity to enter a raffle for prizes (see Appendix B).

## **Data Collection**

The Qualtrics survey remained open for responses for a duration of three weeks, spanning from March 13 to April 3, 2024. To maintain the integrity of our study, we closely monitored survey responses and tracked participation levels to ensure a sufficient sample size for both commuter and on-campus resident groups. This monitoring process involved regularly assessing the number of responses received. We also verified each response for completeness and consistency, safeguarding the accuracy and reliability of the collected data. Furthermore, to streamline the data collection process, we established a deadline for reaching a specific number of responses.

Since our study is a mixed methods study, we planned to use descriptive qualitative, descriptive statistics and inferential statistics. We also planned to complete an unpaired t-test to determine if there are any differences between commuters and students who live on campus in terms of total sleep time, bedtimes and wake times.

## **Results and Findings**

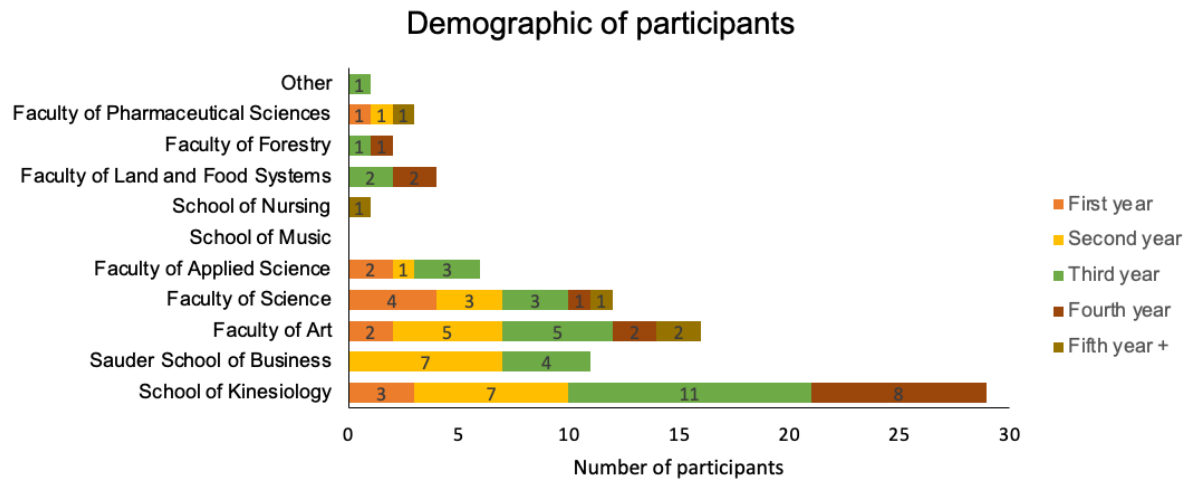
### **Participant Demographics**

A total of 89 participants took the anonymous Qualtrics survey for our study (Figure 1). Four participants were excluded from the analysis as they only completed the first question of the survey, leaving 85 participants for our data analysis (n=85). Of the 85

participants, 56% (n=48) reported that they lived on the UBC Vancouver campus and 44% (n=37) reported they were commuters.

### Figure 1

*Breakdown of the Demographic of Participants Collected in the Survey*



When asked about participants' respective faculties of study, a total of 34% (n=29) reported being enrolled in the School of Kinesiology, 19% (n=16) in the Faculty of Arts, 14% (n=12) in the Faculty of Science, 13% (n=11) in the Sauder School of Business, 7% (n=6) in the Faculty of Applied Science, 5% (n=4) in the Faculty of Land and Food Systems, 4% (n=3) in the Faculty of Pharmaceutical Sciences, 2% (n=2) in the Faculty of Forestry, 1% (n=1) in the School of Nursing, and 1% (n=1) in another unlisted faculty. Additionally, most participants reported being in their third (n=30) or second year (n=24) of their undergraduate studies, with some in their fourth year (n=14) and first year (n=12), and few reported being in their 5th year or higher (n=5).

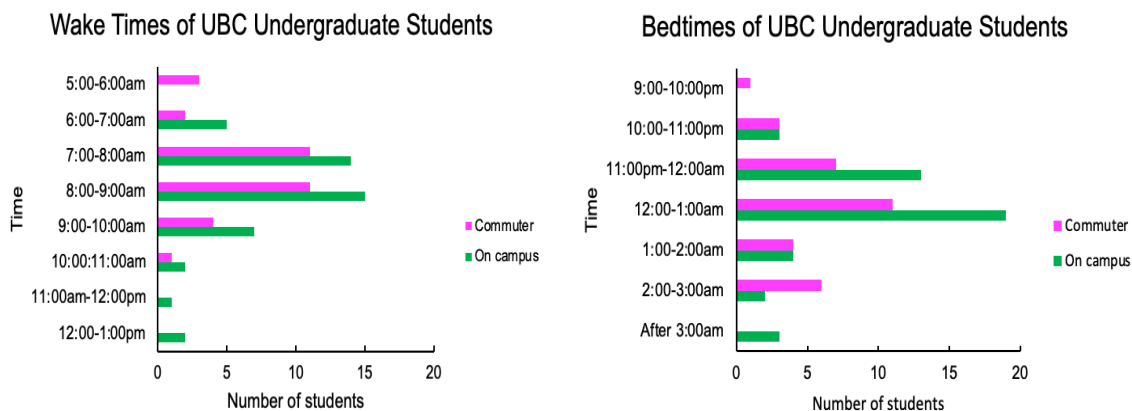
When comparing participants who live on campus and those who were commuters, there were no differences found in average total sleep time (SMD [95% CI] = 0.13 [-0.32 to 0.59] P=0.57), wake times (SMD [95% CI] = 0.52 [-0.08 to 1.12] P=0.09), or bedtimes (SMD [95% CI] = 0.05 [-0.53 to 0.63] P=0.86), which is summarized in Table 1, Figure 2 and Figure 3.

**Table 1***Sleep Time and Patterns of Undergraduate UBC Students*

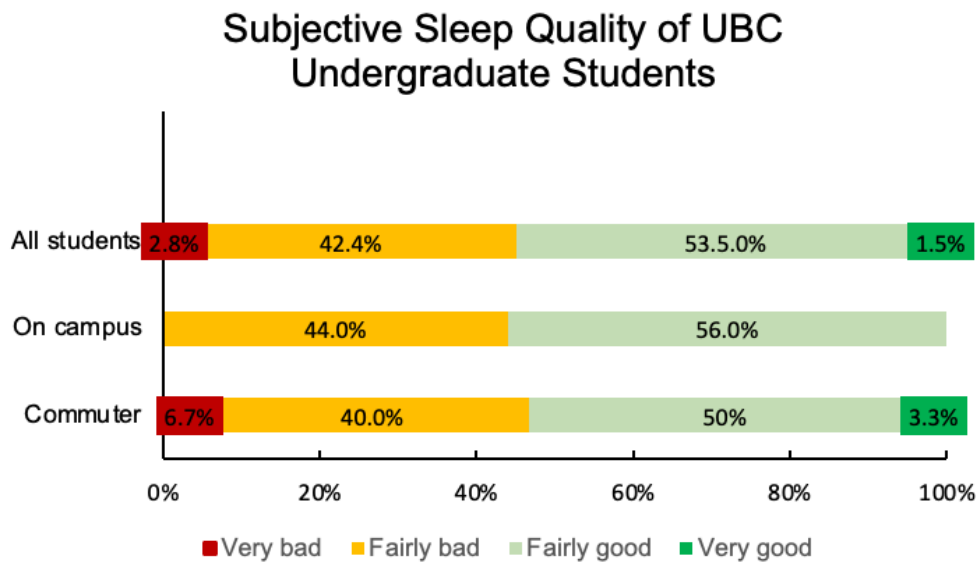
	Total participants N=85		On campus N=48		Commuters N=37	
	<i>M</i>	<i>CI 95%</i>	<i>M</i>	<i>CI 95%</i>	<i>M</i>	<i>CI 95%</i>
Bedtime	12:00- 1:00am ± 9	11:43pm to 1:17am	12:00- 1:00am ± 11	11:39pm to 1:21 am	12:00- 1:00am ± 14	11:43pm to 1:27 am
Wake time	7:15-8:15am ± 9	6:58 to 8:32am	8:00-9:00am ± 12	7:35 to 8:25 am	7:30-8:30am ± 12	7:05 to 8:55 am
Time to fall asleep	29m ± 2	24m to 34m	30m ± 3	25m to 35m	28m ± 4	20m to 36m
Sleep time	6H and 40m ± 7	6H and 27m to 6H and 53m	6H and 44m ± 8	6 H and 29m to 7H and 1m	6H and 36m ± 11	6H and 14m to 6 H and 58m

**Notes:** ± values = SEM (in minutes),

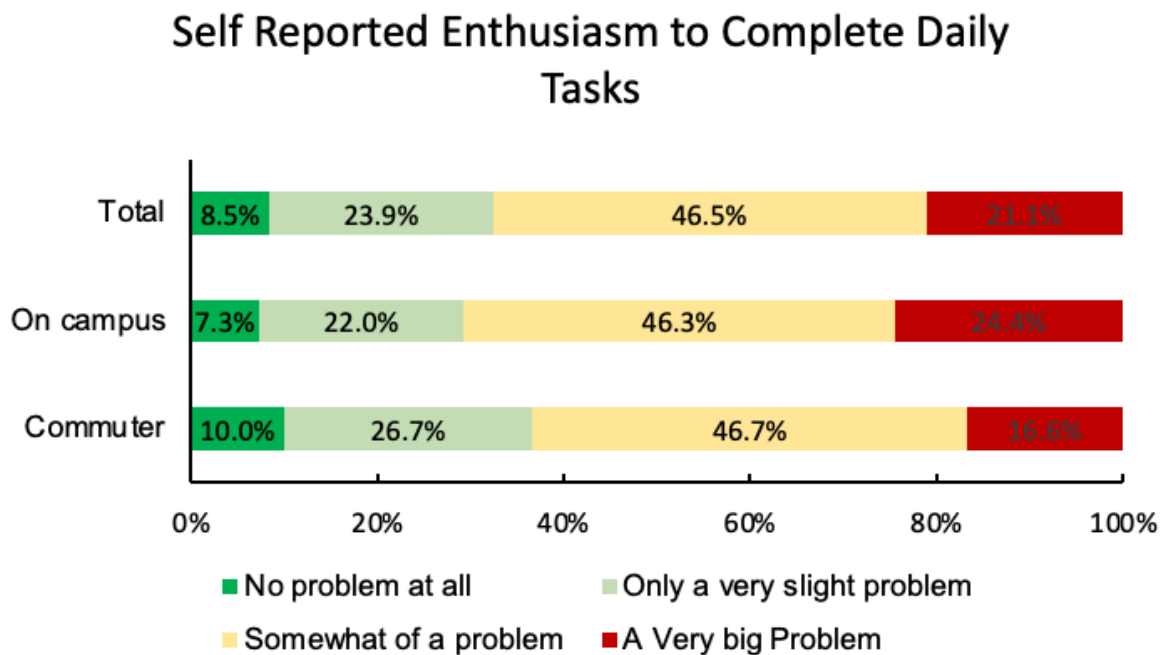
**Abbreviations:** M, mean; CI, confidence interval; H, hours; m, minutes

**Figures 2 and 3***Wake Times and Bedtimes of UBC Undergraduate Students*

Furthermore, approximately 45% of UBC undergraduate students reported having “fairly bad” or “very bad” quality of sleep. On average, there were minimal differences found in subjective reporting of sleep quality between students living on campus and commuters (Figure 4). However, it is important to note that the participants who reported having very bad sleep quality were commuter students.

**Figure 4***Subjective Sleep Quality of Participants*

In addition to these findings, our data also suggests students struggle with maintaining enough enthusiasm to complete daily tasks, which could be an indicator of daytime dysfunction due to a lack of sleep (Buysse et al., 1989). We identified that 46.5% of participants reported having somewhat of a problem with keeping up enthusiasm to complete daily tasks within the past month, and 21.1% reported having a very big problem with keeping up enthusiasm to complete daily tasks within the past month (Figure 5). Results were similar among commuters and students who live on campus, with only slight differences in students who report having a very big problem maintaining enthusiasm to complete daily tasks. 24.4% of students on campus reported having problems with enthusiasm to complete daily tasks within the past month, while 16.6% of commuters reported having a very big problem within the past month. These findings support our previous findings regarding total sleep and subjective sleep quality as worse sleep outcomes are associated with less enthusiasm (Buysse et al., 1989).

**Figure 5***Enthusiasm to Complete Daily Tasks*

Finally, our data suggests that stress is a common barrier many students face when attempting to sleep. Approximately 40% of students reported that stress impacts their ability to sleep. Close to 70% of total participants reported that stress impacts their ability to sleep at least once or twice a week (Figure 6). Additionally, commuter students reported experiencing stress three or more times a week (54.9%), more than students who live on campus (31.0%). In our open-ended questions regarding barriers to sleep, stress was a common answer provided by participants (Figure 7). In addition, many aspects that could contribute to stress were reported as well, such as course load, work obligations and a lack of time.

**Figure 6***Stress Impacting Sleep*





undergraduate students on average sleep only six hours and forty minutes per day, which is below the recommended CESP guidelines of seven to nine hours (CSEP, 2024). In addition, almost half of the students reported having “fairly bad” or “very bad” sleep quality.

Consequently, poor sleep quality has been linked to a lack of enthusiasm to complete tasks (Lund et al., 2010). We found that approximately 46% of students reported keeping up enthusiasm as somewhat of a problem and 21% reported it as a very big problem. Thus, our findings are in line with Lund et al. (2010), who similarly found close to 40% of university students have poor sleep quality and tend to exhibit low enthusiasm.

Furthermore, Lund et al. (2010) found stress to be one of the greatest determinants of sleep behaviours among university students, which is in accordance with our findings. Poor sleep patterns and behaviours exhibited from our data may be related to the high occurrence of stress reported by students, as stress is related to decreased sleep quality and quantity among students (Galambos et al., 2009; Schlarb et al., 2017).

On average, there were no major differences between students living on campus and commuters in terms of total sleep, wake time, and bedtime. This opposes the findings of Kim et al. (2019), who noted that men and women with longer commute times are shown to have an increased likelihood of sleep problems. Our data contradicts our original assumptions, as we had speculated that wake times and bedtimes would vary among commuters and students who live on campus. We hypothesized that commuters may experience greater variability in sleep patterns due to the demands of travelling to the UBC campus.

Overall, our findings elucidate sleep patterns, behaviours and barriers of many UBC undergraduate students. We have found that students do not get enough hours of sleep, have poor quality sleep, and stress is a common barrier for students to achieve restful sleep. UBC Recreation wanted to know more about the sleep patterns and behaviours of UBC students, in which our findings can serve as valuable insights for guiding the creation and restructuring of

tools to improve sleep outcomes and support the well-being of UBC students. Specifically, we intend to assist UBC Recreation in reaching this objective by offering several recommendations based on our findings.

### **Limitations**

There were three primary limitations in this study. First, the validity of our findings might be compromised as we relied on self-reported data from participants, which is subject to recall bias (Althubaiti, 2016). Recall bias can result in overestimations or underestimations of the true effect or association (Althubaiti, 2016). To prevent this, we limited the recall period on surveys to within the last month. For instance, we asked, “On average within the past month, how many hours have you slept a day?”. Despite this, it is still possible that the self-reported data influenced our results.

Secondly, the commuter data was analyzed all in one group, regardless of commute time. As mentioned earlier, Kim and colleagues (2019) suggest people with longer commute times may experience more sleep problems. It is possible there could be significant differences between commuters and students who live on campus if we created subgroups of commuters dependent on their total commute time and distance they have to travel, and then compared these groups to people who live on campus.

Finally, our sample was taken during one of the midterm periods at UBC Vancouver. A study done with undergraduate students by Scullin and colleagues (2018) indicated that fewer than 10% of students sleep eight hours or more before exams. Consequently, it is possible students were experiencing a disproportionate amount of stress, unrepresentative of stress levels experienced throughout the regular school semester. This disproportionate amount of stress could have likely influenced their normal sleep patterns and behaviours, decreasing the validity of our results.

## Recommendations

Our findings suggest stress is a key barrier influencing undergraduate UBC students' ability to sleep. In addition, students' average reported sleep time falls under the CSEP recommended guidelines (2024) and close to 45% of students are reporting “fairly bad” to “very bad” sleep quality. Previous studies have identified physical activity as a potent intervention in reducing stress, improving sleep quality and increasing total sleep time (De Nys et al., 2022; Kredlow et al., 2015). Our recommendations to UBC Recreation will revolve around making physical activity more accessible for UBC undergraduate students, which will consequently result in improved sleep outcomes.

Our first recommendation is to offer and promote more free/low-income physical activity programs or events. UBC contains a unique population of primarily young adults (aged 18-25) who may experience increased socioeconomic barriers than the general population (Escarce, 2003). Socioeconomic barriers can limit physical activity participation (Withall et al., 2011). If there are more free/low-income physical activity programs or events offered by UBC Recreation, this could decrease socioeconomic barriers that UBC students may face, making them more likely to engage in physical activity.

Our second recommendation is to offer more beginner-friendly physical activity programs/events and to advertise them as such. According to the UBC Wellbeing report, close to 40% of students are not meeting the guidelines for physical activity (CSEP, 2024; University of British Columbia, 2023). The idea of social cognitive frameworks suggests individuals will participate in physical activity if two conditions are met; Physical activity is important to them and they are truly capable of enacting an activity (Rhodes et al., 2019). Providing beginner-related physical activity programs/events can support students with low perceived competence, making them more likely to engage in physical activity programs/events. (Withall et al., 2011). For instance, a student may be less inclined to join a

gym because it would require them to have an understanding of fundamental movements and exercises, but may be more inclined to join a beginner group fitness session where an instructor can help fill that competency gap. These types of programs/events could be beginner swim classes, beginner dance classes or even beginner cycling classes. UBC Recreation can survey the broader UBC student body to determine which type of beginner classes are most needed among those that are currently offered. These classes would strive to get students more involved in physical activity and help them develop the skills and competency to engage in physical activity regularly and independently.

Our final recommendation is to continuously improve the workshops and services offered at UBC. We are suggesting that UBC Recreation collaborates with UBC Wellbeing to host workshops or seminars about proper sleep hygiene, the relationship between physical activity and sleep, and overall well-being. These workshops should be designed to provide evidence-based information regarding how regular exercise can positively influence sleep patterns and offer practical tips for integrating physical activity into students' daily routines. To increase attendance at these workshops, organizers can offer incentives such as free healthy food, snacks and raffle prizes. Once the educational workshops are complete, the next step could be to direct students toward further resources and physical activity programs hosted by UBC Recreation. UBC Recreation can also implement sleep-improving exercise programs that are designed to be offered at accessible locations on campus for all students. For instance, yoga, tai chi and mindfulness drop-in classes can all be effective for decreasing stress, and as a byproduct, increasing the quality and duration of sleep (Galambos et al., 2009; Schlarb et al., 2017; Zou et al., 2018).

### **Conclusion**

Previously, little was known regarding the sleep patterns and behaviours of UBC students. In our study, we were able to collect quantitative and qualitative data that helped us

identify the sleep times, quality and sleep barriers UBC undergraduate students currently face. Based on our findings, recommendations to help UBC Recreation enhance the well-being of students were developed.

The present study gathered self-reported data on sleep patterns and barriers from UBC undergraduate students. The findings indicate stress as a significant barrier to sleep, along with school, work, and lack of time. Despite minimal differences between commuters and on-campus residents in terms of sleep patterns, it is noteworthy that participants who reported experiencing “very bad” sleep quality were commuters.

This study adds to the existing knowledge by highlighting the sleep behaviours and challenges faced by UBC undergraduate students, with a focus on commuters compared to on-campus residents, a population previously unexplored in this context. These recommendations offer achievable steps to improve sleep behaviours and well-being among students. By recommending additional free or low-cost physical activity programs and events, physical activity can be more accessible to students facing financial constraints. Moreover, offering beginner-friendly programs and advertising them as such can empower students with low competence to engage in physical activity and ultimately contribute to a more active UBC community. Additionally, continuous improvement of workshops and services in collaboration with UBC Wellbeing can provide students with valuable education on proper sleep hygiene and the relationship between physical activity and sleep.

Furthermore, the findings emphasize the urgency of implementing campus-wide initiatives to support students in improving their sleep habits. These efforts should be tailored to meet the diverse needs of its student population through collaboration with students, faculty members, and researchers.

Overall, this research highlights the importance of addressing sleep behaviours and barriers among undergraduate students to promote wellness. By understanding the challenges

faced by commuters and on-campus residents, targeted interventions can be implemented to create a healthier campus environment and enhance student success.

## References

- Althubaiti, A. (2016). Information bias in health research: Definition, pitfalls, and adjustment methods. *Journal of Multidisciplinary Healthcare, 9*(1), 211-217.  
<https://doi.org/10.2147/JMDH.S104807>
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*(2), 193-213.  
[https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- CSEP. (2024). *Adults 18-64 – 24-hour movement guidelines*. 24 Hour Movement Guidelines.  
<https://csepguidelines.ca/guidelines/adults-18-64/>
- De Nys, L., Anderson, K., Ofosu, E. F., Ryde, G. C., Connelly, J., & Whittaker, A. C. (2022). The effects of physical activity on cortisol and sleep: A systematic review and meta-analysis. *Psychoneuroendocrinology, 143*, 105843-105843.  
<https://doi.org/10.1016/j.psyneuen.2022.105843>
- Escarce J. J. (2003). Socioeconomic status and the fates of adolescents. *Health services research, 38*(5), 1229–1233. <https://doi.org/10.1111/1475-6773.00173>
- Galambos, N. L., Dalton, A. L., & Maggs, J. L. (2009). Losing sleep over it: Daily variation in sleep quantity and quality in Canadian students' first semester of University. *Journal of Research on Adolescence, 19*(4), 741–761.  
<https://doi.org/10.1111/j.1532-7795.2009.00618>
- Kim, S., Kim, Y., Lim, S.-S., Ryoo, J.-H., & Yoon, J.-H. (2019). Long commute time and sleep problems with gender difference in work–life balance: A cross-sectional study of more than 25,000 workers. *Safety and Health at Work, 10*(4), 470–475.  
<https://doi.org/10.1016/j.shaw.2019.08.001>

- Kredlow, M. A., Capozzoli, M. C., Hearon, B. A., Calkins, A. W., & Otto, M. W. (2015). The effects of physical activity on sleep: A meta-analytic review. *Journal of Behavioral Medicine, 38*(3), 427-449. <https://doi.org/10.1007/s10865-015-9617-6>
- Lund, H. G., B.A, Reider, B. D., B.A, Whiting, A. B., R.N, & Prichard, J. R., Ph.D. (2010). Sleep patterns and predictors of disturbed sleep in a large population of college students. *Journal of Adolescent Health, 46*(2), 124-132. <https://doi.org/10.1016/j.jadohealth.2009.06.016>
- Owens, H., Christian, B., & Polivka, B. (2017). Sleep behaviors in traditional-age college students: A state of the science review with implications for practice. *Journal of the American Association of Nurse Practitioners, 29*(11), 695-703. <https://doi.org/10.1002/2327-6924.12520>
- Paterson, J. L., Reynolds, A. C., Duncan, M., Vandelanotte, C., & Ferguson, S. A. (2019). Barriers and enablers to modifying sleep behavior in adolescents and young adults: A qualitative investigation. *Behavioral sleep medicine, 17*(1), 1-11. <https://doi.org/10.1080/15402002.2016.1266489>
- Pilcher, J. J., Ginter, D. R., & Sadowsky, B. (1997). Sleep quality versus sleep quantity: Relationships between sleep and measures of health, well-being and sleepiness in college students: Sleep pathophysiology: A useful tool in psychiatry. *Journal of Psychosomatic Research, 42*(6), 583-596.
- Rhodes, R. E., McEwan, D., & Rebar, A. L. (2019). Theories of physical activity behaviour change: A history and synthesis of approaches. *Psychology of Sport and Exercise, 42*, 100-109. <https://doi.org/10.1016/j.psychsport.2018.11.010>



- Schlarb, A. A., Claßen, M., Grünwald, J., & Vögele, C. (2017). Sleep disturbances and mental strain in university students: Results from an online survey in Luxembourg and Germany. *International journal of mental health systems, 11*, 1-10.  
<https://doi.org/10.1186/s13033-017-0131-9>
- Scullin, M. K. (2019). The Eight Hour Sleep Challenge During Final Exams Week. *Teaching of Psychology, 46*(1), 55-63. <https://doi.org/10.1177/0098628318816142>
- Withall, J., Jago, R., & Fox, K. R. (2011). Why some do but most don't. barriers and enablers to engaging low-income groups in physical activity programmes: A mixed methods study. *BMC Public Health, 11*(1), 507-507. <https://doi.org/10.1186/1471-2458-11-507>
- World Health Organization (WHO). (2024). *Determinants of Health*. World Health Organization.  
<https://www.who.int/news-room/questions-and-answers/item/determinants-of-health>
- University of British Columbia. (2023). *UBC Wellbeing Report 2022-2023*.  
<https://wellbeing.ubc.ca/annualreport22-23#Physical%20Activity>
- University of British Columbia (n.d.). *UBC Overview & Facts*.  
<https://www.ubc.ca/about/facts.html>
- Zee, P. C. (2006). Sleep and Health. *Archives of Internal Medicine, 166*(16), 1686.  
<https://doi.org/10.1001/archinte.166.16.1686>
- Zou, L., Sasaki, J. E., Wei, G., Huang, T., Yeung, A. S., Neto, O. B., Chen, K. W., & Hui, S. S. (2018). Effects of Mind-Body exercises (tai Chi/Yoga) on heart rate variability parameters and perceived stress: A systematic review with meta-analysis of randomized controlled trials. *Journal of Clinical Medicine, 7*(11), 404.  
<https://doi.org/10.3390/jcm7110404>

## Appendix A

### Social Media Recruitment Poster



THE UNIVERSITY OF BRITISH COLUMBIA

School of Kinesiology  
210-6081 University Boulevard  
Vancouver, BC Canada V6T 1Z1

Phone 604 822 9192  
Fax 604 822 6842  
www.kin.ubc.ca

Are you a tired Undergraduate student who attends  
UBC? We would love to hear from you!

As part of a course-based research project (KIN 464), we are conducting a study on the  
sleep patterns of UBC undergraduate students.



If you are a commuter or reside on campus at UBC, we would love to hear from you!

Survey respondents will have the opportunity to enter a draw to win one of the following  
prizes: **Lululemon yoga mat (2), UBC Athletics Prize Pack (4)**

For more information about this project, follow the link/QR code

Project ID: H17-03560-A017, Group 24



[https://ubc.ca1.qualtrics.com/jfe/form/SV\\_1B7dOXckXNZ8JPo](https://ubc.ca1.qualtrics.com/jfe/form/SV_1B7dOXckXNZ8JPo)

Please note that this post is public and anyone who likes, comments or shares the link will,  
by doing so, be associated with the study. The Principal Investigator on this project is Dr.  
Andrea Bundon ([andrea.bundon@ubc.ca](mailto:andrea.bundon@ubc.ca))

## Appendix B

Copy of the Survey

### Default Question Block

#### **CLASS PROJECT: Health Promotion and Physical Activity (KIN 464)**

**Participant Consent Form** Comparative Analysis of Sleep Patterns: Commuters versus On-Campus Students Group  
24

**Project ID:** H17-03560-A017

**Principal Investigator:** Dr. Andrea Bundon (Assistant Professor, School of Kinesiology, Faculty of Education)

**The purpose of the class project:** To gather knowledge and expertise from community members on the evident barriers to sleep experienced by UBC undergraduate students, comparing and contrasting the challenges faced by commuters and those living on campus.

**Study Procedures:** With your permission, we are asking you to participate in a survey. You may only complete each survey once. With the information gathered, students will critically examine how different individuals understand or engage in health promoting activities or health promotion initiatives.

**Project outcomes:** The information gathered will be part of a written report for the class project. The written report will be shared with campus partners involved with the project. Summaries of findings will also be posted on the following websites. UBC SEEDS Program Library:

<https://sustain.ubc.ca/courses-degrees/alternative-credit-options/seeds-sustainability-program/seeds-sustainability-library> No personal information/information that could identify participants will be included in these reports or shared with campus partners.

**Potential benefits of class project:** There are no explicit benefits to you by taking part in this class project. However, the survey will provide you with the opportunity to voice your opinion on your experiences with health promoting activities or initiatives in a broad sense and will provide the students with an opportunity to learn from your experiences. Confidentiality: Maintaining the confidentiality of the participants involved in the research is paramount, and no names of participants will be linked to the data collected. At the completion of the course, all data (i.e. notes) and signed consent forms will be stored on a secure electronic drive by Dr. Bundon. All data and consent forms will be destroyed 1 year after completion of the course.

**Risks:** The risks associated with participating in this

research are minimal. There are no known physical, economic, or social risks associated with participation in this study. You should know that your participation is completely voluntary and you are free to withdraw from the study and there will not be negative impacts related to your withdrawal. If you withdraw from the study, all of the information you have shared up until that point will be destroyed.

**Contact for information about the study:** If you have any questions about this class project, you can contact Andrea Bundon by email at [andrea.bundon@ubc.ca](mailto:andrea.bundon@ubc.ca)

**Research ethics complaints:** If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or e-mail [RSIL@ors.ubc.ca](mailto:RSIL@ors.ubc.ca) . or call toll free 1-877-822-8598.

**Consent:** Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time.

**By proceeding with this survey, I am confirming I have read the above information and agree to participate in this research project.**

**Block 1**

Are you currently an undergraduate student at the University of British Columbia?

- Yes
- No

What faculty are you currently in?

- School of Kinesiology
- Sauder School of Business
- Faculty of Art
- Faculty of Science
- Faculty of Applied Science
- School of Music
- School of Nursing
- Faculty of Land and Food Systems
- Faculty of Forestry
- Faculty of Pharmaceutical Sciences
- Other

What year of your undergraduate degree are you currently in?

- 1
- 2
- 3
- 4
- 5+

Do you live on the UBC Vancouver Campus?

- Yes
- No

Do you commute to the UBC Vancouver campus?

- Yes
- No

If you do commute to campus, which form(s) of

transportation do you use?

- Public transit
- Driving
- Biking
- Taxi/Uber
- other
- I do not commute to campus

Regardless of mode(s) of transportation, on average how long does it usually take to commute to campus? Enter 'N/A' if you do not commute to campus.

- Less than 15 minutes
- 15-30 minutes
- 30-45 minutes
- 45-60 minutes
- 1-2 hours
- 2-3 hours
- N/A (I do not commute to campus)

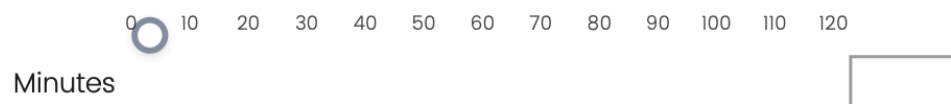
### **Block 3**



During the past month, what time have you usually gone to bed at night?

- Before 7:00pm
- 7:00–8:00pm
- 8:00–9:00pm
- 9:00–10:00pm
- 10:00–11:00pm
- 11:00pm–12:00am
- 12:00–1:00am
- 1:00–2:00am
- 2:00–3:00am
- After 3:00am

During the past month, how long (in minutes) has it usually taken you to fall asleep each night?



During the past month, what time have you usually gotten up in the morning?

- Before 5:00am

- 5:00–6:00am
- 6:00–7:00am
- 7:00–8:00am
- 8:00–9:00am
- 9:00–10:00am
- 10:00–11:00am
- 11:00am–12:00pm
- 12:00–1:00pm
- After 1:00pm

During the past month, how many hours of actual sleep do you think you get at night? (This may be different than the number of hours you spent in bed.)

Hours

0 1 2 4 5 6 7 8 10 11 12

What are barriers that influence the time you go to bed?

**Block 4**

During the past month, how often have you had trouble sleeping because you...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
Cannot get to sleep within 30 minutes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wake up in the middle of the night or early morning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have to get up to use the bathroom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cannot breathe comfortably	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cough or snore loudly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feel too cold	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feel too hot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Had bad dreams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Were feeling stressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you answered other, please include any other reasons that are not listed above. If this does not apply, please type 'N/A'.

## **Block 5**

During the past month, how would you rate your sleep quality overall?

- Very bad
- Fairly bad
- Fairly good
- Very good

What resources at UBC do you think could improve your sleep quality?

During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week

During the past month how often do you take substances to help you sleep (e.g. cannabis, alcohol)?

- Not in the past month
- Less than once a week
- Once or twice a week
- Three or more times a week
- Four or five times a week
- Everyday

During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

- No problem at all
- Only a very slight problem
- Somewhat of a problem
- A very big problem

Do you have a bed partner or room mate?

- No bed partner or room mate
- Partner/room mate in other room
- Partner in same room, but not same bed
- Partner in same bed

## **Block 6**

How often does your commute time influence your preferred time to go to sleep?

- Never
- Rarely
- Sometimes
- Most of the time
- Always

How often does your commute time influence your preferred wake time?

- Never

- Rarely
- Sometimes
- Most of the time
- Always

If you had an 8 am class on UBC Campus, how many minutes before 8 am would you have to wake up in order to get to that class on time?

0 10 20 30 40 50 60 70 80 90 100 110 120

Minutes

## Block 2

Thank you for completing the survey. The following page will redirect you to a new survey where you can enter the draw for prizes (2 lululemon yoga mats and 4 UBC Athletics Prize Packs).

You will need our group number to enter the draw - **GROUP [24]**

Please click the arrow to be redirected.