

An Overview of Sleep Behaviours in Undergraduate and Graduate University Students

Assignment 3: Final Report

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Executive Summary

The objective of the following research project proposed by UBC Recreation was to gain insight into the sleep behaviours of undergraduate and graduate students living in residence at the University of British Columbia. This research project's intent was to gather information about students' sleep habits (including consistency of sleep and wake times and screen time use before bed), quality of sleep, and sleep duration to determine resources needed to support better sleep in UBC students.

Past research demonstrates that awareness of proper sleep hygiene, which includes healthy habits and behaviours surrounding sleep such as consistent wakeup times, limited caffeine and alcohol consumption, and avoiding late naps, is low among university students (Brown et al., 2002). Furthermore, it has been identified that university students consistently report poor sleep, sleeping less than what is recommended by sleep health guidelines (Semsarian et al., 2021; Humphries et al., 2022). The Canadian Society for Exercise Physiology has created the 24-Hour Movement Guidelines, which are a series of prescriptions that focus on the integration of physical activity, sleep hygiene, and the reduction of sedentary behaviours. These guidelines suggest that adults aged 18-64 sleep 7-9 hours per night (Canadian Society for Exercise Physiology, n.d.).

The target population included UBC undergraduate and graduate students living in residence at the UBC Vancouver campus. Participants were recruited by posters placed strategically around UBC campus, through recruitment materials that were shared on social media by group members via Facebook and Instagram, and through recruiting students at the start of lectures with the permission of UBC professors.

The findings of this research project suggest that, as a whole, undergraduate and graduate students living in residence at UBC Vancouver campus do not meet the minimum sleep requirements of 7-9 hours, nor do they report having good quality sleep, meaning that they do not feel refreshed and satisfied following their nightly sleep. Many students cited sacrificing sleep to study, stress, lack of time, time management, and anxiety as significant factors that impede them from being able to engage in healthy sleep habits and behaviours. Overall, sleep hygiene was poor among students, with very few reporting consistent sleep and wake times, and almost all participants reported engaging in screen time before bed. Moreover, awareness and knowledge of the 24-Hour Movement Guidelines was low among participants, indicating a gap in education with respect to these guidelines.

It was determined that residence-specific factors that create barriers for students to achieve good sleep quality and quantity include roommate noise, loud neighbours, nearby construction, fire alarms, differing roommate schedules, hall lights, and outdoor lights. With respect to differences in roommate schedules, many students reported that their roommates often had family and friends in different time zones, and would therefore frequently stay up late and/or wake up early to contact them at odd hours of the night.

As a result of the study's findings, we created both immediately actionable and long-term recommendations for UBC Recreation to better support sleep quality and quantity among students. Immediately actionable recommendations include creating a Canvas module at the beginning of each school year to provide incoming students living in residence with information and resources to incorporate the 24-Hour Movement Guidelines into their everyday lives. Moreover, we recommend that UBC Recreation creates an annual digital sleep workshop for students living in residence to provide them with actionable steps and resources to improve their sleep hygiene, habits, and behaviours. Long-term recommendations include UBC Recreation collaborating with UBC Housing to invest in sleep-enhancing infrastructures, such as soundproofing dormitory walls, automatic dimmers for hallway lights, and blackout blinds for windows, while also taking roommate sleep schedules into account when making these pairings.

Introduction

The question of our study, as posed to us by UBC recreation, is to gain insight into the sleep behaviours of undergraduate and graduate students living in residence at the University of British Columbia, and to provide recommendations to UBC Recreation about the resources needed to support healthy sleep habits in UBC students. Healthy sleep habits include getting sufficient sleep, having regular bedtimes, and maintaining sufficient sleep routines (Tienoven et al., 2014). Through our literature review we observed that, broadly, awareness of proper sleep hygiene, which is defined as healthy habits and behaviours surrounding sleep, including consistent sleep and wake times, regular exercise, limited caffeine and alcohol consumption, and avoiding late naps, is low among university students (Brown et al., 2002). Moreover, it has been determined that regular exercise can increase sleep quality and duration (Bisson et al., 2019). Therefore, it is pertinent that university students engage in regular physical activity. The 24-Hour Movement Guidelines, which are a series of prescriptions focusing on the integration of physical activity, sleep hygiene, and the reduction of sedentary behaviours from the Canadian Society for Exercise Physiology, suggest that adults age 18-64 sleep 7-9 hours per night and participate in 150 minutes of moderate-to-vigorous aerobic physical activity per week (Canadian Society for Exercise Physiology, n.d.). We used these guidelines to guide our study, and analysed if there was a relationship between students' awareness of these guidelines, regular participation in physical activity, and healthy sleep behaviours as a secondary focus.

Moreover, as is identified by Bono and Hill (2021) and Pilcher et al. (1997), sleep quantity and quality are key determinants of academic performance and mental health outcomes of university students. Sleep quantity refers to the total number of hours spent sleeping per night, whereas sleep quality is a measure of the overall sleep experience, focussing on the factors that make sleep more or less productive and rejuvenating, such as

sleep latency (time before onset of sleep), sleep disturbances, use of sleep medication, and sleep's impact on subsequent daytime function (Humphries et al., 2022). We believe that our research holds specific relevance to our chosen sub-population, because, as identified by Semsarian et al. (2021) and Humphries et al. (2022), university students consistently report poor sleep, have poor sleep hygiene, and sleep less than recommended by sleep health guidelines. Sleep is not only vital for optimal quality of life and health, but it is critical for facilitating academic success (Semsarian et al., 2021). It has been determined that students with irregular sleep schedules, meaning sleeping and waking at different times each day, are more likely to have poorer academic performance than those with consistent sleep schedules (Foulkes et al., 2019). Therefore, having a good sleep quality and quantity is highly relevant for both academic performance and general well being. Through this study, our main goal is to determine the factors that impede undergraduate and graduate students living in residence at UBC from adopting healthy sleep behaviours.

Literature Review

University students do not obtain sufficient sleep (Brown et al., 2002; Dautovich et al., 2021; Semsarian et al., 2021; Humphries et al., 2022). There are several reasons that university students report poor and insufficient sleep, including, but not limited to, academic stress, emotional concerns, increased substance use, light and noise disturbances, compulsive smartphone use, and elevated screen time (Dautovich et al., 2021; Semsarian et al., 2021; Yao & Wang, 2023). University students not only get insufficient sleep, both in quantity and quality, they also have dysfunctional beliefs about sleep (Humphries et al., 2022). Sleep beliefs encompass an individual's attitudes about sleep, as measured through the use of a five factor scale known as The Dysfunctional Beliefs And Attitudes About Sleep Scale (DBAS) (Humphries et al., 2022). Students tend to overestimate their sleep habits and underestimate

the significance of sufficient sleep on overall physical health, mental health, and academic performance (Dautovich et al., 2021). Dysfunctional sleep beliefs often result from lack of knowledge about the physical and mental health effects of insufficient sleep, in addition to paying little attention to one's own sleep habits (Dautovich et al., 2021).

Sleep, Health, and Physical Activity

As an inevitable daily activity, sleep is one of the most important factors contributing to good health (Altun et al., 2012). Sleep is essential for physical, cognitive, and psychological well-being (Altun et al., 2012). In addition, sleep is critical for proper cellular and systemic functioning, with its absence resulting in changes in blood pressure, glucose regulation, and even some hormonal axes (Altun et al., 2012). Therefore, sleep quality has a critical role in one's health (Wang & Boros, 2019). Sleep disturbances have been found to influence one's risk of developing cardiovascular disease, cancer, and depression (Wang & Boros, 2019). In a systematic review by Wang & Boros (2019), it was found that when participants spent more time being physically active than average, they reported better sleep quality and quantity. Additionally, a study by Podhorecka et al. (2017) reported that individuals who engaged in moderate or intense physical activity reported falling asleep faster, waking up less frequently throughout the night, and experienced better sleep quality. Wunsch et al. (2017) determined that physical activity is beneficial to enhanced sleep quality in students during stressful conditions, such as exam periods, and states that maintaining high levels of physical activity during periods of academic stress should be a primary objective for university students. Therefore, it is evident that physical activity is critical for sleep quality and quantity, particularly in university students.

University Life and Academic Stress

Furthermore, Oswald and Wyatt (2014) examined the sleep habits of undergraduate and graduate students in a sample of national American university students. Both graduate and undergraduate students reported sleep difficulties, including difficulties falling asleep, daytime sleepiness, insufficient sleep to feel rested, and early bedtimes due to an inability to stay awake during the day (Oswald & Wyatt, 2014). Moreover, university life is typically characterised by significant lifestyle and behavioural changes, such as moving away from home, that result in increased independence and reduced supervision (Memon et al., 2021). As a result, students tend to engage in more social activities, such as going to concerts and bars, develop unhealthy behaviours like binge-drinking, and have demanding academic schedules, all of which contribute to inadequate sleep in university students (Memon et al., 2021). Furthermore, Foulkes et al. (2019) determined that excessive noise from roommates and the residence environment, along with the desire to socialise late at night, are factors that contribute to poor sleep in university students. It has also been determined that the increased academic demands of being a university student contribute to poorer sleep, as many students report studying late into the night, sacrificing their sleep to do so (Foulkes et al., 2019). It is important to note that during periods of intense academic stress, sleep quality and quantity in university students further deteriorates (Memon et al., 2021).

Implications of Screen Time Before Bed

It has also been determined that the widespread use of portable electronic devices has normalised the presence of screen-media devices in the bedroom (Hale et al., 2018). The usage of electronic devices close to bedtime has become one of the most significant factors associated with sleep disturbances (Pham et al., 2021). In a study of university students by Pham et al. (2021), 98.1% of participants reported using an electronic device within two hours before bedtime, with smartphones being the most common device used. A study by

Hjetland et al. (2021) found a strong negative association between time students spend on screen-based devices and sleep quality and quantity, while a study by Nestler and Bockerlmann (2023) discovered that students who engage in screen time late into the evening or night tend to have poorer sleep quality. Furthermore, there is an association between screen time, delayed bedtimes, and decreased duration of sleep (Hale et al., 2018). This is because light from screens in smartphones and computers contains blue-enriched, short-length light, which is similar to exposure under morning sunlight (Pham et al., 2021). Screen time increases physiological arousal, which impacts the circadian rhythm by delaying the onset of melatonin, leading to poorer sleep quality (Pellerine et al., 2023). Therefore, exposure to light from these devices should be avoided before bedtime to achieve optimal sleep quality and quantity (Pham et al., 2021).

Sleep Education and Interventions

Moreover, Dautovich et al. (2021) demonstrated that self-determination activities can be effective intervention strategies as part of sleep education. Self-determination theory examines motivation and behaviour change through a lens of psychological needs satisfaction. Self-determination activities focus on the three psychological needs of the self-determination theory: competence, autonomy, and relatedness, and work with participants to address sleep behaviour change through these three constructs (Dautovich et al., 2021). Students who engaged in self-determination activities were better able to change their sleep behaviours, demonstrating improved sleep behaviours following the intervention (Dautovich et al., 2021). This suggests that active involvement in sleep education and interventions targeting self-efficacy and psychological needs are more effective than sleep education alone. Our study aims to address the knowledge-attitudes-behaviour continuum, a model of behaviour change that utilises knowledge acquisition to change attitudes, with

attitudes influencing subsequent behaviour change (Semsarian et al., 2021), with a specific focus on closing the gap between attitude and behaviour by gathering “wants-based” intervention strategies.

Through our study, we hope to determine the specific factors that impede undergraduate and graduate students living in residence at the University of British Columbia from adopting healthy sleep behaviours, with the aim of making recommendations to UBC Recreation about how to support better sleep in UBC students. Ultimately, we hope to contribute to improving the well-being and academic performance of both undergraduate and graduate university students living in residence by alerting UBC Recreation to the specific needs of students with respect to sleep.

Methods

Study Population

The target population for this study was current, full-time undergraduate and graduate students living in on-campus student housing at the UBC Vancouver campus. Participants had to be between the ages of 18 and 64 years old, as the Canadian 24-Hour Movement Guidelines sleep recommendations of interest are for individuals aged 18-64. Exclusion criteria included individuals with diagnosed sleep disorders, as their sleep habits and quality are not representative of the general population, and sleep disorders can lead to various chronic health problems (American Psychiatric Association, 2024). Sleep disorders are defined as problems with the quality, timing, and amount of sleep that an individual gets, which result in impaired functioning and daytime distress (American Psychiatric Association, 2024). Approximately one third of the general population complains of insomnia, and 4-22% of the population meet the criteria for insomnia disorder (Ohayan, 2011; American Psychiatric Association, 2024).

University students, including both undergraduate and graduate students have been chosen for our study population, as university students overall report poor sleep durations, hygiene, and quality, along with a variety of reasons why they find it difficult to obtain sufficient sleep, including, but not limited to, stress, academics, social activities, substance use, and screen time (Brown et al., 2002; Dautovich et al., 2021; Semsarian et al., 2021; Humphries et al., 2022). University students in different stages of their studies report different degrees of sleep difficulties, with graduate students reporting fewer sleep difficulties than undergraduate students (Oswalt & Wyatt, 2014), though they still tend to fall short of sleep recommendations. By assessing a broad range of university students at various stages in their university experience, it will be possible to identify the cohort of students in need of the most help. Additionally, strategies employed by students who successfully manage their academic, social, recreational, and sleep behaviours/habits can be identified through the inclusion of a large study population.

Research Study Design

Our study design employed the use of a cross-sectional observational mixed methods design, which was achieved through a Qualtrics survey that offered a series of qualitative and quantitative questions. Cross-sectional studies are carried out over a short period of time, and as such, we collected and analysed data gathered from participants at one point in time (Mohajan, 2020). A mixed methods design combines at least one qualitative and one quantitative research component for the purpose of breadth and depth of understanding (Schoonenboom & Johnson, 2017). Therefore, we employed both quantitative close-ended questions and qualitative open-ended response questions to help synthesise a more accurate identification and categorization of sleep behaviour trends within our target population. Data was collected via Qualtrics, the online survey platform, between March 2nd and April 6th.

Upon completion of the survey, data from each participants' response was recorded in Qualtrics. Participants completed the survey only once, with no follow up questions in the future. It was estimated that the time to complete the survey was 5-10 minutes.

Recruitment occurred through a convenience sampling method that involved recruitment materials and posters (Appendix C) which were shared on our group members' social media accounts via Facebook and Instagram. Recruitment posters were also distributed throughout the UBC Vancouver campus, including the Sauder School of Business, AMS Student Nest, the Buchanan Arts Building, Woodward Library, Irving K. Barber Library, and the UBC bus loop. Recruitment posters were also distributed to undergraduate and graduate residences, including Totem Park, Place Vanier, Ponderosa, and Fairview Crescent. Additionally, we requested that several UBC professors of large undergraduate classes posted the recruitment materials to the Canvas page of their classes so that students would see the recruitment poster upon logging in to their Canvas accounts (KIN 110, KIN 132, KIN 120, KIN 363, PSYC 200, GEOG 200, CRWR 200). Recruitment also occurred through word-of-mouth by asking our fellow peers to complete the survey. The recruitment materials were also airdropped to students in communal campus areas including the AMS Student Nest, Woodward Library, and various lecture halls. Finally, participants were recruited at the start of lectures with the permission of UBC professors. Participation in this study was incentivized, as participants who completed the survey were entered in a draw to win a Lululemon yoga mat or a UBC Athletics Prize Pack. Our recruitment target was a minimum of 100 participants. Data collection ended at 11:59pm on April 6th.

Data Collection

Data was collected from participants using a mixed-methods survey. The survey (Appendix A) was composed of 26 questions. Of these questions, 22 were close-ended and 4

were open-ended. The aim of our survey was to understand current sleep habits, quality of sleep, perceived barriers to sleep, and the level of awareness of and participation in the Canadian 24-Hour Movement Guidelines within the target population. The survey included close-ended questions with a range of responses, including Yes/No, 10-point Likert Scale (ranging from “0, Very Poor” to “10, Very Good”), and the option to select multiple answers. Likert Scale questions were used to allow respondents to indicate their opinions, attitudes, or feelings about particular questions (Nemoto & Beglar, 2014). Close-ended questions were used to direct the respondents to the alternatives and choices being offered (Reja et al., 2003). Some close-ended questions include an “other” option to allow for participants to input their own response if the answer of their choice is not included. The survey also included open-ended questions that allowed participants to elaborate and provide more detailed responses. The benefit of open-ended questions is that they allow for a more diverse set of answers, allowing the respondents to express an opinion without being influenced by the researchers (Reja et al., 2003).

Before starting the survey, participants were required to read and agree to the study’s consent form (Appendix B). The survey began with demographic questions to determine that participants met the study’s inclusion criteria. Demographic questions were used to provide information regarding trends within our target population. These involved Yes/No questions that asked respondents about their age, if they are a student at UBC Vancouver campus, live in on-campus residence, and if they are an international student. The purpose of asking participants if they are international students was to assess difficulties adapting to the time change and to determine if they stay up late or wake up early to contact family and friends back home. Demographic questions also consisted of multiple choice questions that asked students about their year of study and faculty. Additionally, amount of recreational, work or school-related, and before bed screen time was assessed. With respect to sleep, the survey

asked participants to report how many hours of sleep they get each night using a sliding scale (ranging from 0-16 hours). Quality of sleep was assessed using a 10-point Likert Scale (ranging from “0, Very poor” to “10, Very good”).

With respect to the Canadian 24-Hour Movement Guidelines, our survey included a Yes/No question that addressed awareness of these guidelines. Following this, the survey included several Yes/No questions to assess participants’ knowledge of the guidelines’ details, such as “Did you know that quality sleep includes practising consistent bed and wake-up times?” Our survey then assessed perceived barriers to sleep within our target population by giving participants the option to select multiple answers from a selection of common barriers to sleep, which included an “other” option to allow respondents to suggest a response or elaborate. To assess participation in and adherence to the 24-Hour Movement Guidelines, our survey included questions to determine if participants were aware of the guidelines, regularly meet the recommended amount of moderate-to-vigorous physical activity per week (such as brisk walking, jogging, and running) (Pellerine et al., 2023), and engage in muscle strengthening activities two times per week.

To assess factors that students felt impede their sleep, there was a select all that apply question, which allowed students to select multiple responses. If students selected that sleep was not a priority to them, they were prompted to complete an open-ended question describing why that was the case. The survey then assessed residence-specific factors that students felt impede their ability to get sufficient sleep quantity and quality with a select all that apply question. Finally, the survey concluded with an open-ended question that prompted participants to think of ways that UBC can help improve sleep quantity and quality in students.

Data Analysis

Our study employed a mixed-methods design, using close- and open-ended questions to obtain quantitative and qualitative data from the target population. Quantitative data was used to analyse close-ended questions, also known as descriptive statistics. Calculation of means, standard deviations, frequencies, and graphical representations were used to illustrate patterns and trends within the data. Qualitative analysis was used to interpret open-ended questions and to identify and categorise trends within responses. Applying a thematic analysis to open-ended responses allowed us to identify recurring themes related to sleep barriers and other qualitative variables and insights. Thematic analysis was used to identify and interpret patterns or themes in a data set, resulting in new insights and understandings (Naeem et al., 2023). This mixed-methods approach, combining quantitative data and qualitative insights, contributed to the understanding and aims toward improving sleep behaviours in undergraduate and graduate university students.

Results

Participant Description

A total of 119 respondents completed the anonymous Qualtrics survey, however only 108 participants fully completed the survey. The 11 respondents that did not complete the entire survey were excluded from the analysis. Of the 108 participants, 54% were 1st year students, 13% were 2nd year students, 15% were 3rd year, 15% were 4th year students, 2% were made of 5 year or beyond, with the remaining 2% consisting of graduate students. Of the study participants, the majority were in the faculties of Kinesiology (39%), Arts (24%), Science (23%), with the other participants being in the faculties of Applied Sciences (6%), Business (5%), and Forestry (3%). The remaining 7% of participants were evenly distributed across the faculties of Economics, Dentistry, Law, Land and Food Systems, Medicine, Pharmaceutical Sciences, and undeclared students. Our study also identified the nationality of

the student makeup, with 22% of respondents self-reporting as international students, and the remaining 78% consisting of Canadian students.

Figure 1

Participant Demographics

Demographics of Participants	%	N
<i>Year of study</i>		
1st year	54	58
2nd year	13	14
3rd year	15	16
4th year	15	15
5+ year	2	2
Graduate	2	3
<i>Faculty</i>		
Applied Science	6	6
Arts	24	25
Business	5	5
Dentistry	1	1
Forestry	3	3
Kinesiology	39	42
Land and Food Systems	1	1
Law	1	1
Medicine	1	1
Pharmaceutical Science	1	1
Science	23	24
Economics	1	1
Undeclared	1	1
<i>Nationality</i>		
Canadian	22	24
International	78	84

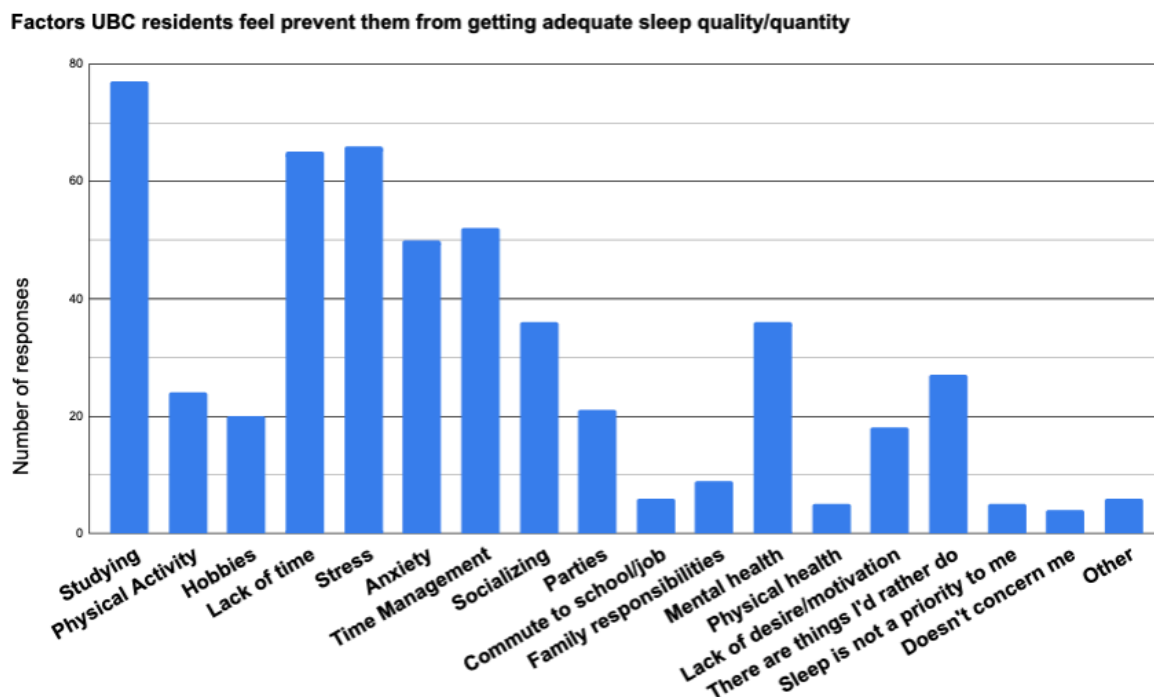
General Factors that Impede Students' Ability to Engage in Healthy Sleep Behaviours

57% of participants reported that both their sleep quality and quantity changed upon moving into residence at UBC. The trend was that sleep quality and quantity changed for the worse upon moving into residence. Many students stated that they now wake up more frequently throughout the night and stay up later than they did before moving into residence at UBC. Based on the results of our survey and our subsequent data analysis, we identified 18 major factors of which students felt prevented them from engaging in healthy sleep habits and behaviours, and subsequently prevented their ability to achieve adequate sleep quantity

and/or quality. These in order of their prevalence of responses were: studying (n=77), stress (n=66), lack of time (n=65), time management (n=52), anxiety (n=50), mental health (n=36), socialisation (n=36), “there are things I’d rather do” (n=27), physical activity (n=34), parties (n=21), hobbies (n=20), lack of desire to sleep (n=18), family responsibilities (n=9), commute to school or job (n=6), other (n=6), physical health (n=5), “sleep is not a priority to me” (n=5), and “I don't care about meeting sleep recommendations” (n=4).

Figure 2

Factors that impede UBC students living in residence from getting adequate sleep quality/quantity



Furthermore, our study identified the average sleep duration of all 108 participants as 6.76 hours per night. Interestingly, however, despite the average sleep duration nearing the 24-Hour Movement Guidelines recommendation of 7-9 hours of sleep per night, only 23% of participants reported having a good sleep quality (feeling refreshed and satisfied following their nightly sleep). For the purposes of this study, we considered good sleep quality as a score of 7+ on the Likert Scale. Moreover, our study identified that the average sleep quality

of all 108 participants was reported to be 4.85/10. Only 34% of participants self-reported having consistent sleep and wake times. Furthermore, when asked how much screen time they engaged in prior to sleep, only 6% of respondents answered none, with 49% engaging in 1-30 minutes and 45% engaging in over 30 minutes. Both of these habits play key roles in proper sleep hygiene and act in part as determinants of sleep quality. This may further indicate a gap in the awareness of proper sleep hygiene habits, and highlights an important avenue for future education efforts.

Residence-Specific Factors that Impede Students' Ability to Engage in Healthy Sleep Behaviours

When prompted to identify the underlying factor impeding their sleep from a list of 18 potential factors, 6% of the total 108 participants chose "other." These participants were then prompted to explain their choice. Amongst these respondents, 4 of the 6 noted noisiness of some sort (from neighbours or construction outside of residence) being a major impeding factor to their sleep quality. This, when compounded with the responses to our survey's final question prompting participants to offer potential solutions for supporting the sleep quality of students in residences, which yielded 18 responses calling for improved sound insulation for residence walls and or doors, indicated that residency infrastructure (specifically the quality of sound dampening or soundproofing of dormitories) may be a potential avenue of future intervention. Furthermore, the aforementioned final question of our survey also yielded many responses which suggested that lighting was a major impedance to students' sleep. 10 responses indicated that hall lights were too bright, and 5 responses called for the installation of blackout blinds for dormitory windows.

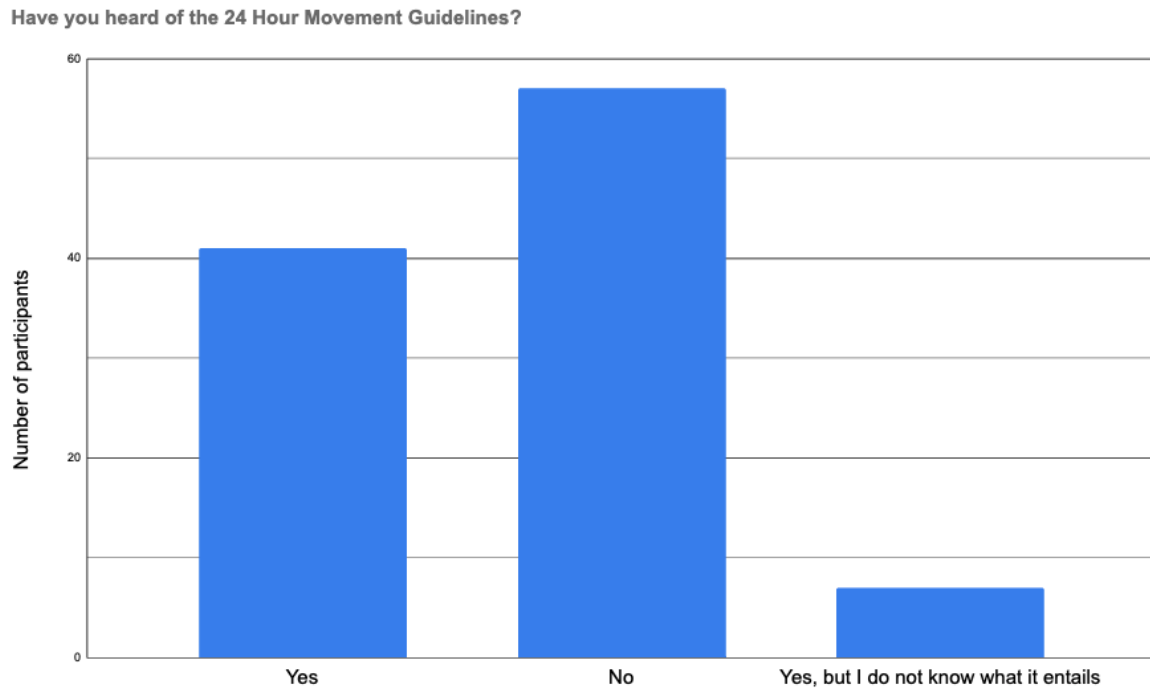
Awareness of the Canadian 24-Hour Movement Guidelines

Through our survey, we were also able to identify a number of other major findings, including results indicating that only 39% of the total 108 participants were aware of the

24-Hour Movement Guidelines, while 54% were unaware and 7% had heard of the guidelines, but did not know what they entail. This demonstrates a significant gap in student awareness, and a major potential avenue for future education efforts.

Figure 3

Participant awareness of the 24-Hour Movement Guidelines



Discussion

Ultimately, our study supports the previous findings discussed in our literature review that students do not achieve sufficient sleep (Brown et al., 2002; Dautovich et al., 2021; Semsarian et al., 2021; Humphries et al., 2022) as is demonstrated by the mean sleep duration of respondents being 6.76 hours per night, therefore not meeting the 7-9 hours recommended per the 24-Hour Movement Guidelines. Our study also affirms the findings of Foulkes et al. (2019) that the increased academic demands of being a university student contribute to poorer sleep, with 77% of students surveyed citing the demands of studying as a major impediment to their sleep quality and quantity. Furthermore, as is indicated by 36% and 21% of survey respondents reporting socialising and partying respectively being impediments to their sleep

quality, our study seems to confirm Foulkes et al. (2019) and Memon et al.'s (2021) findings, indicating that the desire to socialise late at night and engagement in party environments as major factors which contribute to poor sleep quality in university students. Finally, as indicated by our study's results, those who met the physical activity recommendations provided by the 24-Hour Movement Guidelines had a higher average percentage of respondents who slept 7 or more hours per night compared to those who did not meet the guidelines. Therefore, our study supports the findings of the systematic review by Wang & Boros (2019) and the studies by Podhorecka et al. (2017) and Wunsch et al. (2017), which observed that participants spending a greater than average amount of time being physically active reported a better sleep quality and quantity.

These findings enabled us to answer our research question of what the factors are that impede undergraduate and graduate students living in UBC residence from adopting healthy sleep behaviours and habits by providing insight into the underlying causes of poor sleep quality and identifying new avenues for future interventions. The results of our study also provide greater insight into the secondary focus of our study, allowing us to analyse if there is a relationship between students' awareness of the 24-Hour Movement Guidelines, regular participation in physical activity, and healthy sleep behaviours. It was found that those who participated in the 24-Hour Movement Guidelines' recommended 150 minutes of physical activity per week had a higher number of respondents who slept 7 or more hours per night (70% of the 34% who met the physical activity guidelines), which is significantly higher than those who did not meet the guidelines' recommendations. These results, although not conclusive, indicate that there may be a positive correlation between regular physical activity participation and sleep quantity.

Throughout the process of data collection and analysis, we ran into several challenges which required some degree of innovation to surmount. The first of which was difficulty

recruiting sufficient participants for our study. At first, we had primarily spread awareness through promotional flyers including recruitment information and QR coded links to the survey, but quickly we realised that this alone would be insufficient to reach a large enough sample size. This indicated to us that we would require a more innovative multimedia approach to participant recruitment and spurred the creation of several new tactics including in class presentations, asking professors to post the recruitment materials to their course's Canvas page, direct flyer distribution, social media promotion, and airdropping surveys.

Implications

By understanding the factors that impair the ability for UBC students living in residence to fulfil their sleep needs (studying, stress, etc), this allows for a better understanding of what can be done to help students achieve their sleep needs and improve sleep hygiene. With our findings suggesting that many students do not know what the 24-Hour Movement Guidelines entail, partners such as UBC Recreation, along with others involved with UBC, can push additional efforts to increase awareness of these guidelines and sleep hygiene, providing educational opportunities for students and giving them tools to improve their sleep.

By comparing the lack of sleep quality that was found in the student body of UBC with sleep quantity and exercise minutes per week, we found that exercise may produce better sleep quality outcomes. Using this data, UBC Recreation and other UBC affiliates can provide recommendations to students relating to the importance of physical activity with respect to a quality night's sleep. Furthermore, as past research from Dautovich et al. (2021) suggests, increasing the sleep quality of the students at UBC will, in turn, help these students achieve more academic success and increased overall physical and mental health.

By listening to what students deemed would help them meet the 7-9 hours of recommended sleep and what would increase their quality of sleep, UBC Recreation and

UBC Housing can collaborate to take action and implement certain strategies that would benefit all residents. Potential areas of interventions would be better matching students with similar schedules/sleep habits, as well as increased efforts to sound-proof walls/windows and dampen natural and artificial light that enters rooms. This will help residents to achieve more quality sleep than they currently are able to get.

Limitations and Directions for Future Research

Although there were many upsides to our research, there were also certain limitations. Firstly, the data gathered was self-reported rather than observed. As observed in Lauderdale et. al. (2008), participants can be unsure of how much they truly sleep, and can overestimate their sleep quantity. Using self-reported data was necessary for our research project, but an idea for future research would be measuring participants' sleep duration and sleep cycles to fully understand how well or poorly university students living in residence sleep. Another limitation that our study was not able to account for was variables such as how socioeconomic status, or academic workload affect an individual's ability to meet sleep requirements. Given that our survey was open near the end of midterms and over a four day long weekend, the participants may have been able to get more sleep than normal. Our research was conducted within a cross-sectional framework, meaning data was only gathered at a single time point. Future research should be conducted in a longitudinal format to provide more applicable results to university students throughout a whole term. Additionally, a predominant portion of our participants were Kinesiology students. This population may not be representative of the entire student body living in residence, as they are taught about sleep and movement recommendations as a part of some of their core courses.

Recommendations

As is discussed above, only 35% of the student body surveyed were aware of the 24-Hour Movement Guidelines and the sleep hygiene recommendations therein. In an effort

to increase student awareness, we recommend that our partner, UBC Recreation, in collaboration with UBC Wellness create a Canvas module at the beginning of each new school year that provides students with information and actionable steps to incorporate elements of the 24-Hour Movement Guidelines. Furthermore, we suggest creating an annual digital sleep workshop (to be hosted over Zoom or a similar video hosting platform to better accommodate the schedules of students and reach a greater number of residents) to provide students with actionable steps to improving their sleep hygiene, habits, and behaviours. We suggest that this digital workshop also addresses the underlying causes of factors that lead to poor sleep quality and quantity by leading discussions on coping with stress and anxiety, while also examining the importance of time management.

In order to address the residence-specific concerns of students regarding the factors that affect their sleep quality, we recommend that UBC Recreation, in collaboration with UBC Housing, invest in sleep enhancing infrastructure such as soundproofing for dormitory walls, automatic dimmers for residency hallway lights, and blackout blinds for windows. We recognise that the cost of installation and renovation necessary to implement these changes is a major barrier, but we suggest that these could be subsidised by a short term opt in program in which a select number of dormitories could be outfitted with the aforementioned renovations and incoming students could be given a choice to select these dorms at a premium with the goal of using the access capital generated through this program to eventually address the disparity in access to the amenities and make them available to all residences. Furthermore, because students have indicated experiencing sleep disturbances from roommates (due to differing sleep, class, and work schedules or having roommates who, due to having family or friends living in different time zones, may be awake at odd hours to contact family/friends and cause disturbances at inconvenient times) we recommend that that

UBC Recreation in collaboration with UBC Housing create a survey form for incoming students living in residence to better match roommates who share similar schedules.

Conclusion

This research project sought to gain insight into the sleep habits and behaviours of undergraduate and graduate students residing in residence at the University of British Columbia in order to make recommendations to UBC Recreation about resources necessary to promote healthy sleep behaviours among students. Upon completing the literature review, it became apparent that university students regularly report poor quality and duration sleep due to factors such as academic stress, lifestyle changes, and inadequate sleep hygiene. Research also highlights that the need for sufficient sleep is important for academic performance and overall well-being.

Through this research, key factors impacting student's sleep quantity and quality were identified, with studying, stress, anxiety, and lack of time as primary factors. While the mean sleeping duration was 6.76 hours for all respondents, which is close to the 24-Hour Movement Guidelines recommendation of 7-9 hours per night, only 23% of participants reported feeling refreshed and satisfied following sleep. Thus, even though students are sleeping close to the recommended amount, they are not getting good quality sleep. Furthermore, few students reported consistent sleep and wake times, while almost every participant reported engaging in screen time before bed, showing the need for improved sleep hygiene among students. The findings in this study also demonstrated a possible connection between awareness of the 24-Hour Movement Guidelines, regular participation in physical activity, and sleep quality and quantity.

Overall, this research offers valuable insights into student sleep habits and behaviours. As a result of this research, we made specific recommendations to UBC Recreation as to how they can improve the sleep behaviours of UBC students living in residence, including

improving education and awareness surrounding healthy sleep behaviours and habits, upgrading infrastructure in residences to achieve a sleep conducive environment, and improved matching with respect to roommate schedules. Ultimately, improved sleep quality and quantity among students will improve both the well-being and academic success for the entire student body at UBC.

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Appendix A: Qualtrics Survey

Link to Qualtrics survey: https://ubc.ca/1.qualtrics.com/jfe/form/SV_a97OjBCt03NRWwC

Start of Block: Demographic Information

Q1 Are you a current full-time UBC student?

- Yes (1)
 No (2)

Skip To: End of Survey If Are you a current full-time UBC student? = No

Q2 Do you live in UBC residence?

- Yes (1)
 No (2)

Skip To: End of Survey If: "Do you live in UBC residence?" = No

Q3 Do you have a diagnosed sleep disorder? (e.g., insomnia, narcolepsy, sleep apnea)

- Yes (1)
 No (2)

Skip To: End of Survey If: "Do you have a diagnosed sleep disorder?" = Yes

Q4 What year of study are you in?

- 1st (1)
 2nd (2)
 3rd (3)
 4th (4)
 5th + (5)
 Graduate Student (6)

Q5 Are you an international student?

- Yes (1)
 No (2)

Display This Question:

If: "Are you an international student?" = Yes

Q5.1 What is the time difference between your home city and Vancouver?

[text entry] _____

Display This Question:

If: "Are you an international student?" = Yes

Q5.2 Do you ever stay up late or wake up early to contact family members or friends in your home city?

- Yes (1)
 No (2)

Q6 What faculty/school are you in?

- Applied Science (1)
- Architecture & Landscape (2)
- Arts (3)
- Audiology & Speech Sciences (4)
- Business (Sauder School of Business) (5)
- Community and Regional Planning (6)
- Dentistry (7)
- Education (8)
- Forestry (9)
- Journalism (10)
- Kinesiology (11)
- Land and Food Systems (12)
- Law (Peter A. Allard School of Law) (13)
- Library, Archival, and Information Studies (14)
- Medicine (15)
- Music (16)
- Nursing (17)
- Pharmaceutical Science (18)
- Population and Public Health (19)
- Public Policy and Global Affairs (20)
- Science (21)
- Social Work (22)
- Vantage College (23)
- Economics (24)
- Undeclared (25)
- Prefer not to say (26)

End of Block: Demographic Information

Start of Block: 24-Hour Movement Guidelines Action

Q7 How many minutes per week do you engage in moderate to vigorous physical activity?

(i.e., brisk walking, swimming, running)

- 0-30
- 30-60
- 60-90
- 90-120
- 120-150

150+

Q8 How many days per week do you engage in muscle strengthening exercise? (e.g., weight training, bodyweight exercise, resistance bands, etc.)

[sliding scale]

0 1 2 3 4 5 6 7

Days ()	
---------	--

Q9 On average, how many hours do you sleep...

[sliding scale]

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Per night? ()	
During the day (Napping)? ()	

Q10 Do you feel refreshed and satisfied following your nightly sleep?

[sliding scale]

Very poor Average/Mediocr
e Very good

0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10

Sleep Quality ()	
------------------	--

Q11 Do you have consistent sleep and wake times? (i.e.,going to sleep and waking up around the same time every day of the week)

- Yes
- No
- Sometimes

Q12 How much time do you spend sitting per day? (hrs)

[sliding scale]

Click to write Click to write Click to write
Label 1 Label 2 Label 3

0 2 4 6 8 10 12 14 16 18 20 22 24

Sedentary Time ()	
-------------------	--

Q13 How much time do you spend on a screen per day? (hrs)

[sliding scale]

0 2 4 6 8 10 12 14 16 18 20 22 24

For school work ()	
For professional work (job) ()	
For recreation ()	

Q14 Do you engage in screen time before you go to sleep?

- No (1)
- Yes, 1-30 minutes (2)
- Yes, 30+ minutes (3)

End of Block: 24-Hour Movement Guidelines Action

Start of Block: Awareness

Q15 Have you heard of the 24 Hour Movement Guidelines?

- Yes (1)
- No (2)
- I have heard of it, but I don't know what it entails (3)

Q16 Did you know that the 24 Hour Movement Guidelines recommend getting at least 150 minutes (2.5hrs) of moderate to vigorous physical activity per week?

- Yes (1)
- No (2)

Q16 Did you know that the 24 Hour Movement Guidelines recommend performing muscle strengthening exercises involving major muscle groups at least 2x per week?

- Yes (1)
- No (2)

Q17 Did you know that the 24 Hour Movement Guidelines recommend that adults aged 18-64 should get 7-9 hours of quality sleep on a regular basis?

- Yes (1)
- No (2)

Display This Question:

If “Did you know that the 24 Hour Movement Guidelines recommend that adults aged 18-64 should get 7-9...” = Yes

Q17.1 Did you know that quality sleep includes practicing consistent bed and wake-up times?

- Yes (1)
- No (2)

Q18 Did you know that the 24 Hour Movement Guidelines recommend limiting sedentary time to 8 hours or less daily, including breaking up long periods of sitting as much as possible?

- Yes (1)
- No (2)

Q19 Did you know that the 24 Hour Movement Guidelines recommend limiting recreational screen time to no more than 3 hours per day?

- Yes (1)
- No (2)

End of Block: Awareness

Start of Block: Sleep & Barriers

Q 20 Has your sleep quality and/or quantity changed since moving into residence?

- Yes, both
- Yes, sleep quality
- Yes, sleep quantity
- No

Q21 Please describe how your sleep quality/quantity has changed.

[text entry] _____

Q22 What factors do you feel prevent you from getting sufficient sleep quality and/or quantity?(select all that apply)

- Studying (1)
 - Physical Activity (2)
 - Hobbies (3)
 - Lack of time (4)
 - Stress (5)
 - Anxiety (6)
 - Time management (7)
 - Social gatherings/Socializing (8)
 - Parties (9)
 - Commute to school/job (14)
 - Family responsibilities (16)
 - Mental health (17)
 - Physical health (18)
 - Lack of desire/motivation to sleep (19)
 - There are things I'd rather do than sleep (20)
 - Sleep is not a priority to me (21)
 - I don't care about meeting sleep recommendations (22)
 - I didn't know I should be trying to get 7-9 hours of sleep (23)
 - Other (please specify) (25)
-

Q22.1 Why is sleep not a priority to you?

[text entry] _____

Q23 What are some factors about living in residence specifically do you feel impede your ability to get sufficient sleep quality/quantity?

- Construction
- Fire alarms
- Hall lights
- Outdoor lights
- Alcohol/substance use
- Parties
- Noisy neighbours
- Roommate noise
- Roommate schedule differences

Other (please specify)

Q26 What are ways that you think UBC could help improve student sleep quality and quantity?

[text entry] _____

End of Block: Sleep & Barriers

Start of Block: 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 2

End of Block: Block 2

Appendix B: Consent Form

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

Participant Consent Form

Assessing Sleep Behaviours in Undergraduate and Graduate Students Living in Residence at the University of British Columbia Vancouver Campus Group 2

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 current sleep habits, perceived barriers to sleep, and the level of awareness and participation in the Canadian 24-Hour Movement Guidelines. Specifically, we will be evaluating UBC undergraduate and graduate students living in residence on the Vancouver 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

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 . 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.

Appendix C: Recruitment Materials




**THE UNIVERSITY
OF BRITISH COLUMBIA**

School of Kinesiology
210-6081 University Boulevard
Vancouver, BC Canada V6T 1Z1
Phone: 604 822 9192
Fax 604 8226842
www.kin.ubc.ca

Are you a student living in residence?!

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 or contact
johnathanmcleod6@gmail.com



As part of a course-based research project (KIN 464, group #2), we are conducting a study on the sleep habits of students who live in residence. If you are a student at UBC Vancouver, we would love for you to complete our survey
[@https://ubc.ca1.qualtrics.com/jfe/form/SV_a97OjBCt03NRWwC](https://ubc.ca1.qualtrics.com/jfe/form/SV_a97OjBCt03NRWwC)

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

Project ID:
H17-03560-A017



THE UNIVERSITY
OF BRITISH COLUMBIA

School of Kinesiology
210-6081 University Boulevard
Vancouver, BC Canada V6T 1Z1
Phone: 604 822 9192
Fax 6048226842
www.kin.ubc.ca

Are you getting enough sleep??

As part of a course-based research project (KIN 464, group #2), we are conducting a study on the sleep habits of students who live in residence. If you are a student at UBC Vancouver, we would love for you to complete our survey

@https://ubc.ca/qualtrics.com/lfe/form/SV_a97OjBCt03NRWwC

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 or contact johnathanmcleod6@gmail.com

Participate here →



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

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Are you getting enough sleep??

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@https://ubc.ca1.qualtrics.com/jfe/form/SV_a97OjB Ct03NRWwC

Are you interested?

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)



You qualify for the study if:

- You live on campus
- UBC Student
- 18+ years of age

For more information about this project, follow the link/QR code or contact johnathanmcleod6@gmail.com

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

Project ID:
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