An Evaluation of Student Awareness and Participation in the Canadian 24-Hour Movement Guidelines at UBC

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An Evaluation of Student Awareness and Participation in the Canadian 24-Hour

Movement Guidelines at UBC

The University of British Columbia - School of Kinesiology

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Executive Summary

In 2020, the Canadian Society for Exercise Physiology (CSEP) published the first official 24-Hour Movement Guidelines for adults aged 18-64. These guidelines were the first integrated and comprehensive approach to health, which offered evidence-based recommendations for physical activity, sedentary behavior, and sleep (Ross et al., 2020). Its release aims to address the unhealthy lifestyles of adults, which are especially prevalent amongst young college students and often lead to health implications later in life (Lawrence et al., 2017). However, there has been limited assessment of awareness amongst students. Therefore, more research assessing awareness in students is critical in determining approaches to improve participation in the guidelines.

The purpose of our study was to assess student awareness and participation in the Canadian 24-Hour Movement Guidelines at UBC Vancouver. Through our assessment, we hoped to offer practical strategies to raise awareness, increase participation, and identify any barriers/facilitators to meeting the recommended movement guidelines, to ultimately improve overall health and well-being for UBC students.

Our study assessed 44 undergraduate students at the University of British Columbia Vancouver Campus (UBCV) between the ages of 16 and 25 years of age. Data was collected through a Qualtrics survey that included multiple-choice, Likert-type scale, and short answer-type questions. Analysis of our results through frequency tables and descriptive statistics revealed that participants were least aware of sedentary behaviour guidelines but adhered least to moderate-to-vigorous physical activity (MVPA). Additionally, awareness and adherence was overall lower in students who were not in the School of Kinesiology. The majority of participants agreed that increased awareness of the guidelines would encourage them to change their daily life behaviors, noting that knowledge of the potential health benefits of the recommendations would help encouragement, as well as family and friends. Barriers to engagement in the components of the guidelines included lack of time, studying, lack of motivation, laziness, and recommended that awareness of and adherence to guidelines by students would increase by sharing more information on larger platforms, and having more events and challenges with monetary incentives for participation.

Throughout our findings, we were able to recommend three strategies to campus partners in order to address lack of awareness regarding the guidelines. Our first short term recommendation includes focusing awareness of sedentary behavior through investing in supportive infrastructure and increasing posters around campus. Our second recommendation is to partner with and expand the Move U crew to help reach the wider UBC student population and to communicate knowledge of the guidelines during their movement breaks. Our long term recommendation is creation of an online platform that allows users to complete health challenges and quizzes about the guidelines, while being incentivized through discounts and coupons for on campus food.

Ultimately, our aim is to provide research on the 24-Hour Movement Guidelines on campus in order to assist in helpful practical recommendations for UBC partners and to highlight the need for increased research in this area.

Introduction

Canada is in a crisis of health, as only one in two Canadian adults are reaching the recommended 150 minutes of moderate-to-vigorous physical activity per week (Statistics Canada, 2021). Being active is vital to improving overall well-being, quality of life and to minimize diseases or illnesses. However, chronic diseases such as heart disease, hypertension, and cancer, are rampant amongst Canadians as 44% of adults have at least one of the top ten most chronic conditions (Public Health Agency of Canada, 2019). In an effort to guide and promote healthier lifestyles, the Canadian Society for Exercise Physiology (CSEP) published the first official 24-Hour Movement Guidelines for adults aged 18-64 in 2020 focusing on a comprehensive approach to health, and offering practical support about physical activity, sedentary behavior and sleep (Ross et al., 2020). These evidence-based recommendations state that adults should be aiming to accumulate 150 minutes of MVPA a week, incorporating muscle strengthening exercises targeting major muscle groups at least twice a week, getting 7 to 9 hours of quality sleep, limiting sedentary behaviour to less than 8 hours, including no more than three hours of recreational screen time, and ideally frequently breaking up sitting time (Ross et al., 2020). While introducing official guidelines is a step in the right direction, evaluating why Canadians are failing to be active is critical to preventing chronic diseases and improving the overall health of the population. This is especially necessary for a population with a higher prevalence and likelihood of chronic diseases, such as students between the ages of 18-25 years of age (Black et al., 2017).

Literature Review

Canadian Movement Guidelines

The CSEP guidelines are important as they were groundbreaking scientifically backed guidelines that were the first holistic health and wellness approach to be released in the world. Through establishing the importance of movement on health, a wide spectrum of movement behaviours were examined in scientific literature. These include light physical activity (LPA), moderate-to-vigorous physical activity (MVPA), muscle-strengthening activities, sedentary behavior, and sleep. Statistics Canada (2015) characterizes LPA as "activities such as light household cleaning, cooking and leisurely walking', while MVPA typically involves "activity which causes a person to sweat and breathe harder or be out of breath". Sedentary behaviour is defined as "any waking behaviour characterized by an energy expenditure of ≤1.5 metabolic equivalents, while in a sitting, reclining or lying posture" (Tremblay et al., 2017). Studies of the dose-response relationship between sleep and health outcomes found that 7-8 hours of sleep was the most favourable duration correlated to positive health outcomes (Chaput et al., 2020). As for sedentary behaviour, it was found to be negatively associated with several adverse health outcomes regarding cognitive function and physical health (Saunders et al., 2020). Physical activity is also an important determinant of health as higher physical activity equates to a decreased prevalence of chronic disease (Warbuton et al., 2010). Therefore, international guidelines have recommended that 150 minutes of MVPA should be achieved for increased health benefits and reduced risk of several chronic conditions (Warburton & Bredin, 2016). Nevertheless, studies have shown that the whole 24 hour period should be considered to maximize positive health outcomes (Janssen et al., 2020; McGregor et al., 2019), and placing more emphasis on certain types of movement behaviour such as MVPA while disregarding

others would not result in maximum health benefits (Chaput et al., 2014). Each of the three focal key areas of the guidelines impact health greatly, therefore assessing awareness is important in order to evaluate if it is a barrier associated with participation and negative health outcomes.

Literature on Awareness of Guidelines

Due to its relatively recent release in 2020, there has been limited assessment of awareness of the 24-Hour Movement Guidelines in students and the general population. Through conducting a literature review of awareness of the guidelines in the student population, no studies were found for this population. Therefore, awareness about previous physical activity and health guidelines were found instead. In 2011, CSEP had previously published a version of physical activity and sedentary behaviour guidelines for the general public. A systematic review of the previous guidelines showed awareness was lower in the general population but higher in the scientific and stakeholder communities (Leblanc., et al, 2015). The review reported a general lack of awareness, with <10% of survey respondents indicating awareness of the physical activity guidelines, and <5% for the sedentary behaviour guidelines (Leblanc., et al, 2015). While previous history indicates poor awareness of CSEP movement and health guidelines, it is unknown whether this will inform the success or failure of the new 24-Hour Movement Guidelines, as no research has been published to indicate the effectiveness of implementation of the new strategies. To the best of our knowledge, further research is required to assess the awareness of movement guidelines.

The updated guidelines have significant value as they offer a more holistic view of health for the average Canadian adult. The guidelines were created based on a systematic literature review that found optimal health benefits are a result of integrating all the factors that impact the well-being of an individual, such as acknowledging the value of sleep, minimizing sedentary

behaviours, and increasing physical activity (Chaput et al., 2014). Adherence to the CSEP Physical Activity guidelines was found to reduce mortality rate and decrease the risk for chronic health conditions, such as stroke, cancer, hypertension (Warbuton et al., 2010). Results from a Canadian Campus Wellbeing Survey found that post-secondary students are unlikely to meet the new guidelines (Weatherson et al., 2021), therefore further showing the need to increase awareness for the student population. However, the reasoning behind the lack of adherence is unknown and could potentially be credited to lack of awareness of the guidelines . It is imperative when considering health objectives that students learn to prioritize increasing good behaviours while decreasing detrimental habits. Wellness is not only derived from simply fulfilling the recommended daily allotted time for activity, but rather involves engagement in healthy behaviours that reduce sedentary habits (Peterson et al., 2018). This multi-faceted approach is only effective through prioritization of awareness and knowledge. If knowledge of the guidelines are limited, adherence and application is improbable. Therefore more research must be taken to assess awareness of the guidelines in the student population.

Research Purpose

The student population is at-risk as they are shown to have significantly low adherence rates among the adult population. This is evidenced by a survey that sampled 20,090 university students, in which only 9% followed all areas of the guidelines, with reduced sedentary behaviour being the component with the lowest adherence rate, at 22% (Weatherson et al., 2021). Low adherence rates raise concerns due to the detrimental health outcomes associated with low physical activity and high sedentary behaviour (Rollo et al., 2022). Therefore, more research about assessing awareness in students is critical in determining the rationale behind their lack of adherence.

Health guideline awareness for the student population is in dire need of increased research, as the university period for adults brings significant transitions and responsibility in life. New environments, responsibilities, and factors associated with independent living are related to physical and psychosocial health (Lee & Loke, 2005). Therefore, education and knowledge about guidelines is the first step toward impactful change among this population. Considering the inadequate literature on awareness of students regarding the new movement guidelines, our study aims to assess the awareness of UBC undergraduate students to Canada's 24-Hour Movement Guidelines, and their participation. Our study will therefore provide data about awareness and participation levels, how students are currently obtaining their information on health guidelines, and current limitations and barriers for students to adhere to the guidelines. The results from our study will inform suggestions for future change on UBC campus to raise awareness of the movement guidelines and make adherence more accessible, in hopes to improve overall health and well-being for UBC students.

Methods

Study Population

Unhealthy lifestyles during college years and transition to adulthood can lead to health implications later in life, therefore developing health-promoting behaviors during young and early adulthood is crucial (Lawrence et al., 2017). Furthermore, the target population for this study was undergraduate students at the University of British Columbia Vancouver campus (UBCV), of young-adult age, between 18-30 years, as they represent the majority of the student body at UBC – over 80% of students enrolled are undergraduates (Mukherjee-Reed et al., 2021). The inclusion criteria for this study included students living on or off-campus, enrolled in part-time or full-time studies. Including students that live both on/off campus allowed for a wider

range of commuting options and therefore possibly different awareness and participation of the health guidelines. Furthermore, students enrolled in part-time or full-time courses were included to give a better understanding of the lifestyle and behaviour patterns of university students that are in different stages in their lives. Students over the age of 30 and involved in a graduate program were excluded as they make up a very small population of university students (Mukherjee-Reed et al., 2021), and we wanted to focus on adults who are learning to become more aware of independence and individual choices such as living on their own and becoming aware of their health and well-being.

Adults in the 18-30 age range would be transitioning into young and early adulthood, which is a period marked with challenges of acquiring independence and greater responsibility, and changes to lifestyle and life experiences. The transition to university and experiencing post-secondary studies adds on to the abundance of new challenges, such as homesickness, change to peer groups, new relationships, habit and behavioural changes, time management, self-discipline, changes to mental health and other psychosocial factors (Carballo-Fazanes et al., 2020; Memon et al., 2021). The burden of these challenges can often result in university students not prioritizing their health or self-care as they shift their focus on adapting to a new stage in their life. Studies have shown that this transition to adulthood and university life is accompanied by students decreasing their physical activity, and good quality sleep, and indulging more in sedentary behaviors (Carballo-Fazanes et al., 2020; Memon et al., 2021). Therefore, focusing on the 18–30-year-old university population will give a more accurate representation of assessing the 24-Hour Movement Guidelines, as they are a population that is in greater need of assistance and awareness of the guidelines.

Research Study Design

Our research followed a cross-sectional observational quantitative study design achieved through a *Qualtrics* survey. The focus of quantitative research designs are to describe, explain, and predict a phenomenon (Khalid et al., 2012), while cross-sectional studies are carried out at a single time-point measuring prevalence (Mohajan, 2020). Therefore, this type of research design fits our aim of assessing current awareness and participation of UBC students in the movement guidelines through a single time-point data collection survey. The benefits of using a cross-sectional survey are to provide information based on a time point of what is happening in a specific group through a single observation (Haradhan, 2020). Our research design was able to assess the student awareness and participation as conducting a survey will allow for the collection of proper data and adequate research to help assist in our findings of awareness and participation in the guidelines.

Our study follows a cross-sectional observational quantitative research design in the form of an online anonymous survey that aims to collect data and information on UBCV undergraduate students. Surveys in research are a useful tool to allow large populations to be assessed with simplicity and are shown to be effective in producing meaningful results (Jones, et al., 2013). An online survey is convenient and accessible for a greater population while eliminating the limitations of in-person, mail, or telephone surveys (Evans & Mauther, 2005). A survey was created through the online platform *Qualtrics* to collect data from the participants, shown in Appendix A. Qualtrics survey was chosen as it is a high-level tool that acts in accordance with the BC Freedom of Information and Protection of Privacy Act (UBC Information Technology, n.d.).

Sampling occurred through a convenience sampling method through an announcement (Appendix B) that was shared through social media, including Whatsapp and Facebook groups, as well as announcements in other UBCV classes with consent from professors, and through word-of-mouth. The 49 respondents who chose to fill out the survey were provided a link to an anonymous Qualtrics survey and filled out the consent form (Appendix C). Participation was incentivized by being entered into a draw for a Fitbit or a year-long bike membership with HOPR, a bike-share company. It was reiterated that participation in the survey is completely voluntary and will not affect the standing or grade of the student.

Data was collected from 49 respondents aged 16-25 that are undergraduate students at UBC-V. However, 5 responses were excluded due to incompleteness, thus analysis of results was done on 44 of the responses. This sample size allows us to satisfy a recommendation made by Marshall et al. (2013), for us to have a good number to run statistical analysis of results for a quantitative design. The survey was open for approximately two weeks, allowing for sufficient responses to be made.

Data Collection and Analysis

The survey (Appendix A) was composed of a total of 20 questions, 18 closed-ended and 2 open-ended, and aimed to collect data about the participants that ensured they follow our inclusion and exclusion criteria, as well as about their awareness of the 24-hour Movement Guidelines, how awareness of it impacts their participation in it and their current fitness levels. Additionally we asked for their perspectives on the potential barriers to the awareness and fulfillment of the guidelines. These questions helped our goal of assessing the perceived awareness and participation of the UBC undergraduate students to the movement guidelines,

allowing us to make necessary recommendations to help increase recognition and participation in the guidelines.

Some of the 20 questions have an "other" option to suggest a response or elaboration. A range of response types were used for close-ended questions, including Yes/No, 5-point Likert Scale (ranging from "1; Strongly disagree" to "5; Strongly agree"), and the option to select multiple answers. Baseline demographics were gathered to confirm whether respondents fall within the inclusion criteria and to inform trends within the target population. These questions included age, year of study, university program, gender identity, and whether the student lives on or off-campus. The two main goals of the survey were to understand the level of *awareness* of the Canadian 24-Hour Movement Guidelines, as well as the *participation* in these guidelines within the target population. Thus, the survey included questions that addressed awareness of each section of the guidelines, whether awareness would change individual behaviour, and if and where students have heard of the guidelines. Additionally, the survey gathered information about student participation in the guidelines, providing a box to input the number of minutes or hours the participant engages in each behaviour.. Lastly, the survey asked questions about barriers, facilitators, and suggestions for increasing awareness and participation in the guidelines, specifically on UBC's Vancouver Campus.

Data was analyzed using descriptive statistical analysis, including measures of central tendency and frequency distributions, conducted on Microsoft Excel. Statistical analysis was used for likert-scale questions to devise numerical trends (Allen & Seyman, 2007). Qualitative analysis was used to interpret open-ended questions and identify and categorize trends within responses. The survey responses informed us about the level of awareness, participation, and

suggestions for how to increase rates were integrated into the strategies and recommendations we devised for the future.

Results and Findings

Participant Demographics

A total of 49 respondents participated in the anonymous Qualtrics survey, however only 44 participants fully completed the survey. The 5 respondents that did not complete the entire survey were excluded from analysis. Participant demographics are summarized in Table 1.

Table 1. Demographics of Participants

Demographics of Participants	%	N
Age range		
16-20	48%	21
21-25	52%	23
Gender		
Man	18%	8
Woman	80%	35
Non-binary/Third gender/Queer	2%	1
Current student status		
Full-time	91%	40
Part-time	7%	3
Co-op student	2%	1
Faculty		
Kinesiology	25%	11
Science	23%	10
Arts	18%	8
Land and Food Systems	18%	8
Commerce	9%	4
Economics	5%	2
Applied Science	2%	1
Undergraduate Year		
First	5%	2
Second	11%	5
Third	48%	21
Fourth	32%	14
Fifth+	5%	2
Residence		
On-campus	52%	23
Off-campus	48%	21
Commute time		
0-30 minutes	57%	12
31-60 minutes	29%	6
>60 minutes	14%	3

The survey was open to those within the ages of 16-30; 52% (n=23) of participants were between 21-25 years of age and 48% (n=21) were between the ages of 16-25. Of these participants, 80% (n=35) self-identified as women, 18% (n=8) men, and 2% (n=1) queer/non-binary/third gender. When asked about student status, 91% (n=40) responded that they were enrolled in a full-time course load, while 7% (n=3) were enrolled in a part-time course load and 2% (n=1) marked other. The majority of participants were in the faculties of Kinesiology (25%, n=11), Science (23%, n=10), Arts (18%, n=8), and Land and Food Systems (18%, n=8), with other participants in the faculties of Commerce (9%, n=4), Economics (5%, n=2) and Applied Science (2%, n=1). Most participants declared they were enrolled in third year (n=21) or fourth year standing (n=14), while only a few participants were enrolled in first, second, and fifth year or more (n=2, n=5, n=2, respectively. There was a near even split between participants who lived on-campus (52%, n=23) and off-campus (48%, n=21), with most of those living off campus having commute times between 0-30 minutes (57%, n=12).

Participant Awareness of 24-Hour Movement Guidelines

Level of awareness of the various recommendations within the 24-Hour Movement Guidelines (pertaining to MVPA, sleep, sedentary behavior and recreational screen-time) is summarized in Figure 1. Participants had the lowest awareness about recommendations for sedentary behavior and recreational screen time, as a combined 61% responded "no" (n=17) or "I'm aware there are guidelines but I don't know the details" (n=10) when asked if they were aware of the recommended 8 hours or less per day of sedentary behavior with no more than 3 hours of recreational screen time. When asked about MVPA, 45% (n=20) were unaware they are recommended to perform at least 150 minutes of MVPA per week. Alternatively, only 27% (n=14) were unclear or unaware of the guideline's sleep recommendations. A question was posed
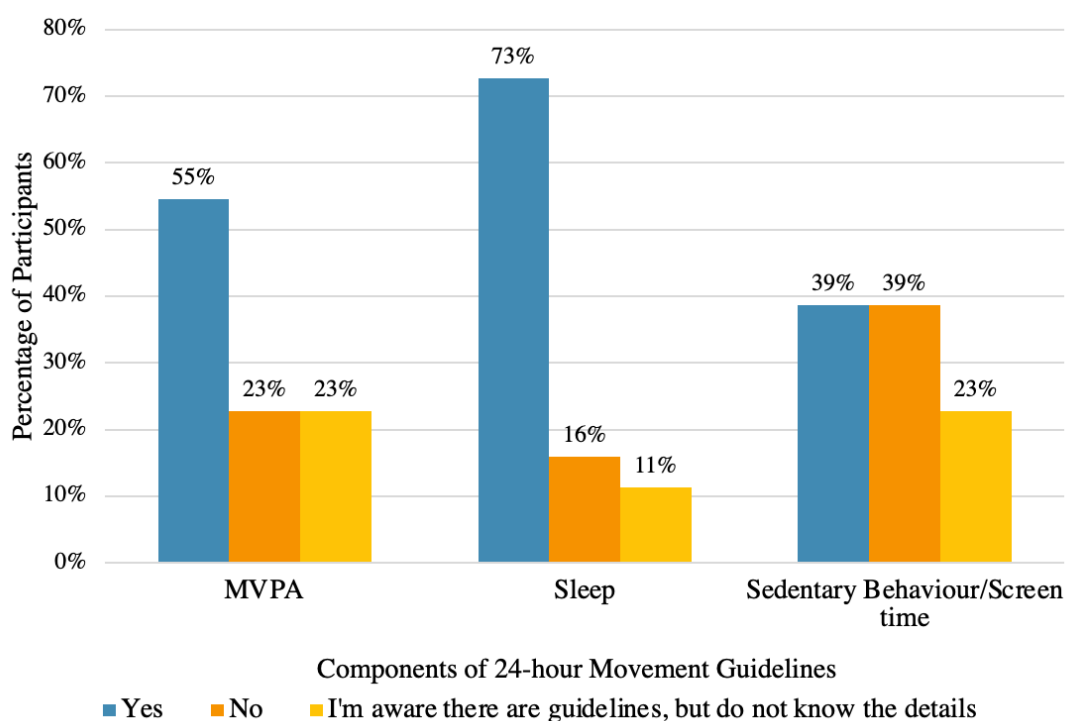
Figure 1. Awareness of 24-hour Movement Guidelines component-specific recommendations of all students

to participants: if they had greater awareness of Canada's 24-Hour Movement Guidelines, would they be encouraged to change their current everyday behaviour. Most participants selected "agree" (57%, n=25) or "strongly agree", 30% (n=13) were neutral, and only 13% (n=6) [strongly] disagreed. This data is shown in Supplemental-Figure 1 (Figure S1) in Appendix D.

Kinesiology (KIN) students made up a large percentage of our respondents (25%), all of which included "coursework" as their source of awareness of the guidelines. Stratification of results, shown below in Figure 2, showed that 100% (n=11) of KIN students had heard of the guidelines from coursework, compared to 15% (n=5) of non-KIN students who have heard of them from coursework. Additionally, 36% (n=12) of non-KIN students had never heard of Canada's 24-hour Movement Guidelines, with one participant elaborating: *"I heard about some of the [information] but did not know they are collectively known as '24-Hour Movement*
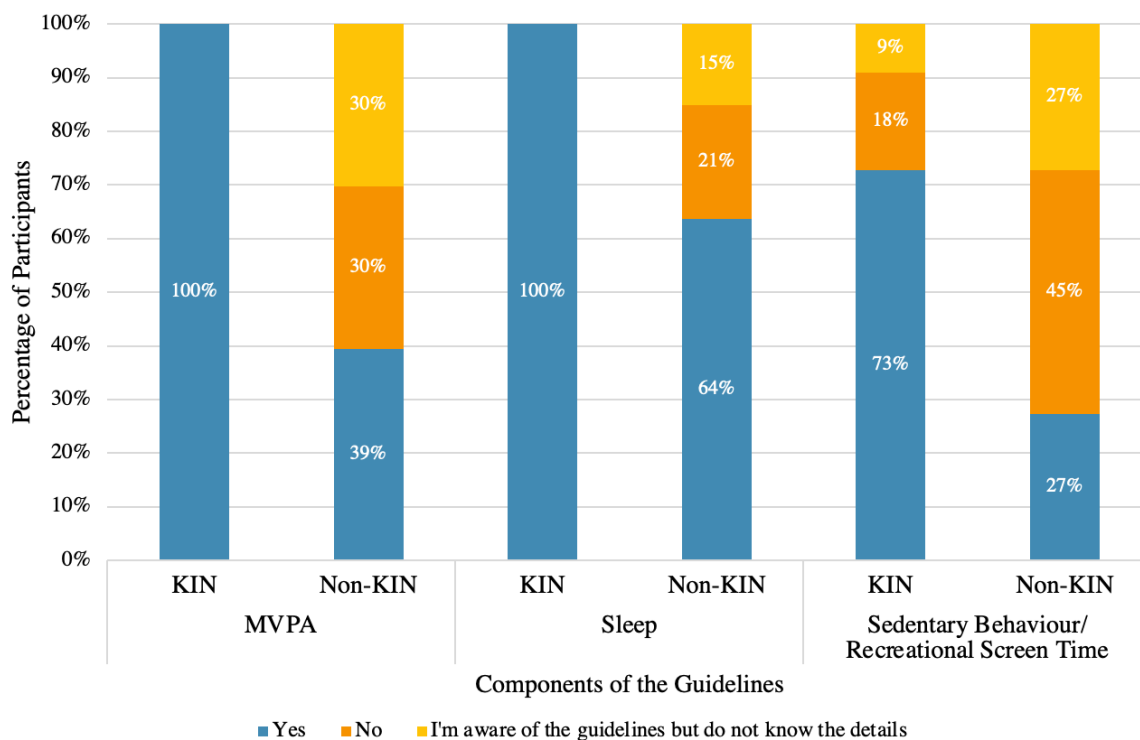
Guidelines'".

Figure 2. Awareness of the component-specific recommendations of the 24-hour Movement Guidelines in students in KIN versus non-KIN students

Figure S2 (Appendix D) summarizes the sources of awareness of the guidelines for KIN students versus non-KIN students. Due to KIN students being more aware of the collective guidelines from coursework, we stratified the results further into the level of awareness of the component-specific recommendations within the 24-Hour Movement Guidelines, as shown in Figure 2. 100% of KIN students were aware of the MVPA and sleep recommendations, however 60% (n=20) and 36% (n=12) were unaware of those respective recommendations, or didn't know the details. Sedentary behavior and recreational screen time had extremely low awareness by non-KIN students, at 73% (n=24) unaware of the recommendations or their details, and 27% (n=3) of KIN students were similarly unaware.

Participant Adherence to 24-Hour Movement Guidelines

Before asking about their adherence to the guidelines, participants were asked if they generally understood the difference between light, moderate, and high intensity activity, and 84% (n=37) answered "agree" or "strongly agree". Average adherence to MVPA, sleep, and sedentary behavior recommendations of all students are summarized in Figures S3, S4, and S5 in Appendix D. Adherence to the guidelines was stratified into KIN students versus non-KIN students as welll, as shown in Figure 3 and 4 below. Table 2 also summarizes the measures of central tendencies for time spent participating in the guideline components.
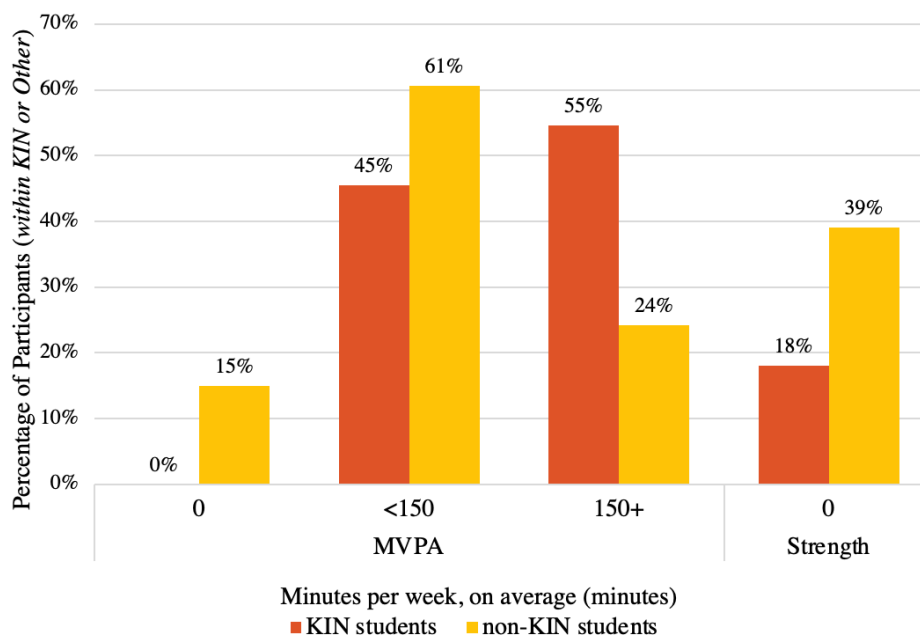

Figure 3. Average time spent doing MVPA or Strength-training per week, of KIN vs non-KIN students

Figure 2 shows how a greater proportion of KIN students (55%, n=6) fulfilled the recommendations for MVPA and do ≥150 minutes per week, whereas only 24% (n=8) of non-KIN students follow the MVPA recommendations (Figure 3a). The average time KIN students spend doing MVPA is 251 minutes/week, which is close to the median of 200

minutes/week (Table 2). In comparison, non-KIN students spend on average 115 minutes/week on MVPA, though the median is much less at 60 minutes/week. Additionally, 15% (n=5) of non-KIN students do 0 minutes of MVPA per week, whereas all of KIN students do at least 30 minutes/week. Additionally, 39% (n=13) of non-KIN students, in comparison to only 18% (n=2) of KIN students who do not partake in muscle-strengthening exercise during the week.

Table 2. Average time spent participating in components of Canada's 24-hour Movement Guidelines by KIN students versus non-KIN students

Faculty	Measure	MVPA (min/wk)	Strength (min/wk)	LPA (hr/d)	Sleep (hr/d)	Sedentary Behaviour (hr/d)	Recreational Screen Time (hr/d)
KIN	Mean	251.0	141.4	2.5	7.1	6.1	4.0
	Median	200.0	90.0	2.0	7.0	6.0	3.0
	Mode	120.0	0.0	2.0	7.0	4.0	3.0
	Minimum	30.0	0.0	1.0	6.0	4.0	2.0
	Maximum	540.0	480.0	5.0	9.0	8.0	10.0
Other	Mean	115.0	65.5	1.7	7.1	6.7	3.2
	Median	60.0	30.0	1.0	7.0	7.0	3.0
	Mode	60.0	0.0	1.0	7.0	8.0	4.0
	Minimum	0.0	0.0	0.5	5.0	1.0	1.0
	Maximum	480.0	360.0	4.0	8.5	14.0	6.0

MVPA= moderate-to-vigorous physical activity, LPA = low physical activity, min= minutes, wk= week, hr= hour, d= day

There is no specific recommended duration for muscle-strengthening exercise, however the guidelines encourage muscle strengthening activities at least two times per week. Figure 2 shows that KIN students spend on average 141 minutes/week, whereas non-KIN students spend on average about 66 minutes/week. All KIN students spend 8 hours or less doing sedentary activities, whereas 15% (n=5) of non-KIN students spend more than 8 hours. Nevertheless, high proportions of each population spend within the upper-limit of the time recommended for sedentary activities. Similar proportions of KIN students and non-KIN students spend a similar average of time for recreational screen time, as shown in Figure 4. KIN students tended to have

higher engagement in LPA at an average of 2.5 hours/day than non-KIN students, who averaged at 1.7 hours/day. Finally, proportions of KIN and non-KIN students adhering to sleep recommendations were very similar, with 73% (n=8) and 82% (n=27), getting adequate sleep, respectively.
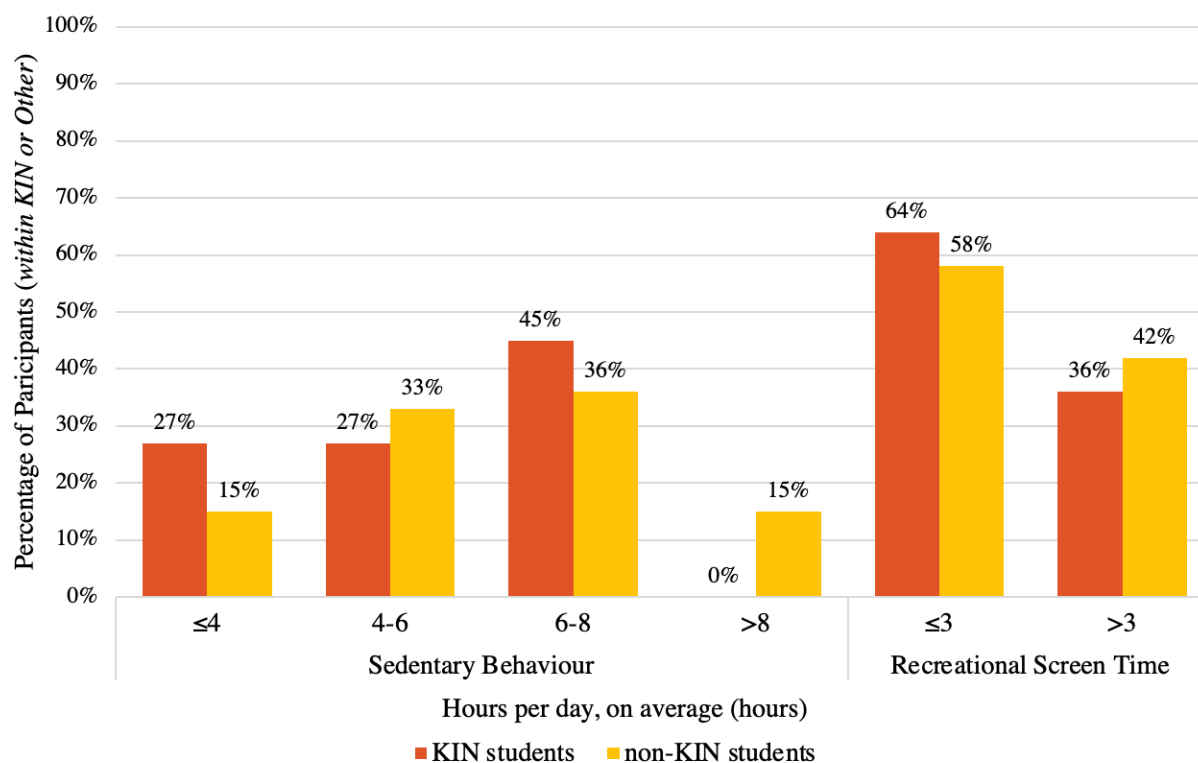

Figure 4. Average number of hours of sedentary behaviour and recreational screen time of KIN students versus non-KIN students

Barriers and Facilitators to 24-Hour Movement Guidelines

After learning about the participants' awareness and participation levels of the guidelines, we asked them about factors that may affect participation in the guideline components. In assessing factors that may prevent participants from participating in the guideline components, lack of time, studying, lack of motivation, long sitting time in classes and laziness were the most selected, as shown in Figure S4 in Appendix D. A response also added "weather" which was not

included in our list of choices. As for factors that may encourage participants from participating in the guideline components, the respondents believed potential health benefits and friends/family were the most impactful factors. Movement breaks incorporated in long lectures was the second most encouraging factor for student participants to follow recommendations and reduce their sedentary time.

Discussion

The purpose of our study was to assess the awareness and participation levels of the Canadian 24-Hour Movement Guidelines amongst UBCV undergraduate students aged 18-30. Since students between the ages of 18-25 are at a higher risk and likelihood of chronic disease (Black et al., 2017), it is important to investigate the underlying reasoning as to why post-secondary students are unlikely to meet the new guidelines (Weatherson et al., 2021). This will be completed through assessing the results of our study and discussing the relevance of our findings.

Our study found that more than half of the participants would be influenced to change behavior if there was greater awareness of the guidelines (Figure S1, Appendix D). However, a significant number of participants responded that they are aware the CSEP guidelines exist but have no detailed knowledge. This finding relates to the problem presented by the UBC partners as it confirms the lack of awareness amongst the university student population, especially non-KIN students as 36% of them had never heard of the guidelines before our survey (Figure S2, Appendix D). This suggests there is a baseline awareness of the guidelines amongst the general university student population, but that efforts should be made to increase level understanding significant enough to initiate behavior change. An interesting finding to note is that 13% (n=6) of participants answered that awareness of the guidelines is not likely to change

their behavior or health habits (Figure S1, Appendix D), indicating an indifference to their health habits and a potential area for increased research as to understanding why.

When analyzing our results, we found that 25% of our participants were KIN students, therefore the decision to stratify certain results into the responses of KIN students in comparison to non-KIN students was made. Participants were least aware of sedentary behavior guidelines compared to sleep and physical activity recommendations (Figure 1). Previous studies concluded similar trends to our findings; levels of awareness were lowest for sedentary behavior than awareness for physical activity (Leblanc et al., 2015). These findings highlight the increased need for awareness regarding sedentary behavior and decreasing sitting times for university students. Nevertheless, our results showed that only about a third of survey participants adhere to the recommended 150 minutes/week of MVPA (Figure S3) whereas the majority adhere to the sedentary behavior and sleep guidelines (Figure S4 & S5). Weatherson et al. (2021) similarly found that university students had lowest adherence rates to physical activity recommendations in comparison to other aspects of the movement guidelines, which corresponds with our findings. However, when looking at stratified results we noticed that in comparison to KIN students, a greater proportion of non-KIN students are not fulfilling the recommendations of MVPA, exceeding sedentary time, not engaging in muscle-strengthening exercises. This emphasizes the need for increased awareness regarding MVPA, muscle-strengthening exercise and the importance of LPA to limit sedentary behaviors in UBC students.

Participants reported that the greatest barriers for adherence to the guidelines included lack of time due to studying, lack of motivation, laziness, and extended periods of sitting in class (Figure S4, Appendix D). A similar study by Kulavic et al. (2013) found that the top three barriers to exercise for college students were lack of time, lack of energy, and lack of willpower.

While there is limited research on the barriers of university students, Faulkner et al. (2016) found that children's reported barriers to their implementation of the guidelines were due to daily time constraints and a misunderstanding of terms used in the guidelines. This shows that lack of time and knowledge about guidelines are important to address, in order to alleviate the barriers for university students to implement strategies to increase adherence to the guidelines. Additionally, participants reported that the greatest facilitators to participation were friends/family, potential health benefits and incorporating movement breaks in classes (Figure S5, Appendix D). Interestingly, Kulavic et al. (2013) found that health was not a primary motivator for college students aged 18-22. This difference in results may be attributed to the larger proportion of Kinesiology students who are more knowledgeable of the significant health benefits associated with physical activity and are subsequently more inclined to take action because of it. In conjunction, it shows how influential family and friends, and possibly community, are in assisting in participation of healthy lifestyle habits for students.

Common themes for recommendations to improve awareness of the movement guidelines included leveraging social media/online presence to educate students, adding physical posters/infographics around the campus, increasing exposure in non-KIN classes, engaging with the community more, and creating more initiatives/events that promote the guidelines. Additionally, when asked for recommendations to improve adherence to the movement guidelines, common responses included financial incentives (e.g. prizes, giveaways, coupons to food), community events, increased education about benefits of physical activity, and improving infrastructure (e.g., sit-stand desks or bike desks) to encourage more activity. These recommendations give our UBC partners context on how they can effectively address the current barriers that limit the level of awareness and participation to the guidelines. The significance of

our study helps provide a solution to the lack of awareness while providing barriers/limitations that students indicated as areas for improvement that UBC can choose to address to help with increased awareness.

   Limitations of our study include the use of convenience sampling, small sample size, high proportion of female responses and potential self-reporting bias. Convenience sampling is a limiting factor as the sample is not chosen at random and can lead to a potential inaccurate representation of the population that is being studied as it has a high degree of bias. As this sampling method selects participants that are easily accessible to the researchers, this may have resulted in a biased sample. For example, it is important to note that in our study kinesiology student's participants had a significantly higher level of awareness across all components of the guidelines compared to their peers in other faculties. Another limiting factor is poor external validity due to the small size of our sample and lack of generalizability of our findings. Due to there only being 44 participants, this is not an accurate representation of the entire UBC student body as there are over 70,000 students that attend UBC. Therefore, our findings lack the generalizability of results. Another possible limitation of our study was the high percentage of female respondents which may skew the results of the study as there was not accurate representation of the genders, as males generally have higher rates of physical activity (Cohen et al., 2020). The method of data collection also posed a limitation as participants may have been prone to self-reporting bias, specifically when reporting their adherence to the movement guidelines. Potential self-reporting bias is an additional limitation that could have had effects on the participation questions, as respondents tend to over-report good behavior while diminishing negative behaviors (Althubaiti, 2016). Lastly, a problem our group faced was our target sample size. Our goal was for the survey to reach 50 participants, however it got 49 responses, of which

2 were completely empty, and 3 were 38% filled, with the essential questions to our research being unfilled. Therefore, we excluded those 5 responses, resulting in our study including 44 anonymous participants. While limitations were present in the study, the intent behind completion of the project was to help with future research in this area. Due to the large literature gap, our project hopes to be the stepping stone to helping shed light of lack of awareness of the guidelines. Potential areas that could benefit from increased research is assessing the wider UBC population through a larger quantitative study, evaluating the different methods used for spreading the guidelines, and further assessment of the faculty differences in awareness of the guidelines.

Recommendations

Our recommendations include one long term aspirational recommendation and two immediate recommendations that were determined based on suggestions by participants and known barriers that limited awareness. Through our recommendations, we seek to address the lack of awareness regarding sedentary guidelines, enhance the current success of the UBC Move U Crew resource and increase engagement of the community through the use of an online platform.

Our first recommendation is to increase awareness regarding sedentary habits and remove barriers to decreasing sitting times, in order to combat the low awareness that was found in our study. Our two-pronged approach involves increasing infographics around strategic areas on campus and increasing infrastructure through active workstations. We believe these can have a positive effect on awareness and participation of the guidelines. The need for this recommendation comes from how sedentary behavior awareness was found to be the lowest in our study (Figure 1), as 62% of the participants were unaware of the guidelines or the specifics

of the recommendations. We further found that the majority of participants identified lack of

time, studying, and lack of motivation that made it difficult to decrease sedentary behavior.

Because university students have identified these hurdles that prevent them from adhering to the

guidelines, we seek to offer a solution that will help address their lack of adherence and to

increase awareness. The solution we seek to offer is by posting infographics in high traffic areas

around UBC such as the AMS Nest, campus libraries, near active workstations, and UBC bus

loop as well as increasing infrastructure to decrease sedentary behaviors (i.e. standing desks in

libraries and common areas around campus). These recommendations were suggested by our

participants as they made suggestions for increased active workstations, standing desks and

increasing infographics around campus. Our participants advocated for increased infrastructure

as a facilitator to decreasing sedentary behavior and that by having more infographics, it would

help with wider awareness of the guidelines. Infographics are a useful tool, like used in the 24

Hour Movement Guidelines, to use for knowledge translation as they offer visual stimulus and

graphics to help aid the relaying of important information. Overall, engagement with visual

infographics and digitized comics have been shown to increase engagement, effectiveness and

information translation (Wang et al., 2019). Removing barriers by increasing infrastructure

around campus and in libraries can have a positive effect for UBC students, as incorporating

active workstations have been shown to decrease prolonged sitting periods for university

students (Bastien et al., 2018). While currently Irving K. Barber (IKB) Library offers one biking

desk and treadmill desk, this is not sufficient to provide options for the thousands of university

students. As often both moving desks are in use, it does not provide options for other students

who want to use other active workstations. Therefore, it is recommended that by increasing

infrastructure and infographics around campus can combat the lack of awareness of sedentary

behaviors regarding the guidelines.

Our second recommendation is enhancing and adding additional support for the Move U

Crew, encouraging lecturers to incorporate more standing breaks in an effort to combat the low

awareness of the physical activity guidelines. Through our study, it was revealed that only 55%

of participants were aware of the physical activity guidelines (Figure 1) and long classes were a

barrier to adhere to the sedentary guidelines, therefore revealing an area where work is needed to

increase awareness. Currently the Move U Crew at UBC can be scheduled by professors to let

their volunteers come to classes and lead the students through quick movement breaks during

class time. While this option is accessible by all professors, due to high-demand, it is often hard

to find time to be able to schedule them in. In our study, strategies that were suggested by

participants to increase awareness and participation included using social media, increasing

exposure in non-kinesiology courses, and including movement breaks in classes. The practical

recommendations and steps that can be taken towards incorporating these strategies include

increasing employment and volunteer opportunities in the Move U Crew in order to have a larger

availability for movement breaks, increasing the social media presence, and encouraging

faculties to allow for movement breaks during long classes. Another suggestion for the Move U

Crew is as they lead classes in movement breaks they can be intentional in their structured scripts

to include factoids about the guidelines, such as "Did you know that the CSEP guidelines

recommend that students achieve 150 minutes of MVPA per week". This can be an effective tool

to enhance awareness while incorporating participation as well. Furthermore, this suggestion is

backed by literature as incorporating standing breaks in classes enhances concentration,

alertness, and enjoyment of university classes for students (Peiris et al., 2021). Movement breaks

in lectures are also shown to decrease sedentary behavior, improve physical health, and mental cognitive condition for students (Paulus et al., 2021). Therefore, encouraging professors to incorporate standing breaks (particularly in 90 minute classes) can be an effective measure to improve health, increase awareness and improve concentration in classes for students.

Our final recommendation is to create a specific UBC health and wellness app that encourages students to pursue healthy habits. This model follows similar apps that currently exist like the Optimity app that utilizes the idea of rewards and recognitions to help with incentivization. The Optimity app is a health and fitness app that encourages users to participate in fitness challenges, complete health quizzes, and pursue positive habits through a gamified rewards platform. Meanwhile, our theoretical UBC app can be an effective tool used to spread awareness of the guidelines through quizzes and help with participation for sleep, sedentary behavior, and physical activity through fun gamified challenges. Additionally, they would be able to follow, add friends, and could complete challenges together. Examples of challenges that could exist are "complete 150 min of MVPA this week" or "for every hour you study today, try to stand for at least five minutes in between every hour". Through completing the quizzes or challenges, users would earn and accumulate points that would be eventually used towards campus food discounts. Campus food discounts would be feasible through partnerships and support from UBC and the AMS of UBC, as many restaurants operate under the AMS and serve primarily students. Offering financial incentives can help with addressing the lack of motivation and laziness that participants quoted as a barrier to them adhering to the guidelines. The recommendation for this initiative stems from suggestions by participants to use incentives, engage with community, incorporate friends and family, and to use social media/online platforms.

Interestingly, when asked about facilitators to participation, family and friends were as influential as having knowledge of potential health benefits, demonstrating the high influence that their peers have over their health decisions. We also discovered that participants suggested an increased social media and online presence can help with dissemination of guidelines. Therefore, we believe that leveraging the influence of social media to create a community of students who influence each other to be active is a feasible way to increase awareness sustainably in the long term.

Additionally, incentivized programs and health gamification systems have been shown to be effective in promoting activity through rewards (Plangger et al., 2019). Through following this framework, we believe success is attainable as Optimity, as an example, was able to reach 1.1 million users across Canada after their launch (Canadian Press, 2020). Since gamified interventions have been further shown to elicit positive sustained changes in health and wellbeing for individuals (Plangger et al., 2019), it is recommended to the partners to seek a platform similar to this as it incorporates the strategies suggested by participants while reducing the barriers associated with the guidelines. This aspirational recommendation could be a large undertaking, but one that is worthwhile alongside the other two more actionable short term recommendations.

Conclusion

Through our research it is clear there is a lack of student awareness and participation in the new Canadian 24-Hour Movement Guidelines, and in particular regarding sedentary behavior. While more research is needed to assess the wider UBC population, we hope our study provides a snapshot to help enact change and act as a call to action to those on UBC campus that can help increase both awareness and participation. It is recommended that campus community

partners take action in helping address the barriers to student awareness and uptake of the guidelines where possible in order to promote healthier student lifestyles and create a positive difference in the lives of UBC students.

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Appendix A

Qualtrics Survey

1. Are you currently an undergraduate student at UBC-Vancouver AND between the ages of 18-30 years old?
   - ☐ Yes
   - ☐ No
2. What is your age?
   - ☐ 16-20
   - ☐ 21-25
   - ☐ 26-30
   - ☐ 31-35
   - ☐ 36-40
   - ☐ Other
3. Which gender identity do you most identify with?
   - ☐ Woman
   - ☐ Non-binary/third gender/queer
   - ☐ Two-spirit
   - ☐ Other(please specify)
   - ☐ Prefer not to say
4. What is your current student status?
   - ☐ Full-time
   - ☐ Part-time
   - ☐ Other (please specify)
   - ☐ Prefer not to say
5. What faculty/school are you a part of?
   - ☐ Applied Science
   - ☐ Science
   - ☐ Arts
   - ☐ Commerce
   - ☐ Education
   - ☐ Land and Food Systems
   - ☐ Kinesiology
   - ☐ Medicine
   - ☐ Law
   - ☐ Pharma, Science
   - ☐ Forestry

- ☐ Economics
- ☐ None
- ☐ Other (please specify)

6. What year of your undergraduate are you currently in?
    - ☐ First
    - ☐ Second
    - ☐ Third
    - ☐ Fourth
    - ☐ Fifth +

7. Do you live on UBC-Vancouver campus?
    - ☐ Yes
    - ☐ No
    - ☐ I do not have stable house (e.g. couch-surfing, living in a vehicle, facing eviction)
    - ☐ Prefer not to say

8. *If Yes to Question 7* Approximately how long is your commute to campus?
    - ☐ 0-30 minutes
    - ☐ 31-60 minutes
    - ☐ More than an hour
    - ☐ Prefer not to say

9. Are you aware that the Canadian 24-Hour Movement Guidelines recommend that adults (aged 18-64) should be participating in at least 150 minutes of **moderate-vigorous physical activity** per week? (Moderate-vigorous intensity includes activities that increase your heart rate and require physical exertion this could include jogging, swimming, or cycling)
    - ☐ Yes
    - ☐ No
    - ☐ I'm aware there are guidelines but I don't know the details

10. Are you aware that the Canadian 24-Hour Movement Guidelines recommend that adults (aged 18-64) should be achieving 7-9 hours of **good quality sleep** on a regular basis with consistent sleep/wake-up times?
    - ☐ Yes
    - ☐ No
    - ☐ I'm aware there are guidelines but I don't know the details

11. Are you aware that the Canadian 24-Hour Movement Guidelines recommend that adults (aged 18-64) should be limiting their **sedentary time** (i.e. sitting, lying down, desk-work, etc.) to 8 hours or less per day, while limiting **recreational screen time** (i.e. Netflix, social media, etc.) to 3 hours or less per day?

☐ Yes

☐ No

☐ I'm aware there are guidelines but I don't know the details

12. Do you agree with this statement: I feel that greater awareness of Canada's 24-Hour Movement Guidelines would encourage me to change my everyday behaviour.

☐ 1) Strongly disagree

☐ 2) Disagree

☐ 3) Neutral

☐ 4) Agree

☐ 5) Strongly agree

13. Where have you heard about Canada's 24-Hour Movement Guidelines before?

☐ Coursework

☐ UBC affiliated programs or events (e.g Move UBC, UBC Rec)

☐ Friends/family

☐ Social media

☐ Blog/publication

☐ Clinician (e.g. family doctor)

☐ Other (please specify)

14. Do you agree with this statement: I know the difference between light, moderate, and high intensity activity.

☐ 1) Strongly disagree

☐ 2) Disagree

☐ 3) Neutral

☐ 4) Agree

☐ 5) Strongly agree

15. How many hours do you participate in each of the following per day? (on average, in hours) *(able to fill in the box with number of hours)*

☐ Sleep

☐ Light physical activity (i.e. standing, walking to class)

☐ Recreational screen time (i.e. watching TV, using social media)

☐ Sedentary time (i.e. studying while seated, sitting in a car/bus)

16. How many hours do you participate in each of the following per week? (on average, in minutes) (*able to fill in the box with number of minutes)*

☐ Moderate-to-Vigorous Physical Activity (i.e running, swimming, dancing)

☐ Muscle-strengthening activities (i.e resistance training, powerlifting, body-weight exercises)

17. Do you feel that any of the following prevent you from participating fully in the Canadian 24-Hour Movement Guidelines? (select all that apply)
- ☐ Lack of time
- ☐ Lack of motivation
- ☐ Studying
- ☐ Sitting for long periods in classes
- ☐ Enjoyment of sitting
- ☐ Laziness
- ☐ Long commute to or from school/classes
- ☐ Work/job
- ☐ Physical incapability
- ☐ Lack of access to equipment or exercise space
- ☐ Cost
- ☐ I do not feel that anything prevents me from participating in the recommended guidelines
- ☐ I don't care enough about the guidelines; they're not a priority
- ☐ Other (please specify)

18. Do you feel that any of the following factors encourage you to participate in the Canadian 24-Hour Movement Guidelines? (select all that apply)
- ☐ Friends/family
- ☐ Potential health benefits
- ☐ Work/school incentives (i.e Bike to Work Week, Move UBC Month)
- ☐ Infrastructure (i.e sit-stand desks, active workstations with bike/treadmill)
- ☐ Movement breaks incorporated in long lectures
- ☐ I do not feel encouraged to participate in the recommended guidelines
- ☐ I don't care enough about the guidelines; they're not a priority

19. What are ways that UBC could increase awareness of Canada's 24 Hour Movement Guidelines for undergraduate students?

20. What are ways that UBC could increase participation in Canada's 24 Hour Movement Guidelines for undergraduate students?

Appendix B

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

KIN 464: Health Promotion and Physical Activity Class-based Project

Are you an undergraduate student?

If so, we'd love to hear from you about your knowledge and participation in the **Canadian 24-Hour Movement Guidelines!**

As part of a course-based research project (KIN 464), we are conducting a study on the awareness and participation of the Canadian 24-Hour Movement Guidelines. If you are an undergraduate student, we would love to hear from you/for you to complete a survey at https://ubc.ca1.qualtrics.com/jfe/form/SV_0oyJmwO3WsEHIZ8. For more information, please email sbarg@student.ubc.ca.

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) and Dr. Negin Riazi (negin.riazi@ubc.ca) is the sessional instructor for the course.

March 14, 2022

Appendix C

Participant Consent Form

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

Participant Consent Form

**Evaluation of Student Awareness and Participation in Canadian 24-Hour
Movement Guidelines
Group 6**

Principal Investigator:
Dr. Andrea Bundon (Assistant Professor, School of Kinesiology, Faculty of Education)
Sessional Instructor:
Dr. Negin Riazi (School of Kinesiology, Faculty of Education)

The purpose of the class project:
To gather knowledge and expertise from community members on the level of awareness
and participation in the Canadian 24-Hour Movement Guidelines. Specifically, we will
be evaluating awareness and participation of UBC undergraduate students within the
Vancouver campus.

Study Procedures:
With your permission, we are asking you to participate in a survey. You may only
complete the 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. *No personal
information/information that could identify participants will be included in these
reports or shared with campus partners.*

UBC SEEDS Program Library:
https://sustain.ubc.ca/courses-degrees/alternative-credit-options/seeds-sustainability-
program/seeds-sustainability-library

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

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

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 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 Drs. Riazi and 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 Negin Riazi by email at negin.riazi@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 clicking "Next", you are consenting to participate in the study.

Appendix D
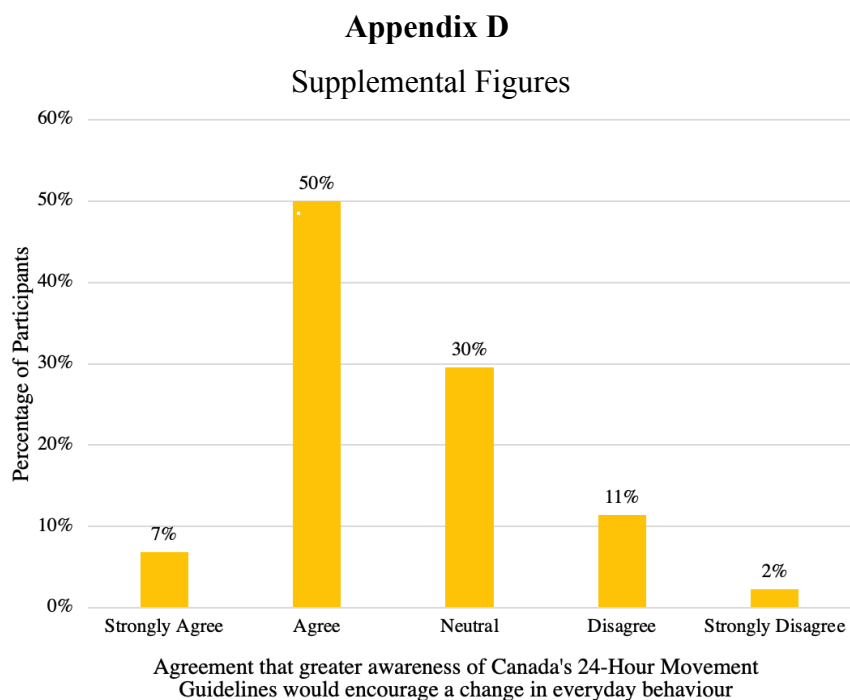
Supplemental Figures

Figure S1. Agreement on whether greater awareness of Canada's 24-hour Movement Guidelines would encourage a change in everyday behaviour
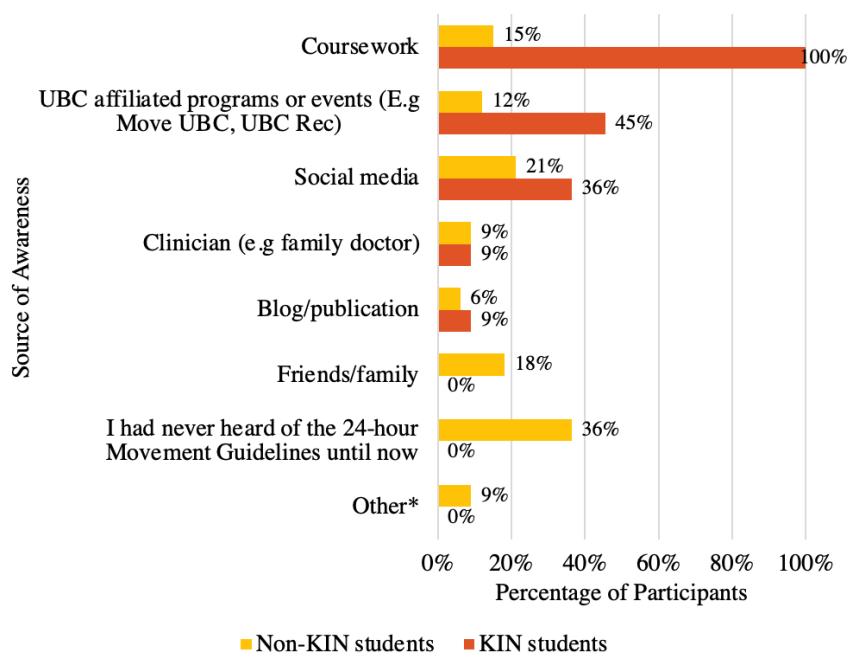

Figure S2. Source of Awareness to Canada's 24-Hour Movement Guidelines by KIN students vs non-KIN students * *6% said they knew the guidelines from high-school, 2% from a sign at UBC war memorial gym*
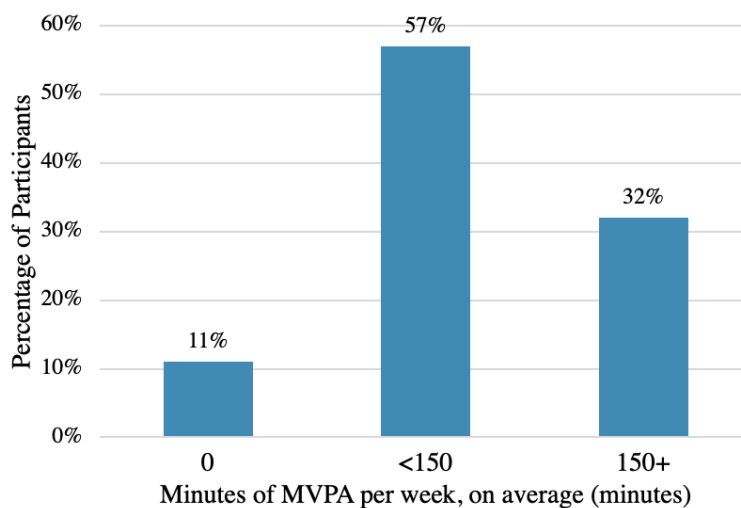
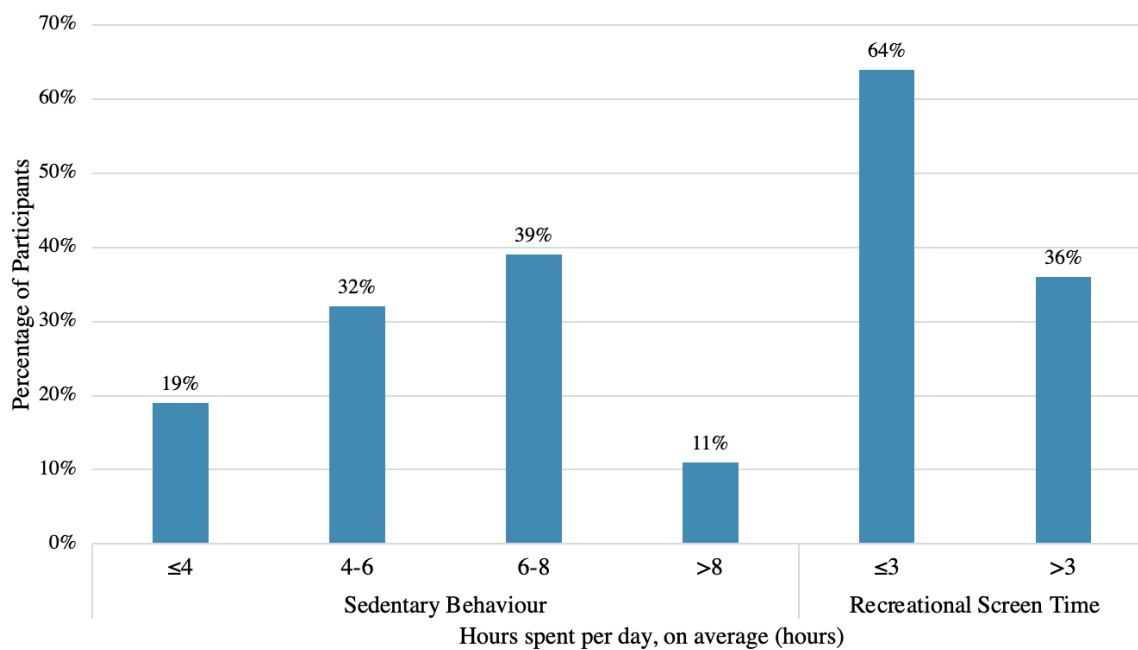**Figure S3.** Average time spent doing MVPA per week of all students (time in minutes)

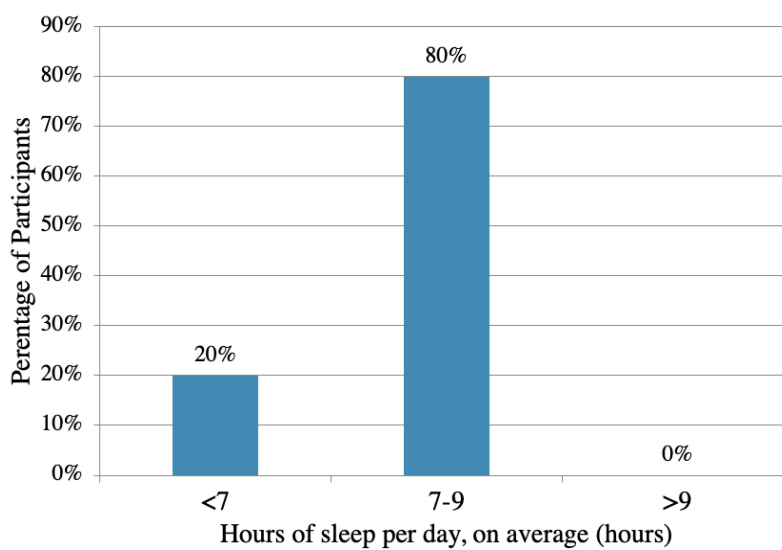**Figure S4**. Average number of hours of sedentary time and recreational screen time of all students

Figure S5. Average number of hours of sleep per night of all students
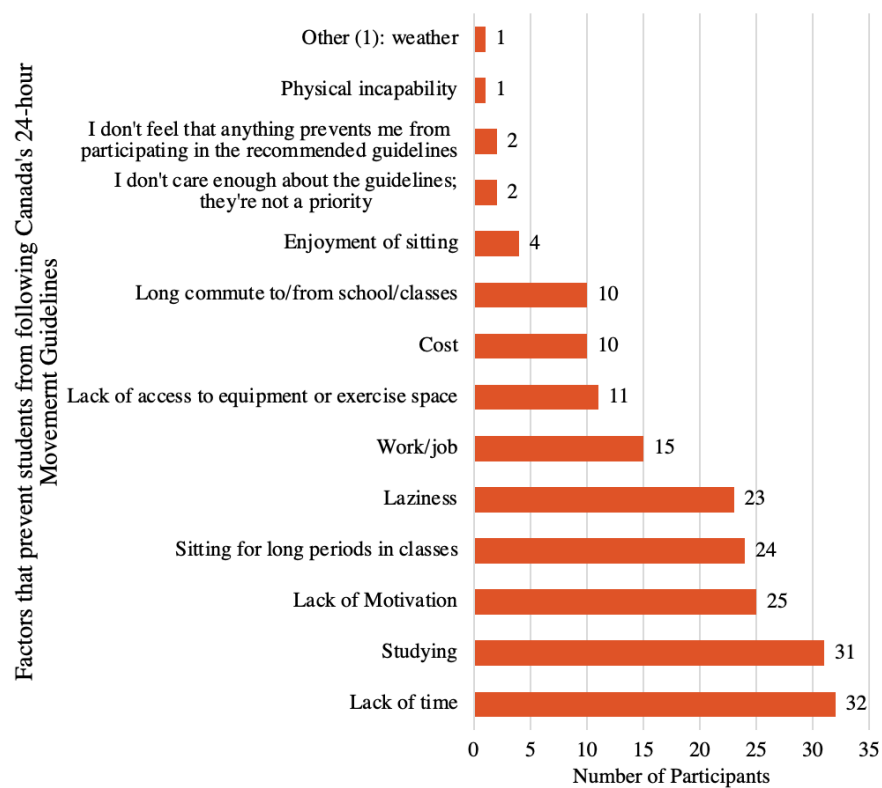

Figure S4. Factors preventing students from following Canada's 24-hour Movement Guidelines
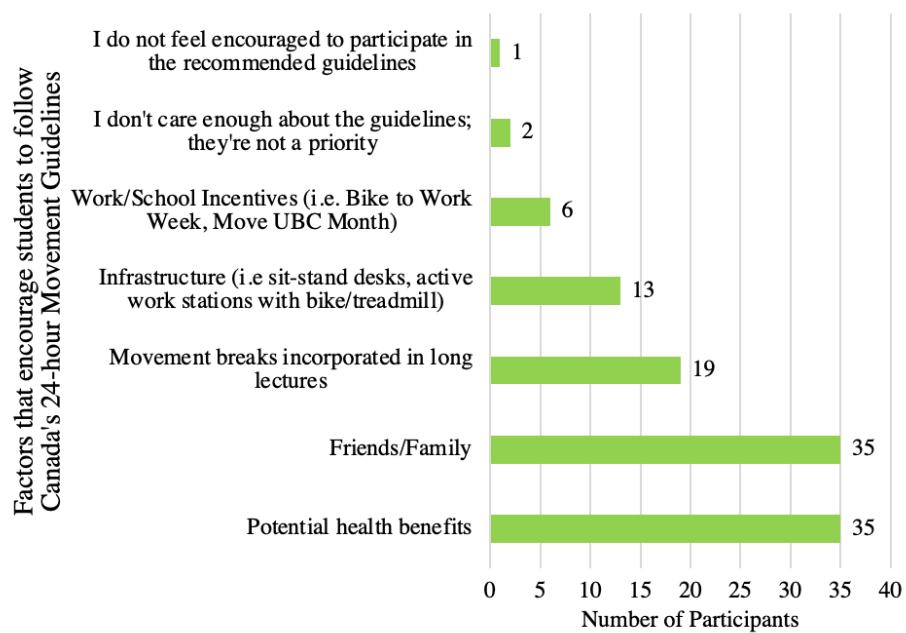
Figure S5. Factors encouraging students from following Canada's 24-hour Movement Guidelines