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Student Research Report

Barriers that Prevent Commuters from Cycling to UBC

Adam Fitchett, Isiah McDonald, Austin Kong, Salemah Shidian, Ryan Tasker

University of British Columbia

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Kin 464 - Final Report

Group #6

Adam Fitchett, Isiah McDonald, Austin Kong, Salemah Shidian, & Ryan Tasker

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Executive Summary

The objective of this paper is to observe the barriers that may prevent commuters from cycling to the University of British Columbia's Point Grey campus who live more than 10km away. Furthermore, we explored potential avenues to improve the situation and decrease the current barriers. UBC's Point Grey campus exhibits a low percentage of students and faculty using cycling as a means of travel. There are approximately three key areas that are identified as prominent barriers that individuals face when cycling to campus. These include bicycle security/theft, accessibility, and travel duration.

Data was collected using two different methods. The first method utilized surveys which were distributed by email and social media platforms. These surveys consisted of ten close ended questions with a total of 21 participants. The second method was through the use of five individual interviews; participants were recruited from those who completed the survey. These interviews were conducted through Skype, as the COVID-19 outbreak prevented face-to-face interviews.

The results suggest that there are multiple factors that prevent or deter commuters who live more than 10km away from cycling to UBC's Point Grey campus. The online survey revealed that 43% of participants refrained from cycling to campus due to the length of distance. Additionally, the survey uncovered that 25% of the participants felt that weather was a key barrier. Moreover, 55% of participants did not know there were bicycle facilities to store bikes on campus. Amenity limitations, such as shower facilities, had mixed results with only half agreeing that this may be a personal deterrent. Moreover, only 7% of the *survey* participants felt that bike security was a large concern, while 80% of the *interview* participants stated that bike security was a significant barrier. Out of the interviews conducted, 80% of the participants agreed that their motivation for cycling to campus was due to remaining active and being outside. Further agreeing with the survey, three out of five interviewees stated weather was a barrier. Lastly, most participants revealed that they had not rode an e-bike as they felt it was not an affordable option.

Interpreting these results, the primary difficulties for individuals looking to commute to UBC's Point

Grey campus by bike is due to the weather, bike security, road conditions, and space to shower and store one's gear. One way we theorized to improve storage and security would be to bring awareness to the facilities that are available. This would be accomplished through advertisement on campus. Additionally, increasing the number of bike cages on campus in locations that are close to showers, lockers, and amenities is required to comfortably cycle to campus. Furthermore, adding reflective blockers and increasing the separation between cyclists and other road users may provide a safer way of commuting to campus. Lastly, implementing an e-bike sharing program will lessen the physical demand of cycling from a lengthy distance. Additional research in these areas must be done to help increase the number of cyclists commuting to the University of British Columbia's Point Grey campus.

Literature Review

The University of British Columbia Point Grey campus (UBC) has an estimated population of over 71,000 people (faculty, staff, students) on campus during daytime hours (Campus & Community Planning, 2019). In Fall 2018, over 54 % of these individuals commuted to UBC by transit, biking, and on foot (Campus & Community Planning, 2019). When scaled, only 1.4 % of commuters chose to cycle to campus. Additionally, more than half of the population chose to travel to campus using public transit (53%) and the other commuters opted to drive alone (33%) (Campus & Community Planning, 2019). As a result, The UBC Transportation Plan aims to have at least 66% of trips made to campus by either transit, walking, and/or cycling by the year 2040 (Campus & Community Planning, 2019). Furthermore, in hopes of promoting sustainability and reducing high demands on vehicle infrastructure, UBC and the City of Vancouver have made substantial efforts to make commuting via cycling attainable by ensuring that all campus roadways are shared, while creating additional bicycle lanes in popular cross sections and areas that connect commuters to campus (e.g., SW Marine Drive ST, Thunderbird BLVD, & Blanca ST; Campus & Community Planning, 2019).

Unfortunately, simply creating accessible bicycle routes on and towards campus may not yield a significant increase in travel patterns by bike. Every human being has their own set of distinct capabilities and attributes that have an impact on their day-to-day roles. As a result, the UBC Campus and Community Planning Committee may need to further explore and consider the different types of obstacles commuters face when deciding whether to cycle to campus (e.g., travel distance, physical competence, cost). By reviewing prior research in this scope below, we hope to identify the common barriers individuals may face when deciding if they are willing to commute to campus from outside of Vancouver/UBC by bike. UBC's Point Grey campus is located on the western portion of the Point Grey peninsula and is 30 minutes away from Vancouver's downtown core (UBC Vancouver Campus, 2020). This campus is separated from the rest of Vancouver by a large regional park and for these reasons, one may consider the campus less accessible than other areas of the city (The Globe & Mail, 2020).

It could be argued that one of the most relevant obstacles commuters may face when deciding to bike to campus revolves around the issue of maintaining bike security. There has been an increase in theft of bicycles and bicycle parts throughout UBC's Point Grey campus (Pathak, 2018). Although surrounding areas in Vancouver have seen a decrease in bike theft, there is still a large concern as to why UBC has seen the opposite trend (Redekop, 2018). There are approximately nine times more bike thefts on the UBC campus compared to the city of Vancouver (Redekop, 2018). Although bike lockers may provide a way to keep a bicycle safe from theft, there may not be enough lockers available for students who wish to cycle to campus. Out of the number of people who work or attend UBC's Point Grey campus, approximately 55,000 are students (The University of British Columbia, 2019). Due to the limited number of bike lockers, only an estimated 0.36% of students can store their bike in a locker at the same time. In addition, Carter (2019) reveals there are about 200 spots available for bicycles in secured lockers which charge a fee for rent (\$120 per year + deposit). This charge may be seen as a potential barrier since many students may not have the financial ability to purchase a yearly locker. However, there are alternatives to these lockers. For example,

there are a variety of bicycle cages located on campus for staff and students to use freely during the day (The Bike Kitchen, 2019). Despite their free cost, the cages are designed to be short-term and bicycles should not be stored overnight as this increases the chance of theft (The Bike Kitchen, 2019). Although there have been some attempted solutions to prevent bicycle theft at UBC's Point Grey campus, a more permanent solution is needed to resolve the continuing bike theft dilemma.

In regard to accessibility, which is also seen as a prominent barrier, prior research has shown that increasing the number of bicycle lanes, as well as implementing a bike sharing system could increase and improve cycling attainability in Metro Vancouver (Winters, Davidson, Kao, & Teschke, 2010). Winters and colleagues (2010) discovered the common motivators that influence whether a commuter will use a bicycle as a means of transportation in Metro Vancouver include, but are not limited to: safety, ease of cycling, weather conditions, and motor vehicles. A regional map of Metro Vancouver was constructed in order to illustrate the designated bike routes. This map revealed that the number of bicycle lanes decreases as one moves away from Downtown, Vancouver and Central Surrey (Winters et al., 2010).

As a result, the creation of more accessible bike routes may encourage students, faculty, and staff to commute to UBC using a bicycle. Accessibility throughout the entire year for cyclists is just as important as the effectiveness of bike infrastructure (e.g., proper bike lanes/routes), which can have a direct impact on how successful future bike share systems could be (El-Assi, Mahmoud, & Habib, 2017). Moreover, El-Assi et al. (2017) found that the built environment and traffic patterns in Toronto were prominent barriers to current and future cyclists. As a result, El-Assi et al. (2017) implemented a GPS tracking system on cyclists who used bike sharing in Toronto. This feature allowed other share members the ability to view other cyclists' preferred routes throughout the day (e.g., rush hour), providing cyclists with the opportunity to adapt and modify their future route(s) (El-Assi et al., 2017). Since accessibility may be the greatest barrier of current and potential cyclists, a sharing system that stretches throughout greater Vancouver could provide commuters with the ability to bypass traffic and ultimately reduce their total travel time to campus.

Past research has revealed that Electric bicycles (e-bikes) provide a good alternative to conventional biking for those who would not be able to make the commute otherwise due to physical limitations (Popovich et al., 2013). E-bikes, which are propelled by a combination of pedaling and battery-powered electric motors, can be a promising alternative to automobile transportation. Their primary advantages include lower purchase and operating costs compared to cars, ability to travel longer distances and with less physical effort compared to traditional bicycles, and zero emissions during operation.

For example, one participant who worked at a university described that she could not ride a conventional bike due to a neurological disorder; however, an e-bike provided her the extra push to make it to campus in a safe and healthy manner (Popovich et al., 2013). E-bikes provide a combination of standard cycling with the assistance of battery powered motors which allows for less physical exertion and may be less costly than driving (Gorenflo, Rios, Golab, & Keshav, 2017). Since our demographic focuses on commuters who travel more than 10 km to and from campus, we aim to find a way to minimize transportation time, which is a common barrier that prevents people from cycling to UBC (Popovich et al., 2013). By using e-bikes, a 40-minute conventional cycle commute can turn into a 20 to 25-minute trip (Popovich et al., 2013).

In summary, through an overview of the above literature, we have discovered that bicycle security, accessibility, and travel duration are key barriers individuals face when deciding whether to cycle to campus. More than 44% of UBC commuters choose to travel by using either a single occupant vehicle (SOV) or a high occupancy vehicle (HOV) (Campus & Community Planning, 2019). In order for UBC Campus and Community Planning to reach their goal of having two thirds of all commutes to UBC made by public transit, biking, or walking, they will need to narrow in on the specific factors, beliefs, and attitudes that prevent staff, faculty, and students from cycling to and from UBC's Point Grey campus. We aim to focus our project on discovering and reducing the barriers that discourage individuals from cycling to UBC, who currently commute a distance of 10km or greater, to and from campus.

Methods

Our group believed that the most feasible form of data collection for our project was through a survey (see Appendix A) and qualitative interviews (see Appendix B). First, we chose to employ the use of surveys and interviews due to their relatively cheap, quick, and efficient way of obtaining a solid amount of data from an institution as large as UBC. Our survey will consist of ten close ended questions. Since one of the main limitations of surveys is the social desirability bias, we will also employ the use of qualitative interviews to increase the reliability, validity, and richness of information in our research (Grim, 2010). Conducting face to face interviews will provide us with the ability to effectively gauge the behaviour patterns of current UBC commuters. A qualitative interview will also provide insight into our participants' personal experiences, attitudes, and feelings, and will help us formulate ideas for promoting biking as a main mode of transportation. We aim to have a total of 20 – 30 surveys completed, in addition to conducting approximately four to five in person interviews.

Our recruitment strategies to gain participants are through modes of email, social media posts, and high traffic bike areas such as the bus loop, parkades, and bike shops (e.g., Bike Kitchen, UBC Bus loop, Thunderbird Parkade). We advertised our survey on the Kinesiology Undergraduate Society Facebook, Instagram page (with the approval of the KUS leaders), and through our own personal Facebook and Instagram accounts. Moreover, we drafted a generic email that outlined the purpose and goal(s) of our study which were contained in a standardized consent form. Originally, we had planned to walk around the Woodward Library, in order to obtain emails and ask people to participate in our survey. In addition, we were to visit high foot traffic areas (e.g., UBC bus loop) on multiple days throughout the school week to recruit more participants. However, due to the escalating COVID-19 virus, we were unable to follow through with our original plan.

Our interviewees were recruited from the participants who have completed our survey. The surveys were filled out by participants using Qualtrics and interviews were conducted one at a time over facetime and skype, following a pre-arranged script (see Appendix B). In total, 21 surveys were collected, and five

interviews conducted. However, due to the nature of the COVID-19 outbreak, our researchers had to conduct the interviews from the privacy of their own home. The interviews lasted an average of eight to ten minutes. Participants who had completed surveys were also asked to participate in a virtual interview, if they wished. In addition, all participants who completed a survey were asked to sign a consent form that outlined the terms and conditions of our project. Interviews were recorded and then transferred over in word form and shared through an online drive for future analyzation and interpretation. Lastly, the results of our surveys were analyzed using Qualtrics.

Results

Through our mixed method approach, our study revealed that individuals (e.g., students, faculty, & staff) who commute to UBC's Point Grey campus from a distance of 10km or greater face several challenges that can impact their decision to commute to campus via bike.

Quantitative Analysis.

Potential Barriers

In terms of travel distance, our online survey revealed that 57 percent of our participants commute an average distance of 15 km or greater, to and from UBC's Point Grey campus (*see Figure A*). As a result, we discovered that almost half of our participants (43 percent) refrain from cycling to campus because of distance (e.g., "too far") (*see Figure B*). Moreover, environmental conditions (e.g., weather concerns) were revealed to be another prominent barrier that discouraged exactly 25 percent of our participants from cycling to campus (*see Figure B*).

Although our literature review revealed that UBC's Point Grey campus has seen an increase in bicycle related thefts, only seven percent of participants viewed bike storage and security concerns as an obstacle that prevented them from cycling to campus (Pathak, 2018). In addition, past research has also revealed that safety concerns while cycling (e.g., lack of accessible bicycle lanes) pose as another prominent barrier when deciding whether or not to travel by bike (Winters et al., 2010).

However, our survey revealed that only 3 participants viewed safety concerns as a barrier that discouraged them from commuting to campus (*see Figure B*).

Transportation Mode

In terms of transportation to UBC's Point Grey campus, 65 percent of participants commute to the university via public transit; however, only 10 percent of participants travel by bike (*see Figure C*). Additionally, even though 40 percent of participants revealed that they own a bike, 14 out of the 20 participants surveyed have never cycled to campus.

Cycling Amenities

Regarding cycling amenities (e.g., storage/security, e-bike share program, accessible shower facilities), our participants' polled results were far from unanimous. For example, when asked, "are you aware of the bike storage options on campus?", close to half of the participants answered "yes", while 55 percent of the participants polled "no". Similarly, when asked "would you like to see more cyclist facilities on campus?", 55 percent of our participants revealed that they had "no preference" (*See Figure D*). Lastly, due to potential physical limitations that may discourage one from cycling to campus (e.g., competence & ability), our results surprisingly revealed that there was a 50/50 split between polled answers of "yes" and "no" when participants were asked, "would you see yourself biking to campus if there was an e-bike share program available?" (*See Figure E*). This statistic came off as a surprise due to the fact that e-bikes have proven to aid in the ease of cycling for commuters who experience physical limitations (Popovich et al., 2013).

Qualitative Analysis.

Through analysis of our semi-structured interviews, the thoughts, attitudes, and opinions of our participants are transcribed below into five integral themes.

Motivations for Cycling to Campus

Out of the five participants interviewed, when asked: "do you commute by bike to campus? If so, what is your motivation for doing so?", more than half of the participants revealed that they do, in fact,

cycle to UBC's Point Grey campus. Generally, the motivation for cycling to campus was unanimous among the four participants who cycle to campus. These participants chose to cycle to campus to remain active and fit, while having the advantage to enjoy the fresh outdoors. In addition, most participants stated that cycling to school was a faster means of transportation which allowed them to effectively travel around campus. For the participant who does not cycle to campus, they revealed the following reasons as to why: "It's too far, as I live more than 15 km away from campus. I also do not want to worry about my bike being stolen or damaged while I am studying". This quote, undeniably, showcases bike theft and security as a potential barrier that can deter one from choosing to cycle to campus.

Terrain Conditions

Our sample's demographic consisted of participants who commute to and from UBC's Point Grey campus at an average distance of 10km or greater. For the most part, all participants face an uphill terrain with a combination of flat and downhill parts. Our results revealed that some participants travel an average distance of 25 km daily to campus.

Potential Barriers

Through conduction of our semi-structured interviews, we discovered more helpful information relating to barriers that prevent our participants from biking to UBC's Point Grey campus. Firstly, three of five participants stated that lack of bike lanes was a safety concern, which ultimately discouraged them from cycling to campus. Moreover, three of five participants mentioned the safety concerns of weather. For example, one participant revealed that he found it dangerous to share the road with cars in suboptimal weather condition. Regarding bike theft, four out of five participants stated that they knew someone, or had their bike personally stolen from UBC's Point Grey Campus. Additionally, two participants had also revealed that bike theft was the biggest barrier that prevented them from biking to campus. For example, one participant stated: "If UBC could provide better assurance or somehow significantly reduce bike theft, then I would consider bringing my bike to campus". Moreover, another participant stated that bike theft was their biggest barrier due to the fact he had experienced partial bike theft on campus (e.g., stolen parts).

Cycling Amenities

Regarding bike security, the general consensus of the participants revealed that they are moderately aware of the bike storage options available on campus but are unaware of how UBC's Point Grey Campus responds to campus bike theft. Moreover, even though every participant interviewed revealed they were aware of the 12 free bike storage cages on campus, many felt they were inconveniently located around campus and, unfortunately, one participant experienced bike theft as a result of using this amenity. However, one participant suggested that UBC's Point Grey Campus should consider advertising these types of amenities more.

In terms of introducing a potential e-bike share program to aid in the promotion of commuting to campus on bike, we asked participants to answer the following two questions, 1) "Would you utilize an e-bike share program if one existed?" and 2) "Have you ever spent time riding an e-bike? If so, what are your thoughts? If no, what is preventing you from trying one?". The results of the interviews revealed that 80 percent of the participants have never rode on an e-bike due to their high purchase price and concerns regarding maintenance. However, if given the opportunity, two participants would try an e-bike, as using this form of transportation would make cycling to, from, and around campus easier. However, in terms of accessibility, one participant noted the following: "I live 11km off campus, could you provide an e-bike out there? If not, it is not really convenient for me to use one on campus". Furthermore, if UBC's Point Grey campus was to implement a future e-bike share program, they may need to assess concerns regarding accessibility.

Possible Solutions

Towards the end of each interview, participants were asked the following question: "If you could make commuting to UBC's Point Grey campus easier for cyclists, what would you like to see?". Overall, the results of our study revealed that participants would like to see the following, a) accessible bike lanes, b) secure bike storages that decrease the chances of theft from occurring, c) increased storage for cycling gear

and bike protection (e.g., rain cover), and d) an increased number of bike racks located outside of popular classroom buildings.

Discussion

Security/Theft

Bicycle theft and secure storage facilities at UBC's Point Grey campus was speculated to be a significant barrier when initially viewing the population of individuals who cycle to campus more than 10km. This was initially assumed due to the increase in bike thefts around this campus compared to the City of Vancouver (Redekop, 2018). Contradictory to the initial assumption, our survey revealed that only 7% of participants thought that security was a significant concern when leaving their bikes locked. However, regarding bike theft, the results from the survey differ from the results of the interviews that were conducted.

There may be various reasons that explain why bike theft was not a primary concern for those that participated in the survey. One proposed theory is that those who cycle to UBC's Point Grey campus every day, and have not experienced theft firsthand, may think that they have durable bike locks that prevent theft. Regardless of the quality of locks, there are still many bike thefts at UBC's Point Grey Campus; this false sense of security may prove to be a critical mistake for bike owners. Bicycle thefts occur even with the most efficient locks. A U-shaped lock may be considered as one of the most effective locks. However, it was observed that these can be destroyed by using a small car jack (Metcalf, 2014). Additionally, some students may have extra security measures, such as removing structural pieces off their bicycle to prevent theft. This is a more time-consuming way of securing one's bicycle and it can be theorized that not every individual is willing or wanting to use this method. Lastly, another potential cause as to why this may not be a concern to those who cycle to UBC's Point Grey Campus is that people may not be aware of exactly how many bicycle thefts actually occur.

It became clear after conducting interviews that bike theft was a considerable barrier to those looking to cycle to UBC's Point Grey campus. Out of the five interviews that were conducted, 80% of the participants either experienced or knew of someone who had their bicycle stolen. This was cohesive with previous literature that suggested that there is indeed a significant amount of bike thefts occurring on campus. Additionally, the issue regarding secure bike storage proved problematic to some of the interviewees. One potential issue with bike storage facilities, such as free bike cages, is there may be a false sense of security when locking bicycles inside. This could potentially lead to using less efficient locks, which could increase the chance of theft. Furthermore, more than half of the participants in the survey were unaware that bike storage facilities existed at all.

Moreover, it is safe to assume that one of the benefits of cycling to UBC's Point Grey campus is convenience, as one can avoid the hassle of having to park their car, in addition to not having to depend on public transit in order to get to and from campus. However, it was brought to our attention during an interview that some bike cages were not considered to be in convenient locations for some classes or places of work. If this is the case for more of the population, individuals may feel a sense of dissatisfaction when using bike cages.

Although there are some contrasting results in our survey and interviews regarding bike theft, it appears that bringing awareness to amenities that are available, informing commuters on bike theft rates, and adding more convenient storage facilities may increase the number of commuters by bicycle.

Weather

Past research has revealed that Vancouver residents may refrain from using a bike as a means of transportation around the city due to weather conditions (e.g., rain & wind) (Winters et al., 2010). Similarly, weather was seen as the second most prominent barrier that discouraged commuters from cycling to UBC's Point Grey campus through an evaluation of our results. For example, when interviewed, four out of five

participants revealed that they will only commute to campus during the seasons of spring, summer, and fall. Moreover, one participant revealed that commuting to campus during suboptimal weather can be an inconvenience due to the fact one must bring additional clothing and gear to campus. Thus, cycling in poor weather conditions may not be ideal for the average university student, as they will have to commute to campus with additional gear (e.g., dry clothing) that may need to be stored on campus (e.g., rental locker). Although weather conditions are seen as the second most relevant barrier that discourage participants from cycling to campus, this, unfortunately, is out of our control as weather is deemed as an extraneous variable.

Distance

Past research has looked into methods that can help reduce travel time, since distance has been viewed as a prominent barrier that prevents individuals from selecting cycling as their main means of transportation throughout urban cities (Popovich et al., 2013). Likewise, through an analysis of our results, we discovered that travel distance was seen as the *most* prominent barrier that prevented participants from cycling to UBC's Point Grey campus. Although our sample demographic was to consist of participants who travel a total distance of 10 km or greater to and from UBC's Point Grey Campus, we were surprised to discover that 12 out of 21 participants commuted a total distance of *15 km* or greater to and from campus. Thus, we discovered that approximately 43 percent of these individuals will not commute to campus via bike due to travel distance. Lastly, in terms of general land structure, almost all of the participants interviewed revealed that they faced an uphill route with a mixture of flat and downhill parts. However, the structure of the participants' potential cycling route had no influence on their decision to commute to campus by bike.

E-bike

Our surveys revealed that 60% of participants have never ridden an e-bike before. This connects to the problem of commuters who live more than 10km, as they have not experienced the benefits and reduction in travel time an e-bike can potentially provide. This enhances our understanding that with more

than half of the participants never having used or owned an e-bike, travel time on a conventional bike could be around double the time if not more. The literature revealed that with the assistance of an e-bike, the physical exertion on an individual is greatly reduced and it could be less costly than driving (Gorenflo et al., 2017). However, e-bikes could still be seen as a potential challenge due to the fact that most of our participants believed that these bikes were unaffordable. In addition, participants also viewed bike safety and security as a common concern. For example, almost all of the responses gathered from our interviews reflected on the issue of bike theft at UBC's Point Grey campus. As a result, we could speculate that most commuters travelling to campus will not invest in a costly e-bike due to the fact it could be easily stolen.

A possible solution regarding bike theft is to develop and a safer bike storage system. For example, an automated underground storage system could ensure far greater bike safety and provide peace of mind for commuters who own expensive conventional or e-bikes. The even split of participants in our survey who said they would and would not use an e-bike sharing program suggests that there is still a potential interest to use this method of travel.

Cycling Amenities

Viewing our survey and interview responses together makes a clear consensus no easier. There remains a mixed view from participants in regard to what amenities are required for them to be more likely to bike to school. For example, most questions received around 50 percent supportive answers. On topics of awareness about existing amenities, a mixed survey response would reveal that there is a large pool of commuters that are unaware of the services that UBC's Point Grey campus provides. For example, most of our participants were aware of the amenities provided on campus (e.g., bike cages) but felt discouraged to use them, since many bike thefts have occurred at these popular bike cage locations. Lastly, increasing post

commute amenities, such as locker or shower facilities could encourage commuters to bike, as inclement weather was an oft-cited concern. The options discussed above can hopefully encourage the commuters of UBC's Point Grey campus to leave their cars at home and cycle to campus.

Limitations

Throughout the research process, we encountered a few challenges and obstacles that may have had a limiting effect on our results. Due to the COVID-19 outbreak, we had to brainstorm new strategies for marketing and getting our research out to prospective participants. We were unable to recruit from high foot traffic bike areas, such as the UBC bus loop and bike parking areas. This led to a limited amount of data and fewer participants involved in our study than we anticipated. Moreover, we kept our survey open for a few extra days to try and increase recruitment numbers; however, this caused extra stress as our time to synthesize data was limited. To overcome the COVID-19 challenge, we recruited our participants strictly through the use of technology. Another challenge we encountered was recruiting participants who lived more than 10km away from UBC's Point Grey campus. Because the parameters and pre-requisites to be a part of our study were difficult to fulfill, we had limited amounts of data. Had we been able to collect data from high foot traffic areas in the previous weeks, there still may have been challenges. For example, we speculated that commuters who traveled to campus by bus may have not had the time to complete our survey. Regardless, our data provides promising information that can be used to hopefully overcome the barriers that prevent commuters from cycling to and from campus.

Recommendations

From this project, we found that there were several main obstacles preventing commuters from using bikes as a means of transportation if they lived more than 10km from campus. This included the weather, bike theft concerns, road conditions or dedicated bike lanes, and space to shower or change and store daily cycling gear. With these obstacles in mind, our recommendations to increase cycling as a mode share for daily commuters involve solutions to secure bike storage, promoting accessible cycling infrastructure to and

from campus, and an exploration of a possible e-bike share plan. Efforts to create possible solutions in the above areas may give commuters the added incentive to choose cycling over other forms of transportation. Thus, we aim to provide UBC's Point Grey campus with recommendations that focus on achieving an accessible and sustainable cycling service.

A short-term goal to improve secure bike storage, we advise UBC's Point Grey campus & Community Planning committee to continue to increase their advertisement of free bike storage due to the fact more than half of our participants were not aware of this option on campus (*see Figure F*). As a result, an increase in the promotion of free bike storage options on campus might prompt students, staff, and faculty members to commute to campus via bike, as they could freely utilize this option.

For long-term solutions, we recommend increasing the number of bike cages and lockers available, while continuing to offer these amenities in more convenient locations, such as the Buchanan (BUCH) learning spaces. Moreover, two of our interview participants cited the inconvenience of the cages as a reason for avoidance with one citing the locations being too far from buildings, they reside in. Therefore, increasing the number of cages concomitantly with the goal of increased cycling to campus can ensure that capacity issues are avoided as best as possible. In addition, the locations of the bike cages and lockers should also be strategic, with attention given to facilities that provide change rooms or shower amenities since many commuters who cycle may require these services (*see Figure D*). Moreover, although the Bird Coop Fitness Centre and the ARC are buildings that provide the above amenities in a central location with bike storage nearby, greater utilization of other shower and locker rooms, such as in the Robert F. Osborne Centre could be achieved by the addition of *secure* bike storage options.

A third of our survey participants and a majority of our interview participants expressed concerns for road safety and adequate separation from traffic. UBC's Point Grey Campus can help to impact this situation by directly improving the roads within the campus boundaries. Along the main access roads to UBC's Point Grey campus (University Blvd, 16th Ave, and SW Marine Dr) there are painted lines separating the driving lane and the cycling lane with nothing to physically separate the lanes. We

recommend the installation of flexible reflective barriers along this painted line to help differentiate the two lanes. A rigid barrier is not recommended as it may block access to current parking spaces along the shoulder of certain routes. This installation could be a solution that both improves cyclists' safety, while not impacting necessary parking space. The reduction of daylight during the winter months and potentially obscured lane markers from leaf detritus or snow, we postulate that the reflective flexible barriers would help all road users. However, long-term recommendations such as installing lighting along stretches currently not illuminated will be costly and not feasible for all cycling routes.

Lastly, understanding that e-bike usage can reduce the physical requirements that may occur covering a large distance, serves as a basis for our recommending their expanded use on campus (Gorenflo et al., 2017). From an analysis of the "Try An E-bike Program", we recommend continuing this program as planned for spring 2020, while expanding for future iterations of the program to include students as well (Campus & Community Planning, 2019). As a prohibitively high cost was reported by our participants as a reason not to purchase an e-bike, an expanded trial program could be a valuable first experience with e-bikes. A long-term recommendation and aspirational goal may be to implement a region-wide e-bike share program. However, one would need to explore what other similar cities and regions have in place already, such as the available e-bike share services available in Seattle (Jump, 2020; Lime, 2020). Alternatively, an expansion of a bike share program such as Vancouver's Mobi bike share service may benefit from adding a fleet of e-bikes for users, as they are seen to improve long distance rides (El-Assi et al., 2017). While this would involve collaboration between municipalities and significant investment, the long-term reduction in traffic strain on the region may be significant but requires more research.

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Figures

Figure A. Q1: How Far From Campus do You Commute From?

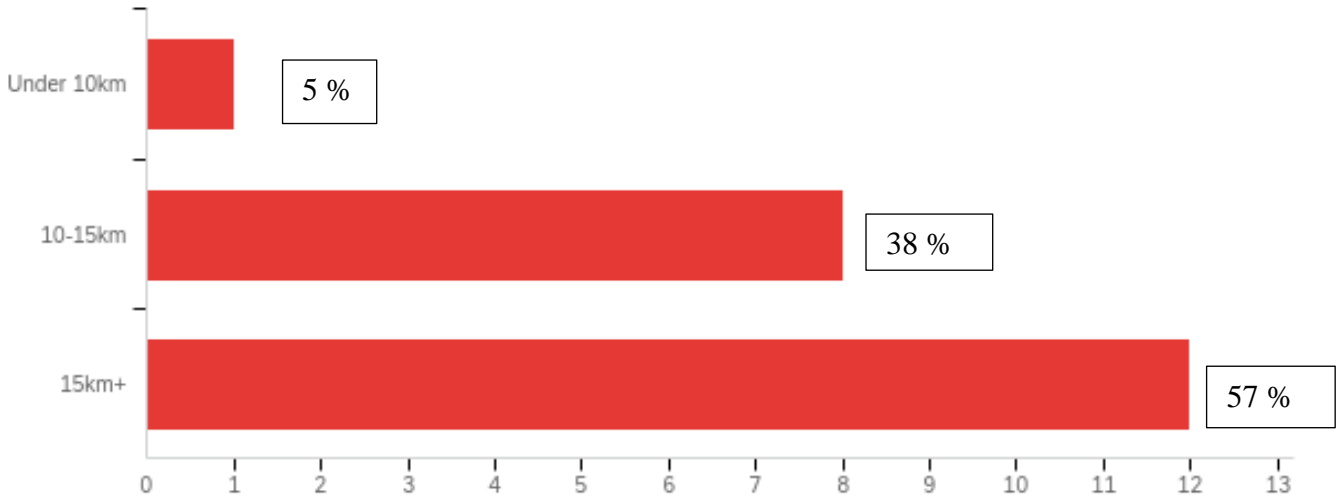


Figure B. Q5: Have You Ever Biked to Campus? If No, Why Not?

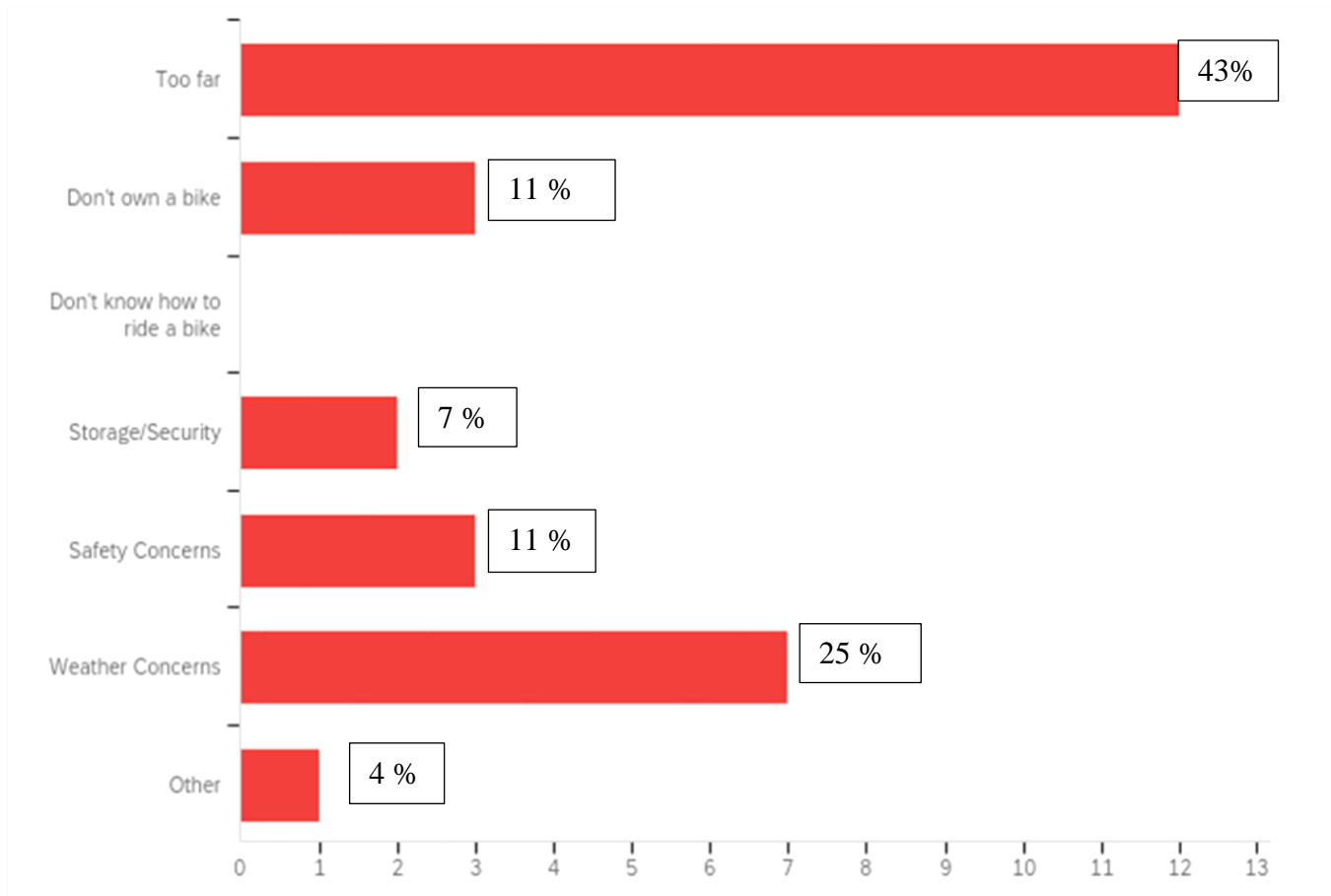


Figure C. Q2: How do You Usually Commute to Campus?

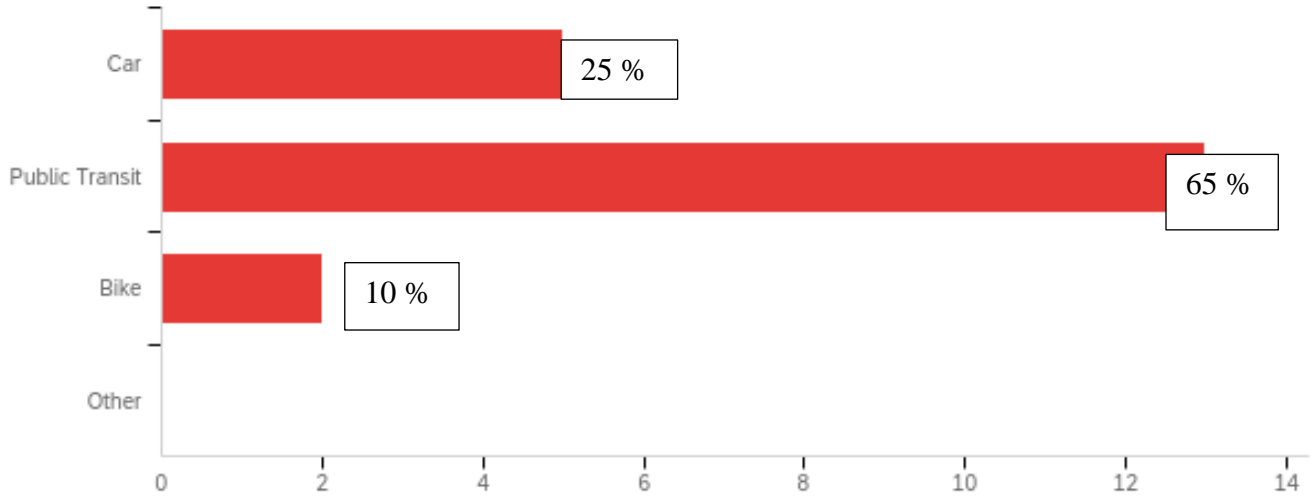


Figure D. Q10: Would You Like to See More Cyclist Facilities on Campus? (storage, showers, etc.)

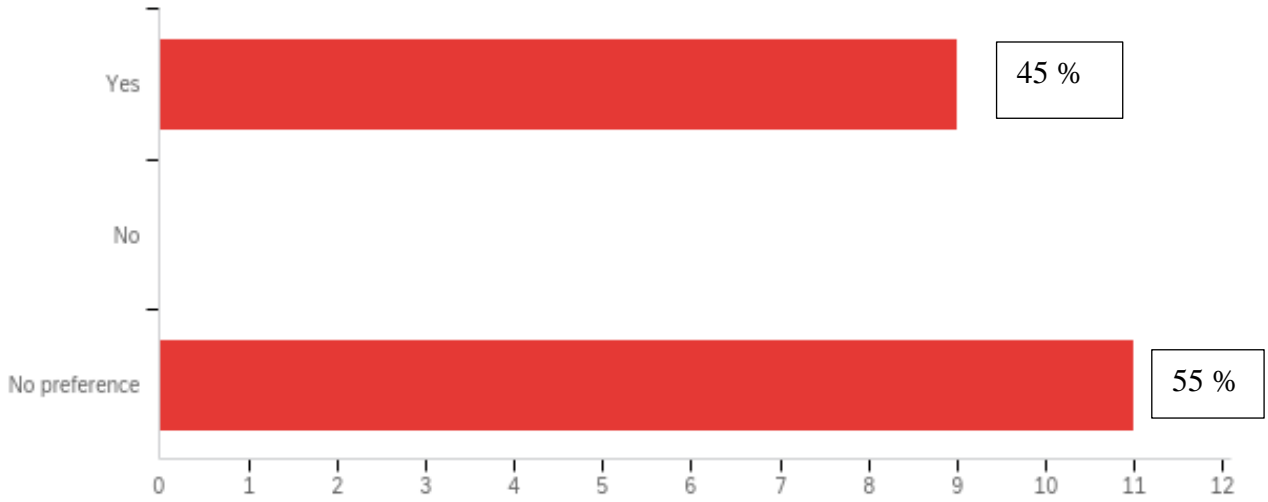


Figure E. Q8: Would You See Yourself Biking to Campus if There was an E-bike Share Program Available?

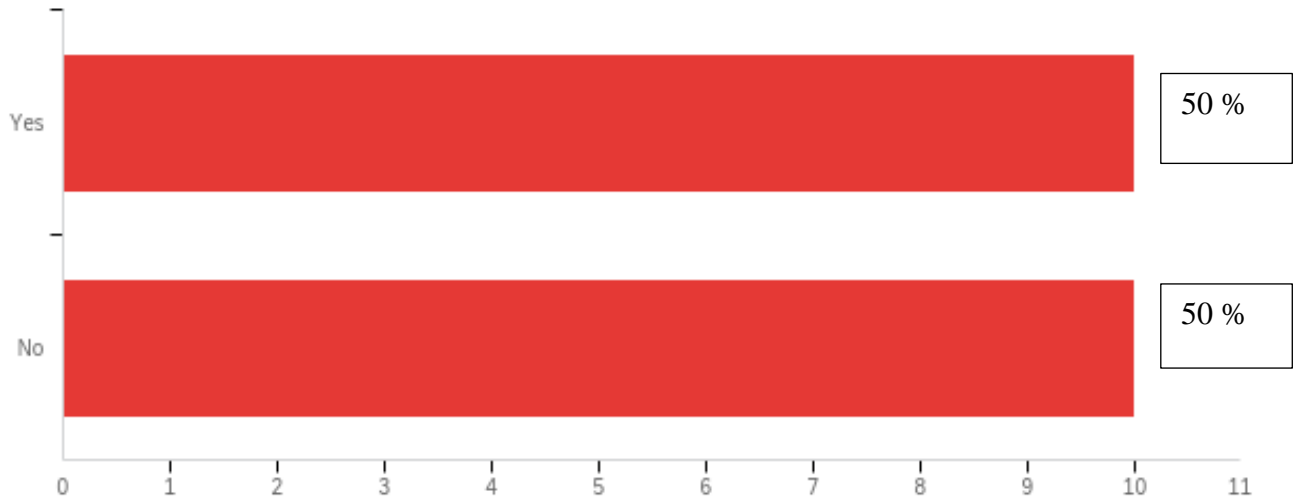
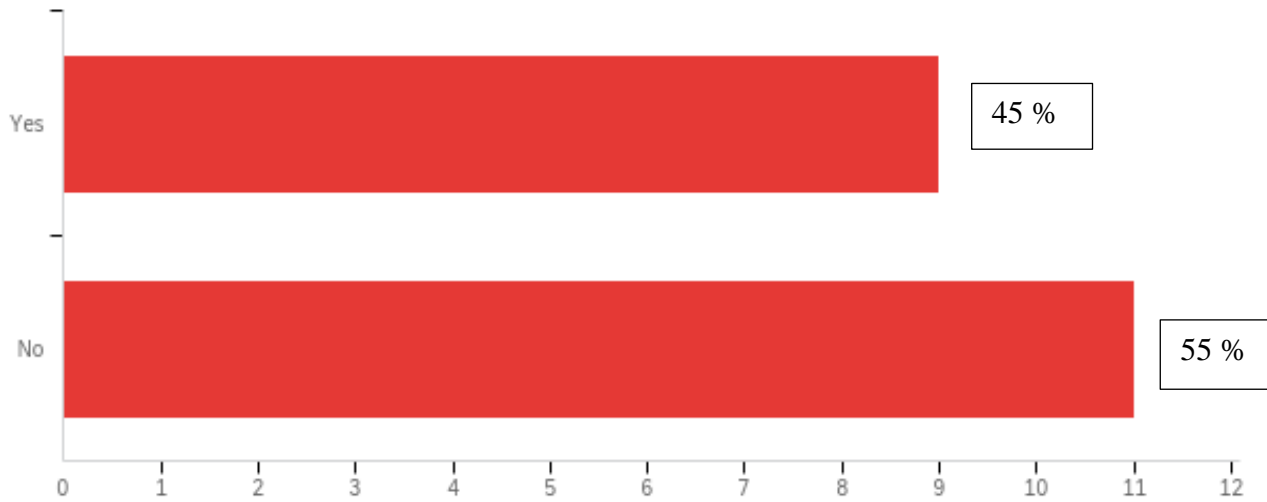


Figure F. Q6: Are you aware of the bike storage options on campus?



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Appendix A

Q1 How far from campus do you commute from?

- Under 10km (1)
 - 10-15km (2)
 - 15km+ (3)
-

Q2 How do you usually commute to campus?

- Car (1)
 - Public Transit (2)
 - Bike (3)
 - Other (4) _____
-

Q3 Do you currently own a bike?

- Yes (1)
 - No (2)
-

Q4 Have you ever biked to campus?

- Yes (1)
 - No (2)
-

Q5 If no, why not? (select all that apply)

- Too far (1)
 - Don't own a bike (2)
 - Don't know how to ride a bike (3)
 - Storage/Security (4)
 - Safety Concerns (5)
 - Weather Concerns (6)
 - Other (7) _____
-

Q6 Are you aware of the bike storage options on campus?

- Yes (1)
 - No (2)
-

Q7 Have you ever used an electric assisted bike (E-bike)?

- Yes (1)
 - No (2)
-

Q9 Would you see yourself biking to campus if there was an E-bike share program available?

- Yes (1)
 - No (2)
-

Q10 Would you like to see more cyclist facilities on campus? (storage, showers, etc.)

- Yes (1)
 - No (2)
 - No preference (3)
-

Appendix B

1. Do you commute by bike to campus? If so, what is your motivation for doing so, if not what is your lack of motivation due to?
2. Do you have a physical or mental limitation that prevent you from biking?
3. What are the biking conditions from your current location to campus (mountains, forest, uphill, etc....)
4. What are the biggest obstacles preventing you from biking? (disability, fear, no bike lanes etc.)
5. What makes you want to bike to school?
6. Have you ever spent time riding an e-bike? If so, what are your thoughts? If no, what is preventing you from trying one?
7. Have you ever had or known someone whose bike was stolen? (if so, does this deter you from biking to campus?)
8. Do you feel that UBC provides enough security for commuters' bikes?
9. Are you aware of any of the free 12 bike storage cages around the UBC Vancouver Campus?
10. Would you like to see more shower facilities on campus if sweating while biking to campus is an issue?
11. If you could make commuting to UBC easier for cyclists what would you like to see?
12. Would you utilize an E-bike share program if one existed?

Appendix C

KIN 464: Health Promotion and Physical Activity**Participant Consent Form for Class-based Projects****Cycle Commuting From Outside Vancouver****Group 6****Principal Investigator:**

Dr. Andrea Bundon (Assistant Professor, School of Kinesiology, Faculty of Education)

The purpose of the class project:

To gather knowledge and expertise from community members on the commuting habits of those who live further away from campus (10+km or outside Vancouver).

Study Procedures:

With your permission, we are asking you to participate in an interview or survey. 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 interview 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 collected.

At the completion of the course, all data (i.e. notes) and signed consent forms will be kept in a locked filing cabinet in Dr. Andrea Bundon's research lab (1924 West Mall) at the University of British Columbia. 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 phone at 604-822-9168 or 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.

Subject signature _____

Date: _____

Appendix D

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

**If you commute to UBC from outside Vancouver
we would love to speak with you!**

As part of a course-based research project (KIN 464), we are conducting a study on the commuting habits of staff and students. If you live outside of Vancouver we would love to hear from you/for you to complete a survey. Survey can be found at https://qfreeaccountssjc1.az1.qualtrics.com/jfe/form/SV_5ihLLDbtBeTSMYF?fbclid=IwAR1P3FIS4xFrOar9B9poNAifoNQIfyrse0W1T2LTILARxDEsd-dGpEU5Qzo or using the below QR code.

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.

