FINAL REPORT: Urban Cycling Project Feedback for Bike Routes on Point Grey Road

Group 7

Erika Dy Ning

Triny Fong

Emma Lei

Pat Wu

Dominic Yu

KIN 464

Instructor: Dr. Andrea Bundon

Teaching Assistant: Negin Riazi

April 3, 2018

Urban Cycling Project Feedback for Bike Routes on Point Grey Road

Partnering with City Studios, this urban cycling project gathered user feedback for three bike routes along Point Grey Road. Key environmental factors that determine cyclist safety and interest in cycling have been identified through research by Cauwenberg et al. (2018) and Ghekiere et al. (2014). The purpose of the project is to obtain feedback on infrastructure and design features pertaining to biking safety risk, and recommending solutions that create a safer, more convenient, and comfortable biking environment to increase bike commuting levels in the communities of Vancouver.

The first step of our methodology was to visit the three bike routes to identify key safety features specific to the intersections. Next, we generated survey questions, which were created based on three main categories integral to cyclist safety: architectural features, vehicle-cyclist interaction, and pedestrian-cyclist interaction (refer to Appendix 1). All survey questions would be answered based on a Likert scale: with 1 representing Highly Disagree, and 5 representing Highly Agree. We generated data through verbally conducted surveys for 10 participants at each of the three routes, for a total cohort of 30 participants. In addition to survey data, we also recorded additional cyclist comments.

Results were analysed to identify features that improved safety and comfortability in the three bike routes, as well as features that may require improvement.

The results showed that majority of cyclists found the bike lanes to be safe at all three routes. User comments recommended that the city build more bike lanes with similar features. All three bike routes had architectural factors that supported safe cycling. These factors were smooth surface of lanes, sufficient width for passing, and absence of obstacles. The presence of pedestrian crosswalks, and the separation of pedestrian sidewalks and bike lanes were factors that were shown to decrease the perceived risk of pedestrian-cyclist collisions. Along all routes, cyclists agreed that speed limits and speed bumps helped reduce drivers' speeds near the bike lane. The presence of physical barriers between the bike lane and the road effectively decreased perceived risks of cyclist-vehicle collisions.

Although the width of the bike lane is adequate for the majority of cyclists, we recommend that the bike lane width is increased to ensure that cyclists feel comfortable passing one another. In addition, we recommend that a sign is inserted by the crosswalk as an indicator to pedestrians that they are crossing a bike lane. We believe this will alert pedestrians of cyclists and will prevent future collisions. We also recommend adding signs to clearly separate the border between sidewalks and bike lanes to ensure pedestrians do not walk on bike lanes and vice versa.

Reducing the number of breaks in the barrier separating the bike lane and the road will also lower collision risk due to drivers pulling out of driveways. Wide mirrors may be added at breaks in the barrier to improve visibility of cars and bikes.

Introduction & Literature Review

The city of Vancouver recognizes cycling as one of the most convenient, energy efficient, and affordable modes of transportation, and the number of cyclists continue to grow each year (City of Vancouver, 2017). This growth may be attributed to the initiative supporting green transportation creating safe, convenient, and more comfortable bike routes (City of Vancouver, 2017). Moreover, factors such as the increased health benefits and reduced air pollution, carbon emission, and traffic congestion support the implementation of biking infrastructure and policies encouraging cycling (Beuhler & Pucher, 2011; Zipf, 2018). According to the 2016 census, 10.5% of the 13,065 people living in the West Point Grey district bike to work. This percentage is significantly higher than the City of Vancouver's overall average (6.1%); thus, analyzing feedback on existing bike routes in this area may indicate favorable features that encourage biking and also assess negative factors that can be remodeled to make cycling more convenient (Statistics Canada, 2017).

Cycling contributes to multiple health and societal benefits (Buehler & Pucher, 2011; Zipf, 2018). It improves both mental and physical health, and provides cost benefits for public health. Cycling is a potential solution for combating sedentary lifestyles (Buehler & Pucher, 2011; Fraser & Lock, 2010), and a rate of 25 cents is saved in health costs for every kilometer cycled (Zipf, 2018). Forty one percent of citizens in Metro Vancouver are interested in biking but are concerned with safety; therefore ,enhancing bike path safety is expected to cause an increase in cyclists (Fraser & Lock, 2010, Buehler & Pucher, 2011). This project investigates environmental factors that encourage or discourage cycling within the Point Grey area. According to a study by Cauwenberg et al. (2018), some of the key environmental factors to examine are traffic safety, infrastructure, maintenance, and design. This study also identified designs associated with decrease safety risks, such as the widths of lanes, physical barriers separating motorized vehicles from the bike lanes, obstacle free lanes, clearly marked bike lane separation from pedestrian walkways, and evenness of surfaces. Another study by Ghekiere et al. (2014) investigated the effects of environmental factors on perceived road safety through interviews with 35 children and parents. The findings indicated concern for cycling on high traffic roads, narrow roads, roads with limited visibility, roads with poor signage at intersections, poor bike lane continuity, and speed limits over 30 km/hr.

Findings from both studies highlighted traffic safety as a major concern and proposed improvements to the bike lanes corresponding to the transportation design guidelines implemented by the City of Vancouver (City of Vancouver, 2017; Zipf, 2018). For example, to increase comfortability, both studies and the city suggested building protected and off-street pathways, designed bilateral bike lane width to be 3 meters wide, and provided paved travel surfaces (City of Vancouver, 2017). Studying bike lanes will influence policies and consequently, changes in policies will increase the percentage of people choosing to cycle as their primary mode of transportation.

This project, partnering with City Studios, will focus on 'user' experiences regarding bike lane features that contribute to rider safety and comfort along bike routes intersecting Point Grey Road between Alma and Highbury Street, Highbury and Wallace Street, and Stephens and Macdonald Street. The information obtained will be summarized for the Active Transport Unit, and data will be allocated individually to their respected bike routes within Vancouver to supplement the creation of 'user' ratings (Bundon, 2018). Furthermore, this data may potentially influence policies and promote positive changes, creating safer, and more comfortable bike paths for all ages and abilities (Buehler & Pucher, 2011; Zipf, 2018). This feedback is necessary for improving bike lane infrastructure, promoting cycling as a primary mode of transport, and encouraging non-cyclists concerned about safety to try cycling. Data collected from this study contributes to active transport strategies, which improves public health and the environment (Litman, 2015).

This project will help gauge 'users' experience specifically on the traffic safety, pathway conditions, intersection safety, bike lane width, physical barriers, and pedestrian-cyclist safety. Collected feedback will be used to determine any safety issues, disparities in between the streets being studied, and determine whether these routes are meeting the proposed guidelines set out by the city of Vancouver and studies by both Caeuwenberg et al. (2018) and Ghekiere et al. (2014). The purpose of this research is to obtain feedback on the infrastructure and design features pertaining to biking safety risk, and recommending solutions that create a safer, more convenient, and comfortable biking environment to increase bike commuting levels in the communities of Vancouver.

Methods & Rationale

We first visited the three routes to identify key features that could affect cyclist safety. We chose three routes in close proximity to each other along Point Grey Road so that there would be a considerable overlap in features, allowing for an overall representation of the bike route. The differences in features between each route allowed us to critically analyze and provide insight on what factors made each route either safe or unsafe.

For more accurate context-sensitive information, we collected data through verbally conducted surveys at the designated bike route locations. We prepared a total of thirteen questions, with nine questions that pertained to all three routes and four questions that were specific to some routes (refer to Appendix 1). Questions that were not applicable to a certain route were bolded in a red colour (refer to Appendix 1). The survey questions were created based on three main categories that we have identified as being influential to cyclist safety: architectural features, designs that reduce vehicle-cyclist interactions, and designs that reduce pedestrian-cyclist interactions. Architectural features include the width of the surface, the smoothness of the surface, and environmental obstacles. Factors that affected vehicle-cyclist interactions consisted of parallel parking spots next to the bike lane, speed limit signs and speed bumps, and openings in the bike barrier for residential and commercial driveways. Factors that affected pedestrian-cyclist interactions included pedestrian crosswalks on the bike lane and the sidewalk adjacent to the bike lane.

Architectural Features

It is important that bike lanes have smooth surfaces as it increases comfortability for cyclists and reduces the rate of accidents. Smooth surfaces will also reduce the risk of riders swerving into the opposite lane (Caeuwenberg et al., 2018; Ghekiere et al., 2014). This is a factor that is especially important for older adults and individuals who are new to cycling.

The next factor we identified was the width of the bike lane. According to the Transportation Design Guidelines for All Ages and Abilities Cycling Routes created by the City of Vancouver (2017), a bidirectional bike lane should be at least 3 metres wide. To assess this, we asked cyclists if they felt that the width of the lane was sufficient for safe passing.

Proper maintenance of the bike lane keeps the bike lane obstacle-free. Obstacles such as overgrown bushes, debris, and potholes can all be detrimental to the safety of cyclists (Caeuwenberg et al., 2018).

Whether or not cyclists perceive the bike lane as accommodating to all levels of abilities is an indication of how safe the route is for cyclists going at different or inconsistent speeds.

Vehicle-Cyclist Interaction

Parallel parking directly beside the bike lane is a feature specific to Stephens Street to MacDonald Street and Alma Street to Highbury Street. We chose to analyze this factor to determine whether the parking of cars directly adjacent to the bike lane may make cyclists feel unsafe from potentially unforeseen collisions such as the opening of car doors. A follow-up question addressed whether or not cyclists felt that the barrier between the parallel parking and the bike lane was adequate.

The next factor we assessed was the maintenance of driver speed. According to the City of Vancouver, the posted speed limit for local street bikeways is 30 km/hr (City of Vancouver, 2017). This is important as it reduces the prevalence of accidents and slower speeds make it easier for drivers to see cyclists (City of Vancouver, 2017). We intend to examine whether the signages and speed bumps will be effective at maintaining vehicle speeds, and whether the cyclists feel that the signs and speed bumps contribute to their safety.

Another vehicle-cyclist factor we identified was the design of the intersection including traffic lights and marked crossings for cyclists when turning left or right. An intersection with high visibility and clear direction of movement will provide both cyclists and drivers with more comfort (City of Vancouver, 2017). The design of the intersection makes the direction of movement clear to all users of the road. A separate right or left turn lane for cyclists also allow cyclists who are not turning to continue going straight without having to wait for cyclists to turn right. A lack of traffic lights increase the ambiguity of when it is safe for cars and cyclists to proceed or make turns, resulting in reduced cyclist safety.

Lastly, we noticed that there was an opening in the bike barrier between Highbury St. and Wallace St. to allow for vehicles to pull in and out of driveways. While necessary, the sudden opening in the bike barrier may pose as a safety risk to cyclists by exposing them to vehicle traffic and vehicles turning in and out of the driveway, thus increasing risk of collision. Since this factor was specific to one bike route, we wanted to see if it contributed to the overall perceived safety of the bike route.

Pedestrian-Cyclist Interaction

It is important to determine if bike route designs help minimize pedestrian-cyclist collisions. We examined the pedestrian crosswalks across the bike lane that was specific to Stephens Street to MacDonald Street and Alma Street to Highbury Street. Pedestrian crosswalks on bike lanes alert cyclists of possible pedestrians and helps them reduce their speed to avoid collisions (City of Vancouver, 2017).

In addition to pedestrian crosswalks, the separation of a bike-only pathway from the walking pathway lowers the risk of pedestrian-cyclist collisions (City of Vancouver, 2017). By having separate pathways, cyclists will not have to worry about passing pedestrians or avoiding them.

Data Collection and Recruitment

The sample size was ten cyclists per route, for a total cohort of thirty cyclists between the three routes. For each of the three routes, we only surveyed at one end of the intersection of each route to prevent surveying the same cyclist twice. These were the areas where cyclists would most likely stop and be receptive to taking time to answer survey questions. Surveying at the ends of the bike routes also increased the probability that the cyclists have biked the entire length, increasing the quality of the data. We visited the bike routes on a weekday afternoon to maximize the number of cyclists most likely to regularly use the bike route for transportation (Caeuwenberg et al., 2018). We limited surveying time to a two-hour period from 3-5pm to maintain consistency.

Before beginning our survey, we introduced ourselves to cyclists as UBC Kinesiology students carrying out a project assessing the perception of safety of bike routes in the city. We emphasized that we are not working for the city, and assured them that personal information would not be needed for the survey. Lastly, we obtained verbal consent from the cyclists before beginning the survey.

During our data collection, some cyclists expressed their opinions on the routes in addition to answering the survey questions. One challenge during our research was that the target sample size of cyclists interviewed the first time was not met. To maintain the consistency of results, we visited again on a different weekday afternoon at the same time of day to gather data. We expected the majority of the cyclists to be cycling for transportation, however, due to the sunny weather, we were able to survey people cycling for leisure as well.

Data Analysis

The first step of our analysis was to compile results for each of the three routes, and determine bike route factors that were effective or needed improvement. Next, we performed a thematic analysis to identify trends of bike route factors that generated high approval ratings in all three groups, as well as factors that needed improvement. We created three bar graphs (one for each feature) that displayed the frequency of ratings on a scale of 1 to 5 of each bike route. One graph was created for each feature to allow visual comparison of the ratings from the three routes on each graph. The y-axis represents the frequency, while the x-axis represents the scale of rating. A higher bar represents more people choosing that rating for that designated route (refer to Appendix 2). A higher bar on the right (rating of 5) indicates that more people felt that the feature was effective in contributing to their safety as a cyclist.

Problems and Challenges Encountered in Data Collection and Analysis

One of the main challenges during data collection was stopping cyclists to take the verbal survey. Many of the cyclists were in a hurry, too busy, or did not slow down enough to notice our group members. We found that it was particularly difficult to stop cyclists going downhill at high speeds. Furthermore, since we surveyed during the weekday, many cyclists were using the bike lane for transportation with a goal of reaching a destination in time, and therefore, had limited time to stop for a verbal survey. The difficulty in recruiting cyclists contributed to the choice of a smaller sample size.

During data collection, we realized the redundancy of certain survey questions and made adjustments to the survey by combining or taking out some questions. These adaptations were made to increase the efficiency of the survey and value the cyclists' time while collecting responses from relevant questions.

We initially planned to survey at one end of each route where the intersection is to prevent surveying the same cyclists twice, which may occur from surveying at both ends of the route. While this was effective, we did not consider the fact that cyclists were likely to cycle through the entire length of Point Grey Road, and those cycling for leisure or exercise may double back. Since all three routes were along Point Grey Road and in close proximity to each other, there was one cyclist who we surveyed along one route and asked again to stop for a survey along another route.

Another challenge to both data collection and analysis was trying to attain safety-related responses from cyclists rather than biased responses. For example, some cyclists remarked that traffic lights did not increase safety along a bike route, based on personal preferences on traffic lights.

Data analyses showed that all three bike routes obtained relatively high ratings for the survey questions. However, the results of our user ratings may be positively skewed by the fact that cyclists who are willing to take the verbal survey are more likely to already be using these bike lanes regularly because they enjoy the route and safety features it may offer.

Findings & Discussion

Alma St. to Highbury St.

Overall, the architecture of this bike lane was highly effective at maintaining the safety of the bike route. Surveyed cyclists unanimously agreed that the smoothness and width of the route was adequate for cyclist safety (refer to Appendix 3). Further supporting this finding was the fact that all surveyed cyclists agreed that bike lanes were free of obstacles such as overgrown bushes, debris and potholes (refer to Appendix 3). This implied that in addition to a safe architectural design to the bike route, there was regular maintenance of the route for safety.

While most cyclists agreed that the bike lanes accommodated all levels of cyclists, there was one neutral response and one response that disagreed (refer to Appendix 3). These results suggest that while the bike lane accommodates most cyclists, it may not accommodate particularly fast cyclists or inexperienced cyclists. Fast cyclists may find it troublesome to pass other cyclists within one lane, while slow or inexperienced cyclists may feel uncomfortable or cumbersome with many faster cyclists riding near or passing them.

Our data analysis found that the design of the intersection was highly effective at reducing cyclist to vehicle collisions (refer to Appendix 2). All surveyed cyclists agreed that barriers between bike lanes and parallel parking spaces contributed highly to perceptions of safety (refer to Appendix 3). Nearly all participants agreed that existing speed limits of speed bumps helped reduce vehicle speeds, and that speed limits were respected by drivers in the area (refer to Appendix 5.2). One participant stated they were unaware of speed limit signs along the route, and therefore was excluded from data analysis.

The properties of this intersection were generally effective at reducing the risk of pedestrian to cyclist collisions (refer to Appendix 2). Most cyclists agreed that the separation of pedestrian sidewalks and bike lanes improved feelings of safety (refer to Appendix 3). Cyclists may feel safer when pedestrians walk on sidewalks separate from the bike lanes, as there is a lower risk of a pedestrian to cyclist collision when they are not sharing the same surface. A majority of surveyed cyclists agreed that pedestrian crosswalks were effective at reducing collisions (refer to Appendix 3). However, some cyclists stated that pedestrian crosswalks were ineffective at reducing pedestrian-cyclist collisions because the crosswalk is not visible enough, causing pedestrians and cyclists to not see one another (refer to Appendix 3). In addition, one cyclist commented that many cyclists do not slow down when approaching the pedestrian crosswalk (refer to Appendix 3).

Highbury St. to Wallace St.

Our data analysis found that bike route architecture was effective at maintaining cyclist safety, as all cyclists agreed that bike route surface was adequately smooth for cycling safety and were free of physical or environmental obstacles (refer to Appendix 5.1). There was also a high level of agreement that the width of the bike lane was very safe for cycling, with only one disagreeing response (refer to Appendix 3).

Overall, we found that the design of the bike route was effective at preventing collisions between cyclists and vehicles. Our data showed unanimous agreement that speed limits and speed bumps helped reduce vehicle speeds (refer to Appendix 3). Cyclists also agreed that they felt safe when executing right or left turns.

This route has potential for improvement to further minimize risk of cyclist vehicle interactions (refer to Appendix 2). All cyclists agreed that openings in bike barriers for driveways along the route contributed to the impression of reduced safety (refer to Appendix 3). The presence of driveways along bike routes are a hazard, as it is difficult for drivers to see cyclists as they back out.

After data analyses, we conclude that the design of this intersection helps minimize the risk of cyclist pedestrian interaction (refer to Appendix 2). All cyclists agreed that having a pedestrian sidewalk separated from bike lanes reduced collisions (refer to Appendix 3). These results suggest that cyclists feel more safe when they do not have to share a transportation surface with pedestrians, likely due to their great difference in travelling speed.

Stephens St. to MacDonald St.

Survey results present that all cyclists agreed that the architecture of the bike route was safe for protected cycling (refer to Appendix 2). Cyclists mentioned that the foundation of the route had a smooth surface for biking free of both environmental and man-made obstacles and that the bike lane was wide enough for both the perception of a safe path as well as for passing other cyclists. Our analysis suggests that cyclists of varying skill levels and speeds would likely also feel confident in their safety.

Safety regarding vehicle to cyclist interaction was also a big concern for all cyclists, as only half of the cyclists surveyed believed that existing speed limit signs and speed bumps reduced car speeds (refer to Appendix 3). The other half of the cyclists neither agreed or disagreed or did not notice that there were signs and speed bumps on the road at all, suggesting that the safety around vehicle to cyclist interaction was still a perceived danger. Despite the ambiguity, all of the cyclists surveyed highly agreed that the barriers set in place between the bike lanes and the parallel parking spaces were adequate for cyclist safety (refer to Appendix 3). In addition to this, all the cyclists also agreed that they felt safe cycling beside a car that was parallel parking (refer to Appendix 3).

Through our data analysis, we can also conclude that that all cyclists felt that the pedestrian crosswalk and the separation of pedestrian sidewalks and bike lanes contributed to reducing pedestrian-cyclist collisions (refer to Appendix 2).

Overall Assessment

Thematic analysis of trends between the three bike routes revealed a number of factors essential to the safety and comfortability of bike routes. Many aspects of the intersection and bike lane design of these three bike routes effectively increased cyclists' perceptions of safety.

These results suggest that future designs and renovations to the bike lanes should implement these designs.

One prominent theme between all three bike routes was that the architectural structure was effective for safe cycling. Smooth lane surfaces and regular maintenance to eliminating obstacles were factors that were shown to reduce falls. Feedback from all three groups showed that the current width of 3 meters on the bike lanes helped participants feel safe when passing other cyclists.

A majority of cyclists agreed that the number of pedestrian crosswalks and the separation between pedestrian sidewalks and bike lanes reduced the perception of risk of pedestrian-cyclist collisions. The cyclists included that other reasons for these collisions would include the risk of sidewalks not being prominent enough to distinguish as a separate path from the bike lanes.

Physical barriers separating the bike lane and the road was shown to increase comfortability when biking beside cars in all three groups. The majority of cyclists felt that drivers respect speed limit signs and that speed bumps along the route effectively contribute to how fast cars drive down the street. The cyclists also felt safe turning at intersections; however, there were mixed results about whether or not traffic lights contributed to the safety of cyclists when crossing intersections. Additionally, only the cyclists who were surveyed along a bike route that had no traffic lights stated that traffic lights do not contribute to the safety of cyclists. According to data from the bike lane at Highbury and Wallace, openings in bike barriers for driveways along the route make it difficult for drivers to see cyclists as they back out (refer to Appendix 3). This decreases perceived safety for cyclists along the route in fear of vehicle collisions.

Challenges and Limitations

A challenge during our data collection was the limited number of participants we surveyed due to time constraints. Increasing the sample size would have provided a better representation of the cyclists who use these routes. Furthermore, on both data collection days, the weather was sunny and dry. This may positively skew our data and present the routes as more safe, thus misrepresenting the cyclists' responses.

Another limitation to our analyses is that we lacked specific age and skill group data. We were not able to gather much feedback from particularly fast cyclists, or cyclists that were travelling to work. The specificity of our data could have been increased by grouping participants based on age group and skill level. Additional data from these groups would have enhanced our analyses by providing further insight into how perceived safety of bike routes compared between cyclists of different ages and skills.

For future studies on bike route user feedback, we recommend allocating more time for data collection to achieve a larger sample size. Additionally, we recommend classifying survey participants based on age and skill level to evaluate whether bike route approval ratings differ between different groups. Lastly, future research should also collect data during a rainy day to evaluate whether cyclists feel safe along these routes in differing weather conditions.

Recommendations

Based on our analyses, we recommend reducing breaks in the barrier separating the road and the bike lanes, adding signs by crosswalks and sidewalks to minimize pedestrian-cyclist collisions, and ensuring that bike lanes are wide and safe enough for comfortable passing at all bike lanes. Implementing these recommendations will increase the overall perception of safety for all cyclists, which will ultimately encourage more cyclists to use the bike routes.

For the bike route between Highbury Street and Wallace Street along Point Grey Road, we recommend reducing the number of breaks in the barrier separating the bike lane and the road. Currently, there are three breaks in the barrier which allow cars to drive through the bike lane. 9 out of 10 cyclists along the route stated that reducing the number of openings in the bike barrier will increase how safe they feel when cycling. Likewise, there are currently 3 driveway openings along the bike route between Macdonald Street and Stephens Street. As a result of the driveway openings, there is also no barrier separating the bike lane and oncoming traffic on the road. This can be hazardous if cars are backing out and do not see cyclists. In addition to reducing the number of breaks in the barrier, wide mirrors can be added to ensure visibility of cars and bikes along the route to minimize collisions.

Even though the pedestrian sidewalk is separated from the bike lane at all three routes, we recommend adding more signs to minimize pedestrian-cyclist collisions. This is especially relevant at the bike route between Alma Street and Highbury Street on Point Grey Road. Cyclists along this bike route stated that pedestrian crosswalks were ineffective at reducing pedestrian-cyclist collisions because many pedestrians and cyclists have a hard time seeing one another. In addition, one cyclist commented that many cyclists do not slow down when approaching the pedestrian crosswalk. Our recommendation is to insert a sign by the crosswalk as an indicator to pedestrians that they are crossing a bike lane. We believe this will make pedestrians more aware of cyclists and prevent future collisions, which will further improve the safety for cyclists using this bike route. In addition to adding signs specifically at crosswalks, we recommend adding signs to identify where pedestrians should walk and where cyclists should bike to ensure pedestrians do not walk on the bike lane and vice versa.

Furthermore, we recommend increasing the width of the bike lanes to ensure that cyclists are comfortable passing one another. At every bike route, at least one cyclist suggested that they did not feel comfortable passing another cyclist. In addition to widening the bike lanes, the two way bike lanes between Highbury Street and Wallace Street is not clearly marked and separated. At this bike route in particular, 2 out of 10 cyclists expressed that they do not feel safe passing other cyclists. Some cyclists also commented that they prefer riding their bikes on the road because there was more space. By increasing the width of the bike lane and clearly identifying the two way route, cyclists will feel more comfortable riding on this bike route in the future.

Appendices

Appendix 1: Survey Questions

How much do you agree with the following statements (1 = highly disagree, 5 = highly agree)

Scale:

1	2	3	4	5
Highly Disagree	Disagree	Neutral	Agree	Highly Agree

I feel that this bike route is smooth enough for safe cycling (e.g. reduce falls).

1 2 3 4 5 N/A

The width of the bike lane is wide enough for me to feel safe cycling (including passing).

1 2 3 4 5 N/A

I feel that the barrier between the bike lane and the parallel parking spaces is adequate for cyclist safety while a vehicle is parallel parking.

1 2 3 4 5 N/A

I feel safe cycling past a car that is parallel parking beside the bike lane.

1 2 3 4 5 N/A

I think that the speed limit signs and speed bumps effectively reduce car speeds for the safety of cyclists.

1 2 3 4 5 N/A

I think that cars in this stretch of the bike lane respect the speed limit.

1 2 3 4 5 N/A

I think that pedestrian crosswalk on the bike lane effectively contributes to reduce pedestrian-cyclist collisions (e.g. reduce speed).

1 2 3 4 5 N/A

I think that the separation of pedestrian sidewalks and bike lanes reduce pedestrian-cyclist collisions.

1 2 3 4 5 N/A

I feel that the bike lanes are obstacle-free (e.g. overgrown bushes, debris, potholes).

1 2 3 4 5 N/A

I feel that this bike lane accommodates for all levels of cyclists (slow and fast).

1 2 3 4 5 N/A

I feel safe executing right and/or left turns at the intersection.

1 2 3 4 5 N/A

I think that traffic lights increase safety for cyclists when crossing intersections.

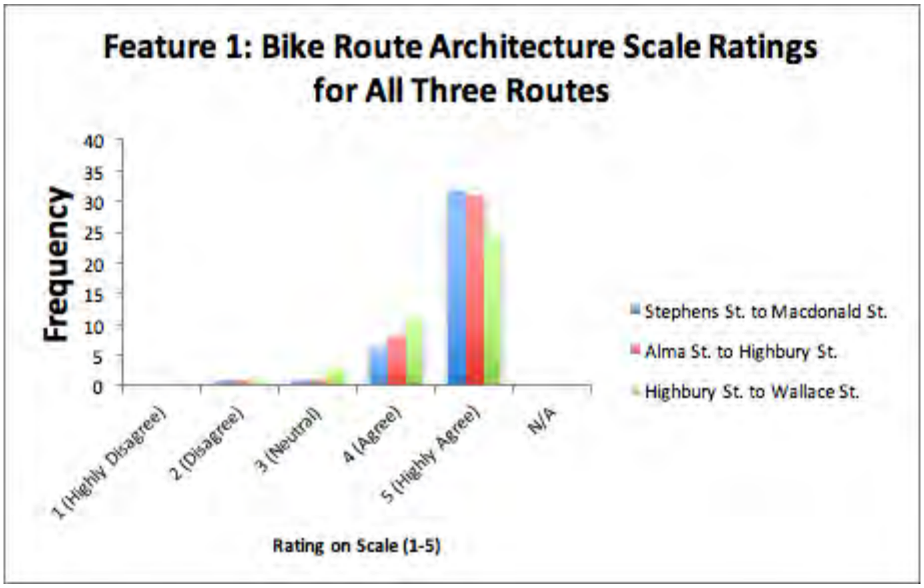
1 2 3 4 5 N/A

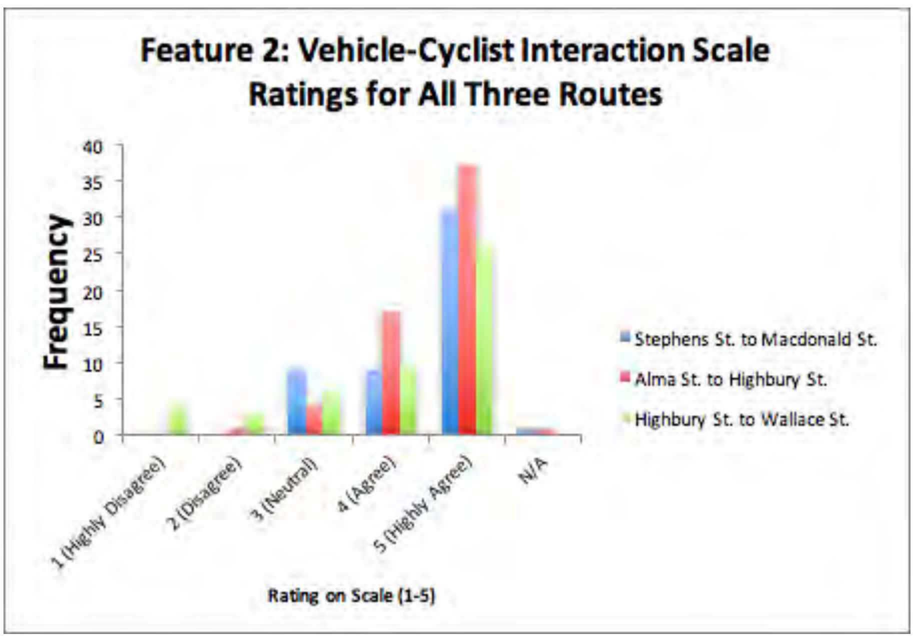
I think that reducing the number of openings in the bike barrier for driveways increase cyclists' safety.

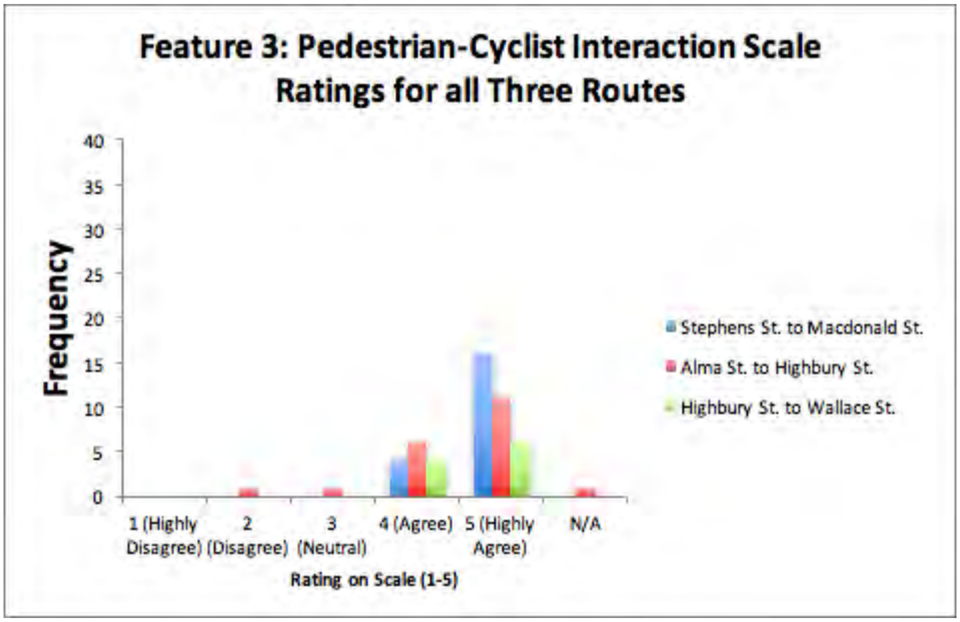
1 2 3 4 5 N/A

ADDITIONAL COMMENTS:

Appendix 2: Ratings of Bike Routes






Feature 3: Pedestrian-Cyclist Interaction Scale Ratings for all Three Routes
Frequency
40
35
30
25
20
15
10
5
0
1 (Highly Disagree)
2 (Disagree)
3 (Neutral)
4 (Agree)
5 (Highly Agree)
N/A
Rating on Scale (1-5)
Stephens St. to Macdonald St.
Alma St. to Highbury St.
Highbury St. to Wallace St.

Appendix 4: Participant Consent Form

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

Participant Consent Form for Class-based Projects

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

Student Group: 7 – Erika Dy Ning, Triny Fong, Emma Lei, Pat Wu, and Dominic Yu

The purpose of the class project:
To gather knowledge and expertise from community members on topics related to physical activity, recreation, health promotion and/or active transportation.

Study Procedures:
With your permission, we are asking you to participate in a verbal survey. Students will collect the surveys and take note of your responses. With the information gathered, students will critically examine how different individuals understand or engage in health promoting activities or initiatives.

Project outcomes:
The information gathered will be part of a written report for the class project. The written report will be shared with the community partners involved with the project. Summaries of findings may also be posted on the following website.
CityStudio Projects: http://www.citystudiovancouver.com/projects/

No personal information/information that could identify participants will be included in these reports.

Potential benefits of class project:
There are no explicit benefits to you by taking part in this class project. However, participating 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 is paramount, and no names will be used in the reports.

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

At the completion of the course and all data 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. Although there is a schedule of questions, participants are free to share what they would like, including refusing to answer specific questions. You should know that your participation is completely voluntary, and you are free to ***withdraw from the survey*** 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. We will be giving you this paper if you have other inquires about the project and will be requiring verbal consent for this survey.

Appendix 5.1: Photo of Bike Lane Between Wallace Street and Highbury Street

The bike lane is smooth, flat, wide, and free of obstacles. There is also a distinct separation between the pedestrian sidewalk, the bike lane, and the road. The physical barriers on either sides of the bike lane, separating the bike lane from the sidewalk and the road, increase the perception of safety for cyclists.

Appendix 5.2: Photos of Bike Lane Between Highbury Street and Alma Street

The physical barriers protecting the bike lane were destroyed due to construction, leaving gaps and debris on the sides of the bike lane, which reduced the safety of cyclists.

There are signs at the intersection of Highbury Street and Point Grey Road to signal cars to yield to cyclists. In addition, the speed limit on this road is 30km/h which corresponds to guideline rules set by the City of Vancouver to reduce risk of cycling (City of Vancouver, 2017).

Appendix 5.3: Photos of Bike Lane Between Macdonald Street and Stephens Street

The intersection at Stephens Street and Point Grey Road has high visibility and clear direction of movement for all transportation modes, including a separate right and left turn lane for cyclists.

References

Buehler, R., & Pucher, J. (2011). Cycling to work in 90 large American cities: New evidence on the role of bike paths and lanes. *Transportation,39*(2), 409-432. doi:10.1007/s11116-011-9355-8

Bundon, A. (2018). KIN 464 Project Description Form – Bike route feedback docx [Word document]. Retrieved from Lecture Noted Online Web site https://connect.ubc.ca/webapps/blackboard/content/listContent.jsp?course_id=_108048_1&content_id=_4667620_1&mode=reset

Cauwenberg, J. V., Clarys, P., Bourdeaudhuij, I. D., Ghekiere, A., Geus, B. D., Owen, N., & Deforche, B. (2018). Environmental influences on older adults' transportation cycling experiences: A study using bike-along interviews. *Landscape and Urban Planning,169*, 37-46. doi:10.1016/j.landurbplan.2017.08.0

City of Vancouver. (2017). Cycling in Vancouver. Retrieved from http://vancouver.ca/streets-transportation/biking.aspx

City of Vancouver. (2017). Transportation Design Guidelines: All Ages and Abilities Cycling Routes. Retrieved from http://vancouver.ca/files/cov/design-guidelines-for-all-ages-and-abilities-cycling-routes.pdf

Fraser, S. D., & Lock, K. (2010). Cycling for transport and public health: A systematic review of the effect of the environment on cycling. *European Journal of Public Health,21*(6), 738-743. doi:10.1093/eurpub/ckq145

Ghekiere, A., Cauwenberg, J. V., Geus, B. D., Clarys, P., Cardon, G., Salmon, J., . . . Deforche, B. (2014). Critical Environmental Factors for Transportation Cycling in Children: A Qualitative Study Using Bike-Along Interviews. *PLoS ONE,9*(9), 1-11. doi:10.1371/journal.pone.0106696

Holden, R. J., McDougald Scott, A. M., Hoonakker, P. L. T., Hundt, A. S., & Carayon, P. (2015). Data collection challenges in community settings: Insights from two field studies of patients with chronic disease. *Quality of Life Research : An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation*, *24*(5), 1043–1055. http://doi.org/10.1007/s11136-014-0780-y

Litman, T. (2015). *Evaluating Active Transport Benefits and Costs*(Rep.). Victoria Transport Policy Instsitute. Retrieved from www.vtpi.org

Statistics Canada. 2017. Vancouver, CY [West Point Grey], British Columbia BC. Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. Retrieved from http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E

Zipf, M. (2018). Safe and Comfortable Cycling for All [PDF document]. Retrieved from https://connect.ubc.ca/bbcswebdav/pid-4679286-dt-content-rid-24813391_1/courses/SIS.UBC.KIN.464.001.2017W2.94095/ENG%20-%20TPL%20-%20Safe%20and%20Comfortable%20Cycling%20for%20All%20-%20Citystudio%20UBC%20Class%20Project.pdf