Drawing the Commute

Application of Drawing and Sketch Maps on the Mental Image and Perception of Commutes in Montréal

by

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Abstract

This thesis aims to uncover perceptual differences between a commuter's understanding of their commute path and reality. Previous literature on perceptions of the urban environment primarily focus on the city as a whole, rather than focusing down upon the experience of the commute. In the research, I had participants draw and explain their commute. After a total of 30 surveys were collected, I coded the interviews and drawings. The main findings upon the analysis was a highly path-based understanding of commutes. Additional common elements were greenery along the route, buildings, and traffic lights. Also, distinctions between transport modes included pedestrians being more focused on their surroundings, cyclists being more preoccupied with safety, and transit riders more occupied with reliability. Participants of all types considered speed the most important, with most choosing the most direct route. This study contributes to the literature by offering a focused look at the commute instead of the more common broad perspective normally used in cognitive mapping research.

CHAPTER 1: INTRODUCTION

Commuting is an activity familiar to essentially all members of society. The act of travelling between a workplace and home is one of, if not the singular, most regular act of mobility a person takes in their life. As a result, a person's understanding and perception of their commute can contribute toward the understanding of a major part (both psychologically and timewise) of their life. Commuting is often framed in an objective sense: minimizing time and maximizing throughput. Nonetheless, commute times have continued to increase in recent years (Bennardo, 2019). As such, while efforts to decrease commute times are important, an alternative approach is to investigate the experience of commuting itself and the outstanding elements that make up a commute in order to make the experience of the commute itself better.

In this thesis I aim to uncover perceptual differences between commuters' understandings of their commute path and reality. From this aim I have devised 4 research questions:

1. How do people understand their surroundings during a commute?
2. What factors affect perceptual differences in people's commutes?
3. Do people who use different transport modes accentuate different parts of their commute?
4. Do mapping apps cause different interpretations of commutes?

In order to answer these questions, I used drawing methods as the primary data collection method in conjunction with supplementary interviews. The investigation of drawings allows the participant to outline their idea of the commute in a visual manner, providing a more concrete representation and tangible points for the basis of discussion. The obtuse nature of these questions is purposeful as perceptions can vary widely between different commuters. As a result of this research I found that people's commutes are most frequently understood as a series of paths. Other features such as buildings and surrounding scenery are often added in addition to these paths. Greenery is a favoured addition to paths, while traffic and pauses to the commute are unfavoured. Between modes, pedestrians and cyclists were more inclined to draw more cartographic drawings while the drawings of transit riders were more abstract. There were not enough motorists in the study to come to any conclusions about motorist perceptions. The usage of mapping apps in the formation of a commute was correlated with increased abstraction in the drawings. Such findings are consistent with existing literature on the topic, and as such, the practice of cognitive mapping is a useful tool in understanding the perceptions of a person's commute.

In Chapter 2 I will cover existing literature on three topics closely related to the matter at hand: cognitive mapping, commuting, and sketch maps & drawing. In Chapter 3 I will outline the methodology I used, primarily explaining the research process and coding of the responses themselves. After this, in Chapter 4, I will discuss the findings from this analysis and in Chapter 5 discuss the implications from them. Lastly, in Chapter 6, I will conclude with a general summary as well as future steps of study on the topic.

CHAPTER 2: LITERATURE REVIEW

In an effort to grasp literature previously done on the topic, I considered two broad categories of research: cognitive mapping and commuting patterns. In addition, I examined literature surrounding the methods of sketch maps and drawing. The importance of cognitive mapping in the topic at hand is due to the commute's perception being formed in a manner stemming from the mental mapping of a person's surroundings. The body of literature on commuting patterns is also of importance as the choices an individual makes during their commute would affect and be affected by the person's perception of their commute. Sketch map and drawing literature also must be taken into account in order to consider ramifications and strategies in using these techniques in research.

2.1 Cognitive Mapping and Imageability

The process of uncovering people's perceptions of a city is not a new one. The history of cognitive mapping has its roots within the field of neuroscience, reaching back to the 1940's in Tolman's 1948 study on the development of the cognitive maps of laboratory rats. With changing mazes and various reward patterns for these rats, Tolman was able to determine patterns of latent spatial learning that resulted in a pattern of a cognitive map of the rat's environment (Tolman, 1948). The rats were found to have a spatial understanding of the test environment which extended beyond a step-by-step knowledge of the test environment. For instance, in his test involving a maze with a hooked pathway towards food, the rats quickly learned to follow the path. However, when this pathway was blocked off and the test environment was replaced with a room with multiple spokes, the rats, after finding out that the familiar path was blocked, would highly prefer to travel down the spoke that pointed almost exactly in the direction of where the food was located, suggesting a more holistic understanding of spatial learning.

This work led to the emergence of cognitive mapping in the field of neuroscience, where it remained for a little more than a decade later after which Kevin Lynch published his book *The Image of the City* in 1960. In it, he coined the term *imageability* which he defines as "that quality in a physical object which give it a high probability of evoking a strong image in any given observer" (p. 9). His study of Boston, Los Angeles, and Jersey City investigated the participants' development of the mental picture of their city. Via in-depth interviews, he determined five

elements of the cognitive map of a city: paths, edges, districts, nodes, and landmarks. Each element provided a structuring aspect to the cognitive mapping of an individual's notion of the city they lived in and in creating a mental image. The elements would appear in various forms. Most commonly, participants would start with familiar lines of movement, such as commutes. Others would start from an enclosing outline. Even others would draw a pattern, such as a grid, and filled from there. However, the drawings were found not to be precise but rather "reduced in scale and consistently abstracted" (Lynch, 1960, p. 86). His conclusions largely revolved around strong recommendations for a highly imageable city, one that has many elements that make the city memorable in the mind. Through the 1960s and 70s, ideas of imageability and the behavioural aspects of city design were more extensively researched with extensions of the original book with works such as *The View from the Road* (Appleyard, Lynch, & Myer, 1964) putting the mobile nature of people into the forefront. Downs & Stea (1977) extrapolated cognitive mapping to much broader scale. They considered cognitive mapping in two manners, the act of mapping and the map itself. The distinction is that the map that is created is merely a representation of a mental image, rather than being the image itself. Cognitive mapping arises from the "mental process of thinking about a place or a route" (Ozkul & Gauntlett, 2013, p. 2). However, more recent research in the field of neuroscience has brought into question the notion of there being an actual fixed image within one's head. Rather, representations that may be created from a supposed image are instead dynamically created and fluid in their representation (Ozkul & Gauntlett, 2013).

Due to the height of urban cognitive mapping being over 40 years ago, the main body of literature does not feature the inclusion of recent changes in information technology and the proliferation of smart phones bring readily available GPS and location-based services. Modern approaches have attempted to incorporate the emergence of information technologies in interim time, though this area of study remains sparse (Park & Stouffs, 2017). Ozkul & Gauntlett (2013) found in their study of London, UK that much of the previous work done by cognitive map researchers in the 1960s and 70s still remain relevant to this day. However, their work focuses specifically on social media's impact on a person's memories attached to a particular place. The stories attached to said place are created in a much more transitory way in social media. The sharing of location creates a continuous narrative of place and space that is shared on the web, creating a separate narrative of places that is parallel to the sketch the participant is actively

producing at the moment. However, the continuous presence of maps provided from social media and mapping apps can disrupt traditional means of wayfinding. Gazzard (2011) examines the app *Foursquare* and its creation of a map not centred around general landmarks, as is the traditional method of wayfinding, but rather creates a user specific map, where the points on the interface are points of interest to the specific user. The growing utilization of location-based services instead may "diminish the importance of local landmark and node distinctiveness and undermine the cognitive mapping process" (Park & Evans, 2018, p. 277). Whether this is true or not, remains to be studied.

2.2 Commuting

One area of research of primary importance to the topic of study is that regular and repeated visit to locations creates much stronger mental maps (Lynch, 1960). The formation of cognitive maps often starts as being "landmark" based before shifting to "route" and later "survey" knowledge (Mondschein, Blumenberg, & Taylor, 2010). As such, a commute, being by nature most often a daily occurrence, leads to the areas around the commute being the strongest mapped (Appleyard, 1970). Much literature focuses on driver's perspectives of the cities, likely due to the car-dominated nature of cities in North America (Appleyard, 1970; Mondschein et al., 2010). However, due to the configuration of the mental image around commuting, the dominant method of the commute has a large bearing on the cognitive map of the individual's surroundings (Mondschein et al., 2010). Mondschein, Blumenberg, & Taylor (2010) conducted research comparing two demographics in Los Angeles, with one being primarily car users and another being primarily transit users. They further divided the modes into passive, active, and mixed travellers, with active travellers needing to actively navigate their way through their commute and passive travellers simply being riders during their journey. Emphasis should be put on "active" being defined here as not following the commonly understood notion of physically active but rather cognitively active travellers. As such, active travellers were defined as pedestrians, cyclists, and also drivers. As I will be using this understanding of active travellers later in this thesis, I will be referring to this understanding of active traveller as *cognitively* active to avoid confusion to the more typical usage of travellers being physically active. These travellers were found to be less variable in distance estimates, more accurate in their estimation of locations, and much more likely to use street names to describe locations. Transit users were

also found to view locations that were less accessible by transit to also be further away than in reality and more likely to use landmarks to describe locations.

The usage of cognitive mapping on commute patterns is not very heavily studied. Much of the literature on cognitive mapping features commutes as a variable within the construction of a wider mental map of a city as a whole, not of the commute itself. However, in an effort to uncover geographic specificity of cycling risk, Manton et. al conducted a study in 2015 to investigate perceived cycling risk in Ireland using mental mapping. By allowing participants to draw their understandings of risk on a map they attempted to uncover areas of increased perceived risk which could act as a better metric for understanding barriers to cycling than objective risk. The usage of the maps in their study allowed for the detailed snapshot of the geographic distribution of risks perceived by the cyclists. There is, however, much variation within cyclists in terms of comfort with cycling and therefore feelings of safety while on the bicycle. The geographic nature of commuting and the specificity permitted through mental mapping techniques allows for a detailed look into the actual perceptions of commutes from the commuters.

2.3 Sketch Maps and Drawing

Much of the literature investigating cognitive mapping involves the participants drawing sketch maps. Past work on the topic of using drawing as a method of participant research has been done as a participatory method investigating aspects of the person such as identity (Gauntlett, 2007), personal health (Guillemin, 2004), and justice (Bober, 2011) to name a few. The technique was primarily developed in the 1970s with Noreen Whettor being a primary advocate for the "draw and write" technique (Gauntlett, 2007). The technique was a response to research involving children to have a more child-centric approach absent from traditional questionnaire forms of interviewing (McWhirter, 2014). The technique has remained lively in the field of child psychology and is helpful for its potential to provide answers to open ended questions, facilitate easy comprehension, and favouring the participant's self analysis due to the "write" portion of the studies (McWhirter, 2014).

Drawing as a technique is broad and is open to many usages. Though on many levels drawing is quite similar to sketch mapping, it typically involves a more pictorial image, rather than the more cartographic image that a sketch mapping produces. As such, the analysis of a

drawing differs significantly from the analysis of a sketch map. In the studies previously mentioned, the utilization of drawing as a research method was primarily used as a manner of coaxing concepts that were not easily put into words. The usage of sketch maps was a major part of *The Image of the City* and its usage allows for the fluid and not necessarily geographic representation of geographic concepts. Due to the commute being inherently geographic in nature, the sketch map is one method of interpreting a "drawing" and the geography or abstractedness of the sketch must also be taken into account when analysing. Blades (1990) investigated whether the results produced by a sketch map could be consistent over time and found that participants would reproduce very similar maps when asked at different times to produce a sketch map. The results suggested that the sketch map method does produce a consistent image that the individual holds of their environment. However, conclusions drawn from irregularities must be taken with incredulity. As pointed out by Downs and Stea (1977) as well as Blades (1990), the inaccuracies of a sketch map may simply be due to a lack of physical drawing skill possessed by the individual, not a purposeful or subconscious projection. As such, when it comes to the accuracy of a map the background cause, be it a mental image representation or the lack of drawing ability, cannot be discerned easily.

CHAPTER 3: METHODOLOGY

3.1: Sample, Survey, and Interview Process

Over the course of two weeks in August 2019 I collected 30 interviews in English from a random convenience sample of people on the McGill campus. Participants were recruited by approaching people around the campus on weekdays during the afternoon. Each survey and interview was conducted in the following manner: participants were provided with a open space on a piece of paper as well as a pen and a selection of coloured markers. Next, the participants were asked to "draw their commute, adding as much detail as they would like". The drawing was then followed by asking the participant to trace the route that they had drawn onto a printed map that was also provided. Throughout this, an ongoing semi-structured interview was recorded and in total took roughly 15 minutes to complete. During the interview, our conversation was audio recorded on a mobile phone and later transcribed. This allowed for an organic and natural interview process as well as a participant-centric analysis of the drawing, substituting the "write" in "draw and write", as following Whettor's practice (McWhirter, 2014) with "draw and speak". The participants were asked to draw their commutes, including details that they find interesting, and important. In addition, participants were encouraged to take the prompt openly and to have fun with their drawings. This was done to potentially counteract leading of the study towards a cartographic model from the explanation during the consent process, in which it was explained that the participant would trace their commute on a cartographic map later in the interview. Colours were provided for the participants to use if they wished to add such an element to their drawing. Each drawing was made on a letter size page, oriented landscape, with a header and footer but leaving the majority of the page blank. After their drawings were completed, I asked the participants to describe their drawing and to walk through their drawing for me. I also asked a follow up question about the participant's feelings to parts of the commute, be them positive or negative and if they found the sections of the commute to be beautiful or ugly. If the participant had not indicated already (whether through the drawing or spoken) I asked the participants for their transportation modes. In order to capture differences in the timeframe of mental image formation, I asked participants for the length of time participants had used the commute that they drew. In addition, I asked about the process in which the participant formed the commute, and whether or not they commonly used technology such as Google Maps. This question was

included specifically to investigate the effects of technology and mental imagery, due to location-based services potentially having impact on the formation of a cognitive map (Park & Evans, 2018). Afterwards I questioned participants about elements that appeared in the drawing. First, I would encourage the participants to point out anything that jumped out specifically and once that line of questions was exhausted, I pointed out elements of the drawing that stood out to me. If the participants had any other common commute patterns, drawing a second sketch was also made available.

After the drawing was well discussed, I asked the participants to trace their commute across a map of Montréal. In order to have an appropriate level of detail in each map, the maps were spread over several sheets and multiple sheets were provided to participants in order to cover their entire commute. Once the participant's tracing was complete, I followed a similar structure to the discussion of the drawing. First, I asked participants if any particular differences stuck out to them. After, I prompted participants to explain differences that were of interest to me. These explanations allow the participant's interpretations of their drawing and its differences to be placed at the forefront of the analysis.

3.2: Analysis and Coding

Because of the various interpretations of the word "drawing" by the participants, I needed to investigate both the sketch map and drawing interpretations of the prompt. The interviews were also separated by transport mode. If the participant had multiple commutes with different modes, they were classified as both. The surveys were coded into a scale from abstract to cartographic. Each drawing was rated out of 5 with 5 being completely non-cartographic and 1 being completely cartographically based. See Table 1 for exact categories.

Table 1: Abstractness ranking and description of rating

Category	Description
1	Pure diagram. No extra features.
2	Mostly diagram, has extra features.
3	Diagrammatically based, but loose in terms of spatial position.
4	Geographically fluid. Features are rather loose spatially.
5	Non-Geographic. Just image.

The inclusion of Kevin Lynch's five elements were each individually tallied with specific landmarks such as the appearance of Mont Royal and downtown buildings being split and tallied individually. The inclusion of traffic lights and trees were tallied in other columns. I also tallied whether or not street names were used or if the roads had width, and included details about whether all the roads had these features, only some roads, or only the roads the participant travelled on. These elements were tallied into a spreadsheet with each datapoint connected to the specific participant.

The transcriptions were also coded with details being tallied up as well as specific details extracted. Utilizing Atlas.ti, the transcripts were coded into 30 specific codes which were in turn grouped into four broader categories along with an addition category for other data. See Table 2 for a complete list of codes and categories. This interview data was then used as further description on the participant's drawings, which are this thesis's primary focus. Elements frequently brought up by participants were used to assist with categories in the tallying of the drawings in addition to providing a participant-centric voice in the analysis of their drawings.

Table 2: List of codes, categories, and details.

Category	**Code**	**Details (where applicable)**
Commute Environment	Architecture	
Commute Environment	Commute details	
Drawing	Ending at campus/building	Whether the drawing ended at a campus or a specific building
Drawing	Explanation of landmarks	
Drawing	Explanation of anomalies	Unusual drawing features
Commute Pattern	Frequent or infrequent usage	Mentioning the repeated patronage to a particular element
Perception	Hard to orient underground	
Commute Environment	Hills	Steep slopes and elevation along the commute
Perception	Importance of direction	
Perception	Importance of distance	
Perception	Importance of mode	
Perception	Importance of pleasantness	
Perception	Importance of reliability	
Perception	Importance of speed	
Commute Environment	Intersection	Discussion of road intersections
Commute Environment	Mountain	Discussion of Mont Royal
Perception	Novelty	Unique experiences along a commute
Perception	Passive transport on transit	
Commute Environment	People on commute	
Perception	Personal tendencies	
Commute Pattern	Preference of one route above another	
Perception	Street name usage	
Perception	Safety	
Commute Environment	Traffic lights	
Commute Environment	Trees	
Perception	Trends more important than details	
Commute Pattern	Uses locations personally	
Commute Environment	Weather	
Data	Usage of mapping apps	
Data	Time had commute	

CHAPTER 4: RESULTS

4.1: Details on Participants

After collecting the raw surveys, a resulting pool of 30 participants was completed. Participants in the project were often students and thus often had their commutes for a short amount of time due to moving to Montréal recently, or moving apartments recently. However, there were also significant outliers who maintained their commute pattern for a much longer period. As a result, the average amount of time a participant maintained their commute for was 3 years and 2 months while the median was much less at merely 10 months. It should be noted that these times were likely subject to significant rounding by the participants. The shortest amount of time a commute had been maintained was quoted as one week by participant 220801. Three other participants had maintained their commute for less than one month. On the other end, the longest maintained commutes were maintained for 20 years, a time period shared by 2 participants: 210804 and 300801. Four participants had maintained commutes for more than 10 years with one additional participant maintaining a commute for more than 5 years. Of the remaining participants, 12 had maintained commutes for less than 1 year but more than 2 months and the remaining 10 participants had maintained a commute for between 1 and 5 years, with the maximum time span being 3 and a half years within this group. The mode share exhibited by the sample group was relatively evenly divided between pedestrians, cyclists, and transit users. Twelve participants walked, 8 cycled, and 11 used transit. Two participants use both transit and bike as a primary mode, with neither preferred as primary. One participant used a car as their primary mode of transport.

4.2: Features in Drawings

Primarily of interest to this project was the details featured by the participants. Drawing upon the previous research by Kevin Lynch, features that participants used to define their commutes were tallied. To reiterate, the five categories of features are paths, edges, districts, nodes, and landmarks. Most participants, 25 of the 30, used paths in their drawing. Paths were usually drawn as the routes the participant takes which would usually follow streets. As such, cross streets and street names were frequently added as detail to the participant's drawings to situate their drawing. For transit riders, paths would often be the metro lines travelled on, with 2

participants abstracting the lines to simple lines following the diagram of the metro seen on the trains. One particularly telling example of the abstraction of the metro and its relationship with the diagram was participant 130801 who drew their drawing with south at the top. The participant described their image of the metro was based upon as being based upon the diagrammatic map. As a result, the zigzagging of the metro seen on maps was consequently inverted due to metro maps following the conventional north-at-the-top orientation and the participant drawing within south-at-the-top. This participant declined to share their drawing in the final paper. Another example is of participant 280802 (Figure 22) who drew both a cycling and a metro route. The participant drew the routes as being beside each other despite the cycling route crossing a bridge over a kilometer east of the station. The participant explained it as "Well, in my head it's just because, I think it's just because I am following the bike path. It was still in my head the metro goes straight, but yeah, no it doesn't". The remaining seven metro riders did not follow the diagram instead simply rendering the metro as a straight line or in one case a district. The abstraction of metro lines continued into people's tracing of their commute onto the cartographic map as well. Participants frequently found it difficult to place starting stations on the map and were rarely able to easily locate intermediate stations. The metro is largely understood as a point-to-point mode of transportation. This sentiment was summed up nicely by participant 130802:

> I notice more on the walk and the bus because you can see outside but the metro's just kind of a blur. Like I have literally no idea where I'm going. The only reason I know where the metro goes is because I, like, have got to get out at stops. But I don't know where it goes.

Paths are naturally conductive to a commute. With paths primarily being avenues of travel, it is not surprising that commuting, an act of moving in itself, mentally follows a structure similar to this. The paths themselves, however, are not always singular lines. It was not uncommon for participants to draw the roads and paths as having width, often being representative of the actual width of the road. For instance, Parc Avenue is a major thoroughfare that many participants interacted with. Frequently, this road was drawn wider than others, with the participant noting the large road as an important landmark along the route of the road. Participant 210802's drawing is a good example of this (Figure 14). 25 participants featured drawings with roads on them. Of these, 15 drew roads with width. 7 drew all roads having width, 4 only widened major roads, 2 only cross streets (these commutes were drawn as straight lines), and 2 only the streets

the participant travelled along. The importance of the street being drawn is demonstrated via the widening of the drawn line. Roads that are rendered as important may be rendered larger than the others. This is most exemplified by the drawings that featured widened roads for the major roads and the roads travelled along. Drawings featuring only widened roads would frequently vary the width of the roads in a similar manner as well, with wider roads being major roads or roads the participant travelled along. These streets were not always labelled on the drawing. 18 participants chose to label their roads with the remaining 12 leaving them unlabelled. Of the participants who labelled their roads with street names, 6 labelled all the roads they drew, 4 labelled only a few, and 7 labelled only the roads travelled on. There was much overlap between the commuters who drew road widths and those who labelled their roads. Only 2 participants had road widths without labelling them and 4 had labels without road widths. 14 drew both road widths and labels. Transit riders did not include street names at the same frequency as cyclists and pedestrians. 3 of the 10 transit riders included street names. By contrast, 6 of the 8 cyclists and 8 of the 12 pedestrians included street names. The sole driver also included them.

The second most common Lychian feature was the usage of landmarks, with 16 participants featuring these features. Landmarks were a broad category. Depending on the scale of the commute, landmarks could be scaled as small as a traffic light or as large as the cross on the top on Mont Royal or the pointed peak of 1000 de La Gauchetière. These featured in commuters who used modes that were cognitively active as outlined by Mondschein et al. (2010). Longer commutes would often feature larger landmarks which are more identifiable from the city as a whole rather than the minutia of the streetscape. Traffic lights, for instance, appear as a detail on people who have relatively short commutes who used cycling and walking as their method of commute. Participant 210803 (Figure 15) had a particularly short commute and the only included landmark along the way was a traffic light. The traffic lights serve as a barrier in these commutes, causing frustration to the commuter as they wait for the light. Having a short commute exacerbates the impact of these momentary stops, especially at specific locations. This stopping and going was reiterated by all participants who featured traffic lights. However, the lights were also understood to be an important piece of infrastructure for the sake of safety. For instance, participant 280801 (Figure 21), a pedestrian, said this on their inclusion of traffic lights:

> [You have] got to be careful when crossing. I guess the traffic lights come in handy a lot,

> but you have to be aware- it's not smooth at all. Like, it engages … all of my senses but in a kind of survival way. It's like way too much. But if there's a scale, it's not smooth at all, I think.

The inclusion of traffic lights appeared in the drawings of 5 participants, with 2 being cyclists and 3 being pedestrians. The same frustration of waiting and safety aspect were expressed by both groups.

Buildings are frequently understood in two different ways: those being rendered as simple footprints and those being rendered as drawings of the buildings themselves. The latter includes representations of a building's façade and three-dimensional isometric drawings. A total of 23 participants featured buildings in their drawings. The coding I used in analysis marks buildings as distinct from landmarks because of to the variance in their appearance. For instance, representations of the starting and final destination buildings are not landmarks *along* the route. Contrarily, landmarks may also be simply labelled and not drawn or not be buildings at all. Rendering as footprints were the more frequently used method, being featured by 15 participants. Building drawings were featured by 12. Of these, 4 used both footprints and drawings in the same drawing. Divided by mode share, buildings as footprints dominated pedestrian views with 10 of 12 pedestrians exhibiting this feature in their drawings. By contrast, 3 of the 10 transit riders and 2 of the 8 cyclists featured building footprints. Drawn buildings appeared much more equally across modes. 5 of 12 pedestrians, 4 of 10 transit riders, and 3 of 8 cyclists featured drawn buildings. The sole driver did not feature either drawn or footprints of buildings in their representation. The high amounts of buildings that appear in the drawings of participants indicates that buildings are commonly an important part of a participants understanding of their commute. Buildings along a commute may feature as the destination point, frequently used other locations such as cafés and stores, or simply as a representation of the participant's surroundings. Downtown was often rendered as a dense collection of buildings which may be contrasted against other sections of the commute. This was frequently stated by the participants to be a notable change of scenery and character of the neighbourhoods they are in. The lack of footprints in metro riders may stem from the abstraction caused by being underground and the lack of resulting surface obstacles to navigate. As explained earlier, the abstraction of the surface by the metro results in a point-to-point understanding of their commute. The immediate locations may not necessarily be different, as indicated by a similar appearance of drawn buildings. The

cyclist's lack of footprints may be from a similar cause, with buildings in their immediate vicinity being unimportant to their commute.

This changing of scenery and neighbourhood characteristics were also noted when discussing the participant's inclusion of trees in their drawings. 5 participants included trees in their drawings, the same number that included traffic lights. 3 of these participants were pedestrians with one being a cyclist and the last one being a transit rider. The transit rider included trees along their walk to the metro station. 2 participants included both trees and traffic lights. This may have been due to increased levels of detail found in these participants' drawings resulting in the overlap. The occurrence of trees along the commute was frequently commented on in the positive, with participants deciding to include them into their drawing due to the pleasantness the trees bring. An example of the positivity of trees was the discussion by participant 160803:

Researcher:	I notice you drew all the trees along Parc [Avenue].
Participant:	Well there are huge trees along there.
Researcher:	Yes there are, yeah.
Participant:	And there are huge trees right along the campus too so the more natural elements we have in the city the more enjoyable and less stressful it is. I find. And so I think it's good to live in a city that's very conscious of its urban environment.
Researcher:	Okay so you find it very important so you decided to include it in your map?
Participant:	Yeah.

Both trees and traffic lights were rendered in a similar fashion, with them being drawn as drawings of the object itself. However, trees were drawn in groups, often along a road or in a park. Trees drawn on the map were not representations of specific trees but rather series of trees or a cluster of trees. Frequently, trees were drawn along the side of a road to delineate roadside trees and greenery.

The most common specific landmark was Mont Royal, which was a reoccurring feature unique to Montréal. Five participants chose to include it as an important landmark of their commute. Of these five, two chose to include the cross, two drew it as a mountain without a

cross, and one drew it as a boundary. Mont Royal is a prominent geographic feature of Montréal and notably features in the background of McGill. As such, the prominence of Mont Royal may partially be related to the sample being dominantly working on or near the McGill campus. Participant 220801 describes their commute as being entirely towards and away from the mountain.

> I mean like if you look like at the surrounding for sure when I walk towards my- the law building, what I see- like, what I see is the mount in the back- the mountain in the back. So, I mean like, I feel more getting outside from the more crowded situation because when I walk back, instead I see all the buildings. I see like, you see like. So that's the feeling that I have.

In their drawing, they did not draw Mont Royal itself, but rather their entire commute as a increasing slope (Figure 17). This participant also had only lived in Montréal for 1 week and therefore would have had a very limited view of Montréal as a whole. The participant who drew it as a boundary noted that their understanding of Mont Royal was that it was a former major block in their commute due to them formerly living north of the mountain and thus needing to go around it in order to travel downtown where they worked.

Researcher:	I'm noticing you drew Mont Royal. I assume you mean the mountain?
Participant:	Yeah.
Researcher:	As well as the river. So are these sort-of important landmarks in your commute do you think… or just your picture of Montréal?
Participant:	Yeah because the reason why I couldn't go to work was because I can't go under! Or over.

Mont Royal was also noted as a frequent place of leisure taken after work. As such, the park is frequently used as an alternative commute returning from work when the commuter decides to use a route that is seen are more pleasant or for the sake of recreational exercise. It should be noted that despite five appearance of Mont Royal, trees, and traffic lights each, they did not necessarily feature in the same drawing. Only 1 drawing featured all 3 of these features. 3 drawings contain 2 of these features, and 6 contained only 1 feature.

Edges, districts, and nodes were comparatively rarely used by participants with 4, 7, and 3 participants utilizing these features respectively. The edge most commonly featured was the St. Lawrence river. Districts were often park areas such as Mont Royal or Jeanne Mance Park. Only

one participant identified a district as a neighbourhood and used it to define the area they worked in (Figure 23). Nodes were exclusively used by metro riders to show stations that either they entered, exited, or transferred between lines.

One participant, 210801, did not use any Lynchian features as they chose to draw their commute as the actual image of the metro train (Figure 13). They therefore drew an entirely non-cartographic drawing. This leads me to the abstractness ranking of this study.

4.3: Abstractness & Abstraction

Of the 30 participants, 18 were placed into category 1 or 2, indicating that over half of the participants have a strongly cartographic image of their commute. Within these participants, seven were ranked in category 1 and thus 11 were in category 2. Of the remaining participants, 5 participants were ranked into category 3 as well another 5 in category 4. The remaining 2 participants were ranked into category 5, with the aforementioned participant 210801 being an example of this category. See Table 1 for descriptions of each of these categories. There was not significant variation between each mode share with the numbers of each in each category being moderately even between each category from 1 to 4 (Figure 1).

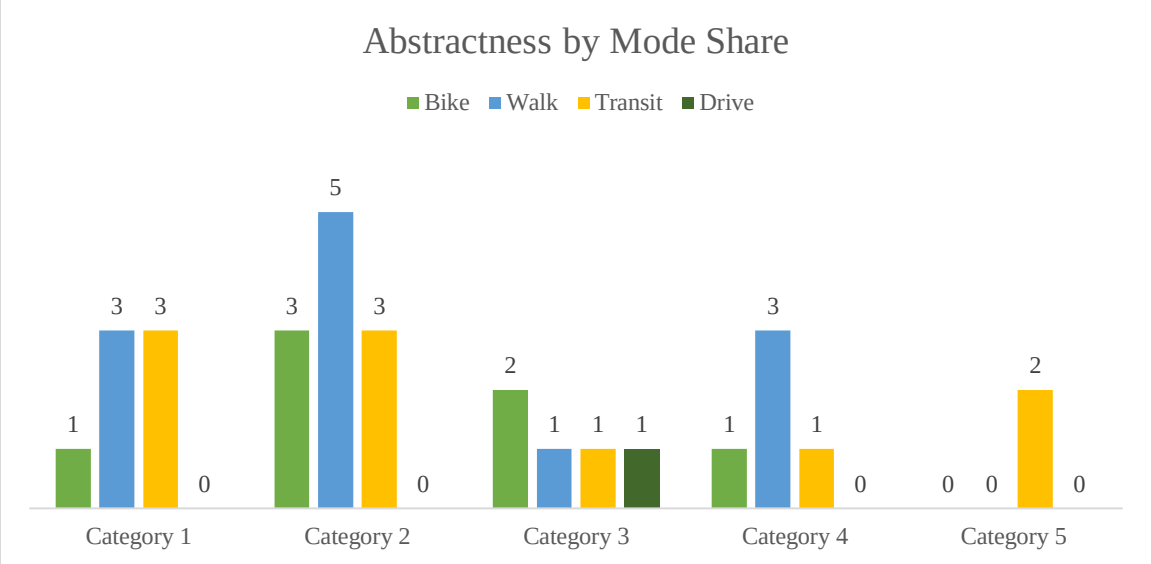

Figure 1: Graph showing travel mode grouped by abstractness categories

However, category 5 consisted only of transit riders. This does not, however, indicate an increase in the abstraction of transit riders. Rather, transit riders have much more variation in the abstraction of their drawings. Cognitively active commuters gravitate towards a moderately cartographic interpretation of their commute, while transit riders interpret their commutes more

equally across categories. With one driver there is not enough to indicate any tendencies but the drawing this participant made also relied heavily on streets and street names in addition to landmarks. Transit riders may use a cartographic model in their navigation, as with a path-based approach that reflects the metro map. However, the lack of direct geography associated with the commutes of transit users also allows the transit user to represent their commute as disassociated with geography. One participant chose to draw their commute entirely as a straight line, even with multiple line transfers (Figure 28). Another drew the metro as a zone, a circled area travelling from one walking path to another. Finally, the most abstract was the participant who only drew the metro train itself, demonstrating that their commute was a ride on a train rather than a route.

Commonly reinforced by many transit users was their lack of understanding of their surroundings. Multiple transit riders noted themselves as doing other activities such as reading while on the metro. Additionally, metro tunnels do not serve as meaningful locators, as discussed previously in my section on Lychian path features. As such, it is not surprising that both participants who feature in category 5 abstractness are both transit riders. When describing their commute, one of these participants described their time on the metro as being a time for them to think and clear their thoughts. The passivity of transit as described by Mondschein et al. (2010) may be a prime reason as why such a result occurred.

Over time, the abstractness of a commute tends to increase then become less abstract again (Figure 2). Participants who had their commutes for between 2 months to 1 year made up the vast majority of participants using more abstracted representations of their commutes. All category 5 participants and all but one category 4 participant were in this category. For those participants who had their commutes for very short amounts of times, the distribution is similar to that of those who have had their commutes for the longest amounts of time. Participants having commutes for 1 to 3 years tended to be less abstract.

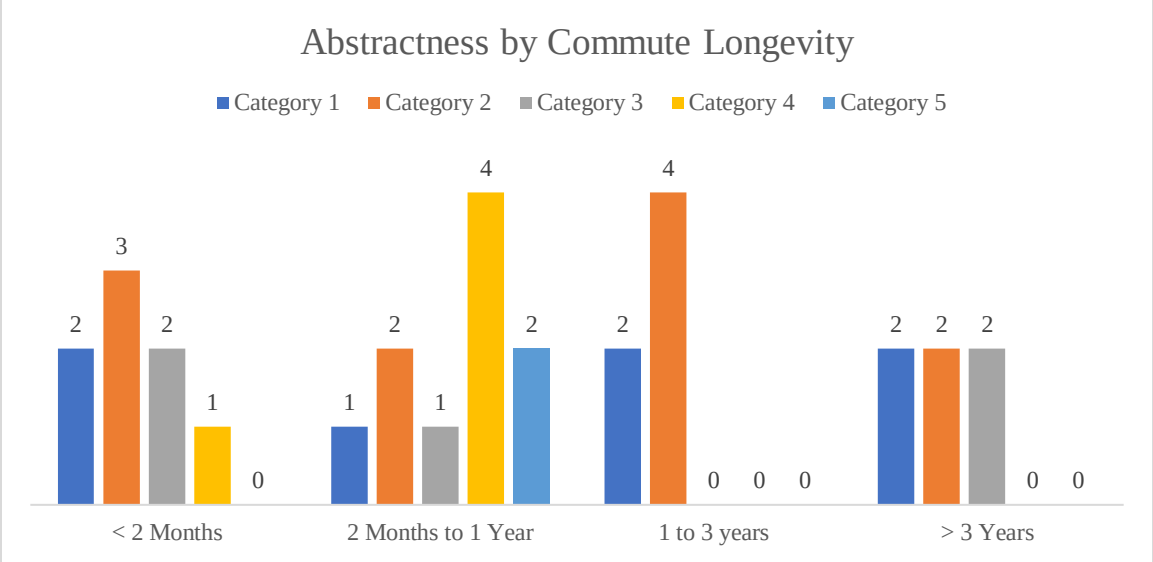

Figure 2: Graph showing abstractness grouped by commute longevity

The resultant timeline of commute drawings is a shift from a middle to low abstractness towards high abstractness before returning to a middle to low abstractness again. The continued presence of the same commute does not, therefore, result in a linear direction of abstractness.

Within a highly cartographic model there may be abstractions leading to imperfect reproductions of the participant's commute. Accuracy was often understood to be a good quality to the participants. Upon tracing their commutes onto a print-out of a map of Montréal, many participants reacted in a manner indicating a they treated the drawing aspect as a challenge to reproduce to a high level of geographic accuracy. Statements such as "I did pretty well" and "Not too bad!" were common when the drawing and the map were compared. Efforts were made not to bias participants into using a strictly cartographic model, with my instructions being explicitly permissive to exercising creativity as well as to have fun. Nonetheless, the cartographic tendencies remained strong. However, despite the urge to accurately reproduce a map, minor details were excluded. Rue Sherbrooke commonly appeared in people's commutes and yet despite a shallow northward curve towards the east, every participant who drew Sherbrooke rendered it as completely straight. Participant 200802 noted that they only take this curve into consideration if they travel further down Sherbrooke, where the angle would bring the traveller much further north than if it were straight.

> I only take that into consideration if I need to go way further out, because I do know that it does curve further up. So if I want to go... here [pointing to Rue Berri and Rue Ontario]. Technically it's on the same level of Sherbrooke here [pointing downtown on Sherbrooke] but no I would have to go on Maisoneuve to get over.

This abstraction was particularly notable in metro riders, who have no way of telling where the metro line goes underground. As mentioned previously, there is a tendency to favour the metro map as a basis for their drawings. When tracing the commute on the line, it was impossible for participants to know and find where the metro line travels underground. As such, where possible participants would connect metro stations in a connect-the-dots fashion with straight lines. However, due to the map printout I used, many metro stations were very difficult to find and as such for the sake of brevity in addition to metro rides being predictable, I allowed participants to draw the line directly from their start to the destination. Despite this, participants still often found it difficult to find the metro stations at the beginning and end of their transit commute.

Another common discrepancy observed was the length of segments. Metro sections were often compressed into shorter segments of the commute versus their corresponding geographic distance. Frequently, this compression reflected time spent on segments. Walking segments are much slower meaning the distance travelled for the equivalent amount of time is considerably less. As such, metro segments representing a similar amount of time actually cross a much larger distance which is compressed in the drawing. Cyclists and pedestrians also produced drawings with compression. Frequently, participants would draw sections they deem pleasant as shorter than sections that were less pleasant. For instance, participant 160804 said:

Participant:	It feels really long. This feels very pleasant and nice. Even though it's downhill at some point, which is really…
Researcher:	So it just feels fast?
Participant:	It feels great. Yeah. Actually, all of this is downhill until this part is uphill, so I think I've over exaggerated the hill part.

Extra elements added to the commute were typically notable shops or stores familiar to the participant. For instance, participant 160803 (Figure 7) chose to include several cafes they frequented along the route of the commute. By contrast, features not commonly used by participants were often excluded. Participant 160802 (Figure 6) included all roads along Rue Milton except the minor side road of Lorne Avenue. Commuting from Milton Park itself, the participant was familiar with the neighbourhood but could never remember travelling up Lorne.

The familiarity of a feature makes it an important element in the participant's surroundings and thus they may choose to include it into their drawing.

4.4: Commute Selection & Pleasantness

One of the intentions of the interview was to ask if certain elements of the commute created better commute experiences and modified the participant's commute in any way. The exact reasons can be summarized in 2 forces that were occasionally in tension with each other: speed and pleasantness. Both of these categories are umbrellas that cover multiple other reasons underneath them. The category of speed covers speed itself, distance, and time. Pleasantness covers the experience of the commute itself: comfort, surroundings, safety, and interest. The speed factor is typically more important to of the participants, with most choosing to select their primary route based upon which is fastest. As such, the most common response to being asked what determines the route they take is the route that is most direct and takes the least amount of time. A frequent modification of a participant's route would be to favour the metro over bus due to improved reliability. However, participants often had alternative paths to and from work. Often, alternative routes were chosen due to more pleasant surroundings, favouring being outdoors longer, exercise, or novelty. The paths some participants chose were primarily due to these reasons, typically when the time cost is minimal. Pedestrians commonly mentioned the pleasantness of greenery along the commute, which was often rendered as trees along the route. When asked about the sections of their commute, the greenery was the most frequent element to come up in discussion. Cyclists tended to focus much more on safety, with many stressing the importance of bike lanes and quieter side streets. Participants would often merely choose the fastest route, even acknowledging more pleasant alternatives. One cyclist specifically noted that their commute along Rue Sherbrooke did not feel particularly safe due to the high amount and speed of traffic. However, they nonetheless preferred speed above all else when selecting the route to take and found the unpleasantness a worthwhile trade-off. Transit riders never preferred taking the bus above the metro, despite potential views from windows and being outdoors. One transit rider noted getting bored on their metro and bus ride as they had nothing to do.

The driver noted their primary reason for driving was the need to make multiple stops to drop off children at school as well as the comfort and convenience of their personal vehicle. On their commute drawing they included the metro location, which was relatively near to their place

of residence. However, with multiple stops, coordination between multiple transit routes and timetables meant waiting multiple times for vehicles. As a result, they “did not want to be rushing in the morning, tied to the metro or the bus schedule and dropping off kids too”. The ease of making their own schedule as well as the comfort of their car was their reasoning behind forgoing transit despite it being relatively near and present in their conception of their local neighbourhood.

4.5: Mapping Apps

During the interview, participants were also asked whether they formulated their commutes with a mapping app such as Google Maps. 14 of the participants reported using a mapping app when formulating their commute. Of these participants who answered yes, four reported modifying their commute later on. Their reasons for modifying their commutes varied from wanting to walk more or finding a faster or more reliable transit service. Of the participants who did not use a mapping app, many were still recent movers to Montréal. However, for participants who held the same commute for greater than 10 years exclusively did not use an app for their commute. Notably, of these participants, only one reported regularly using a map app in their regular activities. Two of these long-term commuters reported avoiding mapping apps due to their preference for absorbing their surroundings and a want to avoid the need for technology. Most participants, however, simply navigated their way to campus or their workplace on their own. Often, the location of their apartment was selected specifically due to its location to convenient access to their workplace or campus. As a result, for the regular commute, there was often not much need for an app to dictate the exact directions for the commute. Metro riders tended to use map apps more frequently with six metro users using apps while only three did not. On the other hand, cyclists less frequently used the apps, five choosing to forgo the app and three using it. Pedestrians also less frequently used apps, with five using apps and seven not. However, these commuters typically had shorter commutes and thus options for their commute were obvious and limited. The sole driver did not use apps, but also was a long-term commuter and reported using map apps frequently when finding directions to new unknown locations.

In relation to elements included in their drawing, users of mapping apps included fewer details than their non-app using compatriots. 6 of the 14 map app users featured landmarks while 10 of the 16 non-map app users featured landmarks. The commonly drawn features of Mont

Royal, trees, and traffic lights also appeared much more frequently in non-map app derived commutes. Of the 5 participants that featured each of these features individually, 3 did not use mapping apps. It bears reiterating that there is not significant overlap between drawings that featured one and multiple of these features. Most commonly, only one of each of these features appeared in the participant's drawings.

Table 3: Usage of mapping apps by abstractness category

Category	***1***	***2***	***3***	***4***	***5***
Number of App Users	2	4	2	4	2
Number in Category	7	11	5	5	2
Percentage	28.5%	36.4%	40.0%	80.0%	100%

Usage of abstractness also increased as usage of mapping apps increased (Table 3). The reliance of mapping apps instead creates a more abstract notion of their commute. The mapping apps may not be the cause of this trend, however. Often, when asked about their usage of mapping apps, participants who rely heavily on apps would consider themselves poor navigators and have a bad understanding of their surroundings. As such, their understanding of their commute is heavily reliant on the directions of the map, rather than a more holistic understanding of navigation about the city.

CHAPTER 5: DISCUSSION

My findings signify that the perception of a person's commute varies greatly. Elements of a commute drawn onto a map provide insight into what the commuter deems important to their travelling. The variation of elements suggests commutes are mentally structured in different ways by different people. Nonetheless, there are common traits and parallels that can be determined from the results.

5.1: Relationship with Lynchian Features

Much of the results reflects a general understanding of the city, with commutes being a subset of the subject's understanding of their environment. As such, the participant's understandings of their commute line up well with Kevin Lynch's findings of people's understanding of the city. The scope of the participant's discussion here is limited to their travelling to their place of work or study and as such results drawn can be specified to this end. The path-based nature of a commute resulted in a much higher representation of paths in the drawings of a commute. This path-based understanding is the most straightforward understanding of a commute: with the participant treating the commute as a series of directions to follow. The exclusion of minor variants in the path, such as the shallow curve of Rue Sherbrooke or small jogs in the road network, signify point-to-point nature of the participant's conception of their commute.

The imageability of the commute also plays a role in the inclusion of features in the drawing and pleasantness of the commute overall and in sections. Imageable elements such as recognizable buildings and familiar shops play a role in the formulation of the image as their inclusion mark a significant part of the commute. However, generally commutes did not feature any of these elements. Instead, the paths themselves were often more important. Similar to Lynch's findings, transit ridership along underground routes also allowed for an increased abstraction of the participant's surroundings. Despite this, transit ridership did not necessarily lead to more abstraction but rather more varied abstractness.

Imageable neighbourhoods may surround the commute but does not generally impact the commute itself. However, recognizable neighbourhoods may provide pleasantness during the commute. The neighbourhood Milton Park was often seen as a pleasant section to walk through with classic architecture and high amounts of greenery. Rather contradictory is that more pleasant sections of a commute tend to get compressed. As a result, a pleasant commute is

perceived as shorter than one that is unpleasant. An imageable neighbourhood may result in the neighbourhood being present in the participant's mind, but when travelling through it towards another destination, such imageability results in the surroundings being perceived to pass by faster than reality. High traffic areas and generally unpleasant parts of a commute stand out as well. Generally, a pleasant commute through a highly imageable and characteristic area allows for the commute time to pass faster than otherwise.

The structure of this analysis was highly influenced by Lynch's work. This approach provided a very useful framework for the categorization and collation of data from the very qualitative and varied drawings. The more fluid category of abstractness is heavily related to the inclusion of Lynch's categories of features. The more path based a drawing was, the more cartographic it would lean. The lack of paths indicated a much more abstract notion, one primarily focused on surroundings and environment. As such, abstractness served similarly to a summary or a proxy of these features.

5.2: Important Elements of a Commute

The exact elements that are most important to people vary from person to person. However, there are commonalities between the participants. In general, roads and paths form the backbone of commutes. Most participants identified their commutes as being a series of directions and movement in those directions. As such, the primary understanding of a commute is one similar to a GPS instruction list: a series of step-by-step directions and distances for a person to follow in order to get from A to B. This backbone is not universal with multiple participants choosing to formulate their commute in a non-cartographic manner. As a result, these commuters depicted their commute in a more experiential manner. In these depictions, the commuters' surroundings mattered more than the paths and routes they took. However, the actual reasoning for selecting a commute is typically done to maximize speed above all else. As a result, the important elements are typically the roads and paths that they go down instead of the surroundings. However, those who liked exploring more varied routes did not necessarily include more featural elements in their drawings and often simply drew extra roads.

Frequently included and talked about features were traffic lights, which impeded travel but allowed for more safety, and trees which enhanced the streetscape. These elements outstand and are important to a participant's conception of their commute. Traffic control allows for the

segregation of directions of travel to ensure there are fewer conflicts between travellers. However, the by-product is traffic in one direction or transportation mode must stop in order to allow other traffic to move. The stopping is often short but significant wait times can lead to outstanding intersections in a person's commute. Trees and greenery, on the other hand, do not directly affect the speed of the commute and instead merely enhance the surroundings of the commuter. However, they are important enough on the commute to be present in many participant's conceptions of their commute. As such greenery is an element that is often appreciated by the commuters. While most commuters favour speed, routes with more greenery are often more favourable. This same tendency applies to more safe routes where participants would often select routes that are safer, such as using bike lanes, but often not at a great detriment to speed.

More varied surroundings such as specific buildings and landmarks occasionally play a role in the commute's perception as well. Participants slightly favoured an understanding of buildings as footprints rather than drawings of the buildings themselves. The route-based nature of the commute may play a role in this conception. With the general favouring of cartographic drawings, the overhead footprint view of the building is the most conducive to this pattern. In addition, in an urban environment, buildings serve as the primary barriers when walking or cycling, with the negative space being the roads and means of travel between them. The most common buildings were at the beginning and end of the commute, whether a footprint or a drawing. The buildings that were drawn along commutes were typically regularly visited ones, such as cafes. The commute, therefore, is often understood as a quite direct way from one building to another, with other buildings being included if they serve as frequent diversions or stops along the way. Since background buildings were not frequently drawn, the built infrastructure of the city is often an unimportant aspect to the commute's conception. However, when they *are* drawn, they demonstrate the character of the neighbourhood. Tall buildings often symbolize the density of downtown and shorter houses may be seen to generalize a decrease in density. As such, the buildings are rarely specific but rather signify a general atmosphere much in the same vein of the trees drawn along the roads. The trees do not signify specifics but rather the general character of the road, with more greenery. The common inclusion of Mont Royal as a specific landmark was may be due to its domination over the Montréal landscape. Participants also citied its utility as a large park space for recreation after work. The central nature of Mont

Royal provides easy accessibility to the park space that serves as a common detour for participants seeking a more scenic commute or for the sake of exercise. The complication Mont Royal has in this analysis is that its height means that it is visible from much further away than most parks and as such is a frequent background landmark, rather than necessarily a landmark that is interacted with. A future direction to this research would be to examine whether Mont Royal was included primarily due to its landmark status or its utility as a recreational space. The inclusion of other urban parks that do not have a large vertical presence in a skyline, such a Central Park in New York City, would be an indication of large parks being included for the sake of recreation. However, the landmark nature of such parks may lead to their inclusion for the sake of it being a city-wide landmark rather than simply a landmark in the commute.

Over time, the inclusion of features changes. As established in section 4.3, abstractness of a commute tends to follow a U curve with drawings starting as more cartographic, shifting to more abstract after about 2 months, then returning to more cartographic after about a year. This finding goes against the findings of Mondschein et al. (2010) who state that spatial knowledge starts as landmark based. Rather, commutes start from being route based before landmarks are added to spatial knowledge.

This study did not investigate the temporal development of the commute perception as a primary focus. However, the focuses participants have may shed some light. A frequent reason for having alternative routes was the participant's desire for exploring new areas of their surroundings. As such, the increased exploration of their surroundings may lead to a looser understanding of their commutes. Overtime, however, the exploration loses its novelty and there is a return to a simpler commute drawing as the surroundings are no longer novel and important. A point counter to this claim is the two category 5 participants, which were very abstracted depictions of the metro, did not show anything about their surroundings. As such, their choice for depicting the metro in such a manner was not from their exploration outside. Alternately, such a trend may be related to the demographic and choices of the participants themselves. Long term commuters are naturally older to have held the same commute for many years while the shorter-term commuters are often younger, frequently students. Another alternative explanation is that participants with a more cartographic understanding of their surroundings may tend to live in the same place for longer. Further research should be conducted to determine the veracity and causes behind this phenomenon before conclusions are reached.

The cognitively active travellers and passive travellers outlined by Mondschein et al. (2010) were found to have differences as well. Most notably, transit riders were more open to drawing abstract drawings and were more geographically fluid than cognitively active travellers, those being pedestrians, cyclists, and drivers. As a result, the exact geography of a metro or transit line is unimportant. Transit is a point-to-point based utility and the travelling along the transit route is unimportant. Even along bus routes, where there is at least outside stimulus, the abstraction remains. Because of this point-to-point nature, there is little consideration into the route choice other than to maximize speed. However, the journey to from the start point to the transit station and the transit station to the final destination rely on a small amount of active travelling. Therefore, the transit ride may be modified to adjust this section of the commute, though the transit ride itself is not the reason for its adjustment. Rather, the alternative routes for transit riders is always dependant on speed and reliability as opposed to better surroundings. Transit riders never discussed the conditions of the transit route itself. Amenities on transit would often be related to the reliability and speed aspect of the commute. For instance, participant 130801 noted that one of their reluctances to trust the bus was its unreliability and such an aspect could be improved by adding a bus arrival screen at the stop itself.

Cognitively active commuters did not use highly abstracted drawings of their commute. As these participants' commutes involved real time navigation in the city, the outlining of this navigation process is written in the drawing. Rather than the simple point-to-point of a transit rider, cognitively active commuters must travel from decision point to decision point. These points are usually intersections where the commuter must turn or move past. The much greater inclusion of street names by cognitively active commuters reinforces this claim and was also found by Mondschein et al. (2010). By contrast, the only decision points on transit is where and when to get off. Since the navigation of cognitively active relies on the participant to be aware of their surroundings, the route and surroundings are of more interest to them.

5.3: Making a Pleasant Commute

The preference for each person is slightly different and these preferences are reflected in the routes that they chose. For instance, the participant who selected a route along Rue Sherbrooke despite identifying it as feeling unsafe preferred speed above the risk. Nonetheless, the common tendency to want a safe and pleasant commute was present amongst all commuters. The details

of what makes a pleasant commute can be summarized into three main points: greenery, safety and smoothness. It should be noted, however, that speed was favoured above the pleasantness of the commute. Pleasantness can be thus seen as an additional benefit that may help choose between two routes or to select an alternate.

5.3.1 Greenery

It is clear that people favour greenery along their commute. Greenery was often the most prevalent positive element of a person's commute. While architectural surroundings were also perceived to be good, greenery was more universally and often mentioned. As such a general improvement of a commute or travel in general would be to add greenery along common travel corridors. Additionally, in order to encourage pedestrians onto certain corridors, greenery can lead to these corridors being favoured as long as it is not a significant detour.

Pedestrians are most aware of greenery in their surroundings as both cyclists and transit riders did not feature trees as much as pedestrians did. The only transit rider to feature trees only featured them on their walk to the metro station. This is most likely due to the fact that, with most of the transit rider's commute being in a vehicle, there is little consideration for outside and surroundings are not as consequential. For cyclists, it is less clear as both pedestrians and cyclists are outside and active, both cognitively and physically. The lack of focus on greenery may be related to cyclists being much more involved with traffic which requires more focus on the road itself rather than surroundings. For cyclists, a common sentiment was the discussion of traffic and safety along their route.

5.3.2 Safety

The level of comfort along sections of a commute can be driven by the safety of the route. Cyclists facing traffic have safety as a much larger concern than other modes. Because transit riders are passive in their commute, they largely removed from perceiving traffic safety. Montréal's transit system additionally did not present any issues of personal safety while riding the vehicles themselves. Pedestrian participants generally did not find much worry about safety either, though on significantly high traffic areas with fast vehicles and many pedestrians this did become a concern. Cyclists and pedestrians favour separation from other modes of transportation. A concrete example is participant 160803 being concerned of the growing number of cyclists on the sidewalks of Parc Avenue north of where the bike path ends.

Northward cyclists may choose to avoid the high speeds of cars on Parc itself and instead choose to bike along the sidewalk, at detriment to the perceived safety of pedestrians. The perception of safety can be aided by allowing increased separation between mode types travelling at different speeds or decreasing speeds altogether.

5.3.3 Smoothness

Smoothness exhibits itself in all modes but in different manners. Cyclists and pedestrians have similar experiences, with traffic lights being the primary inhibitor of a smooth commute. The pausing of a commute results in the appearance of traffic lights in many drawings. The association between the traffic light and the pause is strong enough for traffic lights to serve as representations of this pause. For transit riders, smoothness is expressed in a manner of reliability. Multiple transfers and unexpected waiting times were the primary cause of concern for transit riders. This does not express itself in the drawings but was talked about during the interviews instead.

5.4: Impacts of Mapping Apps

Mapping apps were used by about half the participants in this study. The frequency and prevalence of mapping apps creates an interesting aspect of study for affects on the city. Park and Evans (2018) postulated that landmarks and nodes would no longer be as important when faced with the accessibility of mapping apps. This was reflected in this sample as map app users did not use landmarks as frequently as non-map app users. However, this did not necessarily indicate a shift towards a more path-based understanding that followed routes. Instead, the commute is understood less as a cartographic model but instead as a more abstract sense of an experience.

This correlation may not be the cause, however. There may instead be a self-selection of route choosing. It was not uncommon for map app users to claim they had a very poor sense of direction. Therefore, if the participant already had difficulty navigating, a cartographic model may not come naturally to them and lead them to use mapping apps more rather than the app itself causing the non-cartographic understanding. Another aspect of note is many participants chose their place of residence specifically because of the convenience of their commute. As a result, they planned their commute while looking for apartments, often on a map, and their familiarity with the map of their surroundings was not necessarily related to the formulation of

their commute by searching for their commute route on a mapping app but still heavily influenced by the easy accessibility of map apps themselves. Additionally, while mapping apps may be used as a starting point, many participants expressed their willingness to explore and try alternative routes. As a result, participants would often be aware alternative routes known that were not necessarily recommended by the app. However, it is also very common that the map app route is simply the most direct route, and therefore fastest, so it remains the dominant one. At that point, the impact of the map app as the formative element of the route is relatively weak as the individual's understanding of the neighbourhood was not limited by the map app. Rather, through exploration and experimentation the participant would likely have walked the same route without it.

5.5: Limitations

The results and conclusions garnered from this thesis must be taken with a grain of salt due to its limited sample size and very narrow sample population. The sampling of people on the McGill campus during workday hours naturally resulted in most participants having workplaces at or around McGill or were students at the university. McGill's downtown location means the majority of jobs in the area are white collar and result in a skew towards this demographic. Further limiting the reach of the study, the limitation of my own language abilities meant I was only able to conduct this survey in English. Montréal's francophone population was therefore fully excluded from this study. Another significant population in my sample was the student body of McGill. Due to this study being conducted during the end of the summer, much of the student body was not on campus. However, as the surveys continued and the school years approached, several student participants had arrived early for their studies and therefore had their commutes for very short amounts of time. Therefore, the longevity of the commutes in the study are not representative of the general population.

The temporary and fleeting nature of a person's conception is important to consider and is stressed by the previous scholars on cognitive maps. These drawings produced by the participants are drawn at the particular moment that they were surveyed and would likely change from day to day, season to season. The most basic example would be the number of cyclists surveyed. If the study was done in the wintertime what is understood as "your commute" may not reflect the image of their summertime cycling patterns but rather their route when weather is

less favourable. Another issue with utilizing the drawing method is the tendency for errors in drawing to not necessarily be purposeful and instead simply be due to limitations in artistic ability and constraints due to the medium. This was cautioned by Downs and Stea (1977) and was also witnessed in this study. While I often used minor discrepancies as a conversation point during the interview, occasionally the participant did not find much significant about the discrepancies. In one instance, the participant explicitly stated they simply ran out of room on the page. Other participants stated they had left elements out due to wanting to keep the survey within a reasonable time limit or within what was interpreted as a time constraint by my recruitment statement though there was no limit.

Though there are issues with the sampling technique, the usage of drawing as a strategy to expose a person's detailed understanding of their commute may be extended. An important additional note is that I have attempted to be particular about avoid the usage of percentages in my analysis. Where percentages are used, I only intend them to allow for better readability of the numbers as the sample size is too small for the precision implied by percentages. More research should be conducted to generalize these findings.

CHAPTER 6: CONCLUSION

In general, commuters favour faster commutes above all else. However, when looking at the details of the commute, commuters often favour more pleasant routes when less pressed for time or when they want an alternative to their standard commute. Pleasant commutes more frequently involve greenery, but other aspects of a pleasant commute also incorporate the safety of the route as well as the smoothness and reliability. Greenery was more prevalent in the drawings of pedestrians while safety was more important to cyclists. Transit users were most focused on reliability and speed. These findings can be used as areas of focus for the particular modes of commuting in order to have the commute itself be a better experience. Understandings of the commutes themselves were largely based upon paths, with navigation along streets and transit lines being the primary way participants rendered their commutes. As such, the roads and routes that people take on their commute is often what defines it rather than their surroundings. However, mapping apps cause an increase in abstraction of the commute and as such may be an indication of their usage causing a decreased cartographic understanding of the environment.

The scope of this thesis was broad but lead to informative findings. Further research should be conducted in narrower aspects of the commute, perhaps investigating a singular feature such as the impact of greenery or traffic lights along the route. The investigation of motorist perceptions is also largely left out of this thesis due to the lack of sample and is a place of further study. Interesting and important areas to investigate which were not sufficiently looked at in this thesis is the development of the commute over time as well as studying a wider sample population.

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Appendix A: Participant Drawings

Figure 3: Drawing by participant 000801
Transit Rider

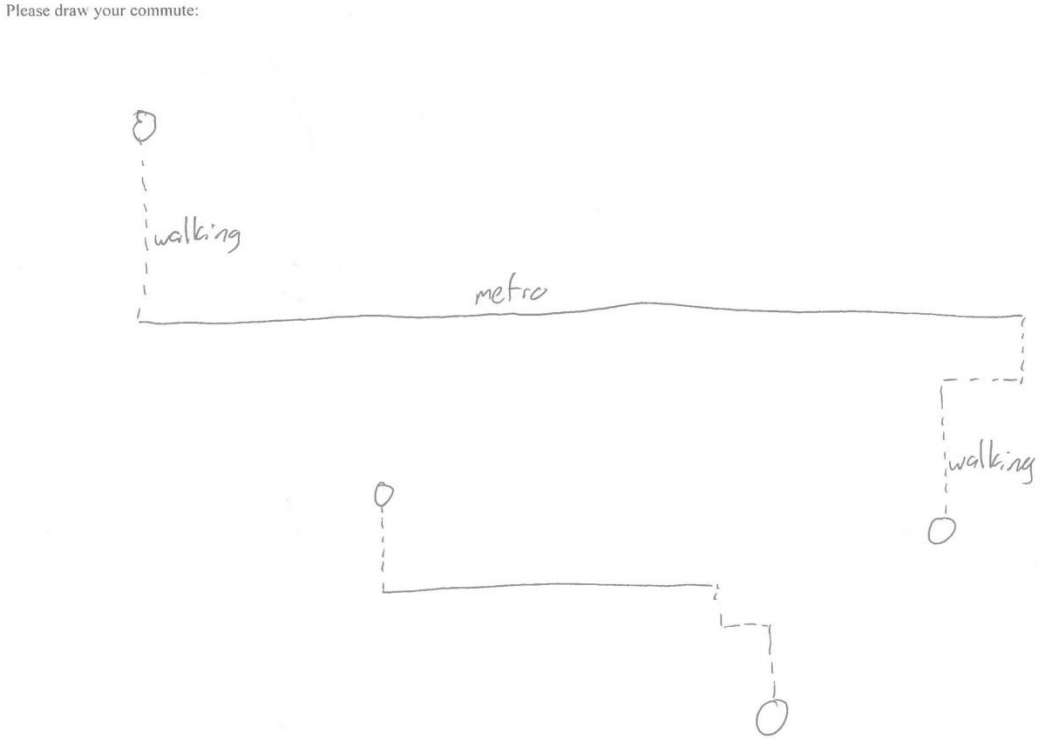
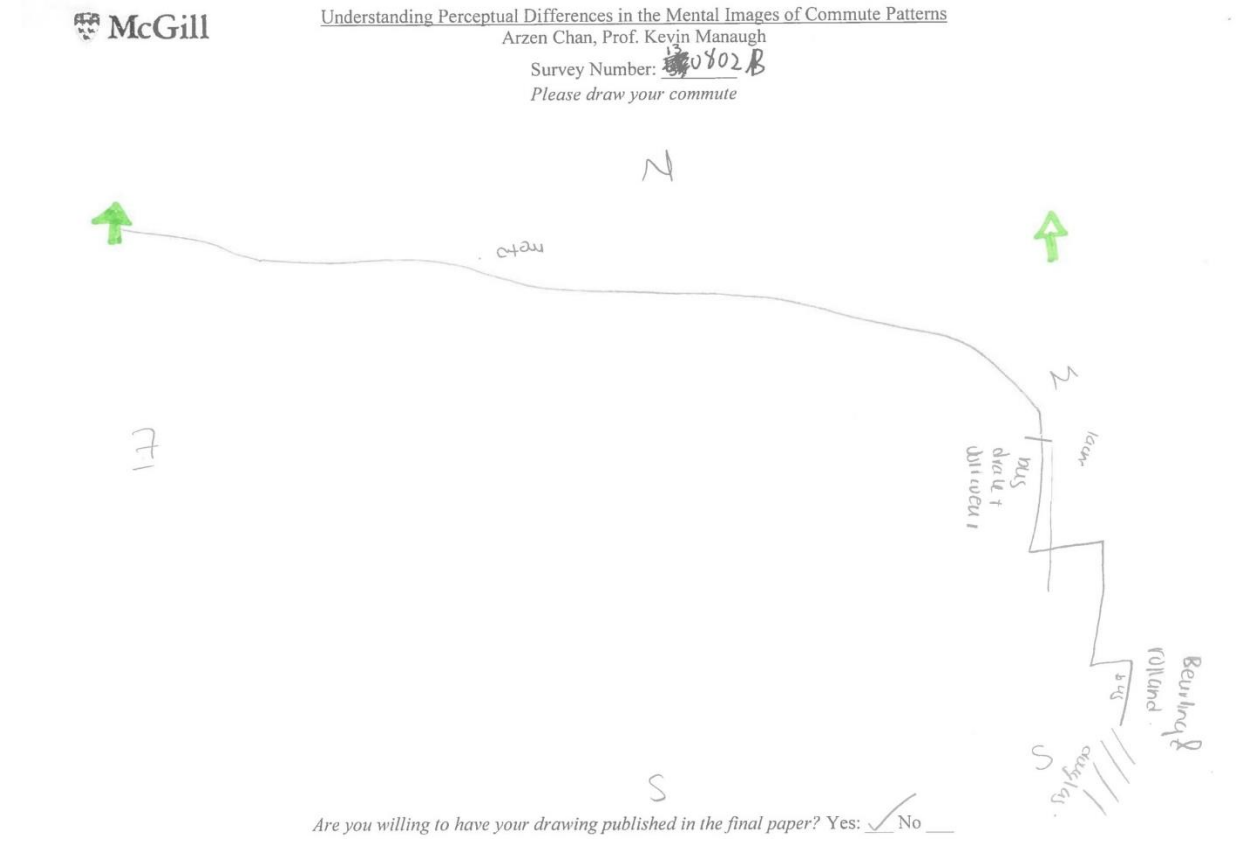


Figure 4: Drawing by participant 130802
Transit Rider (Note: Participant used two pages)



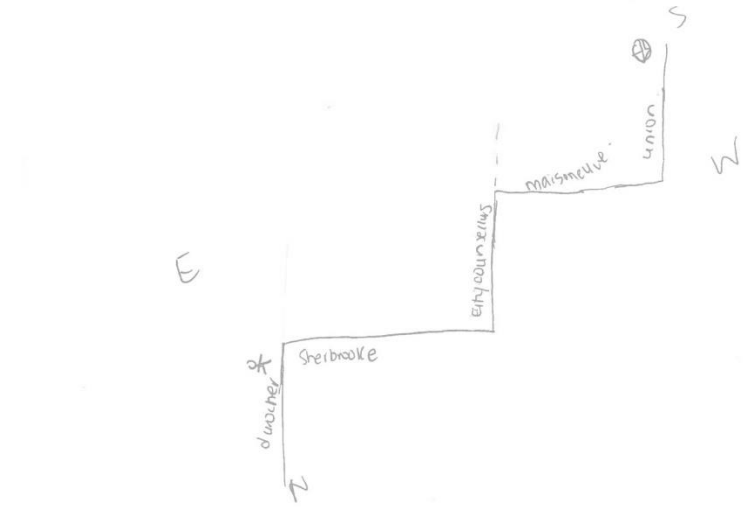


Figure 5: Drawing by participant 160801
Transit Rider

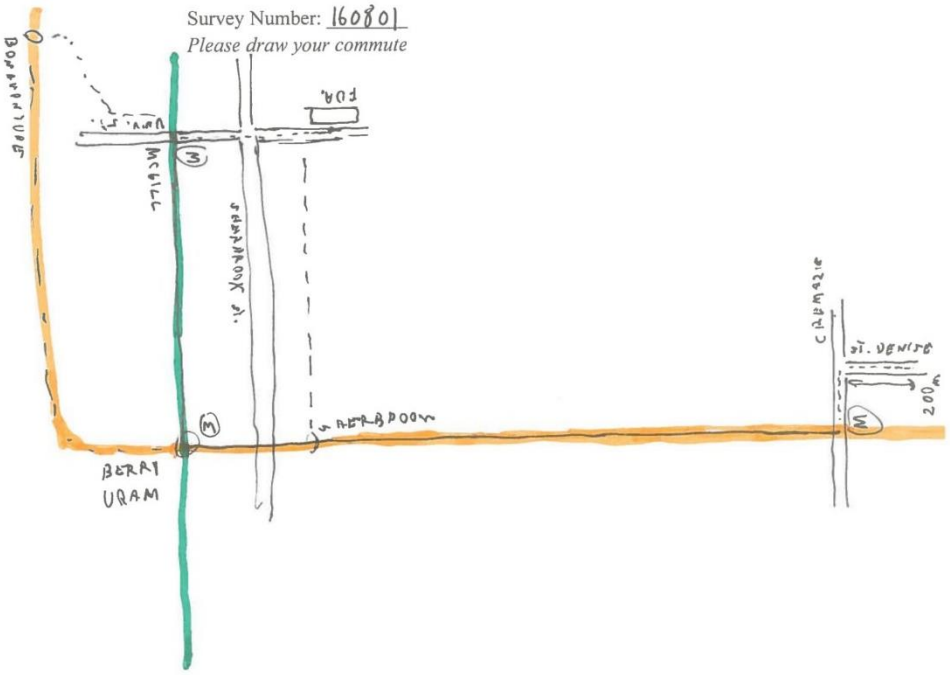


Figure 6: Drawing by participant 160802
Pedestrian

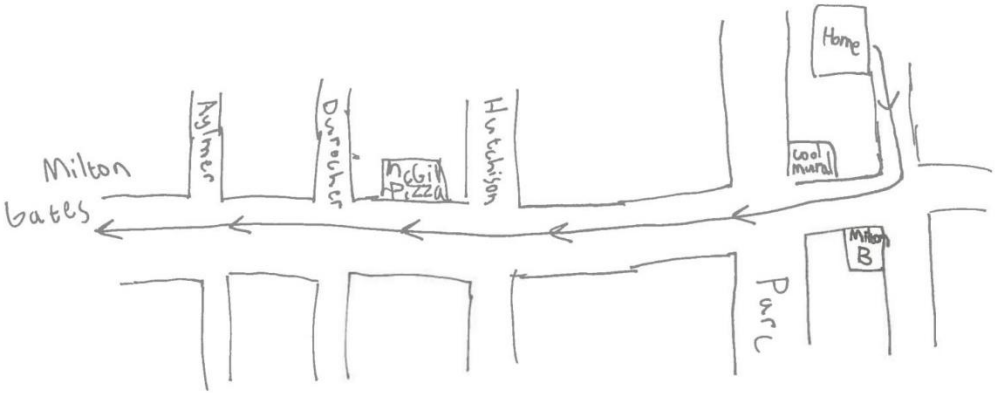


Figure 7: Drawing by participant 160803
Pedestrian

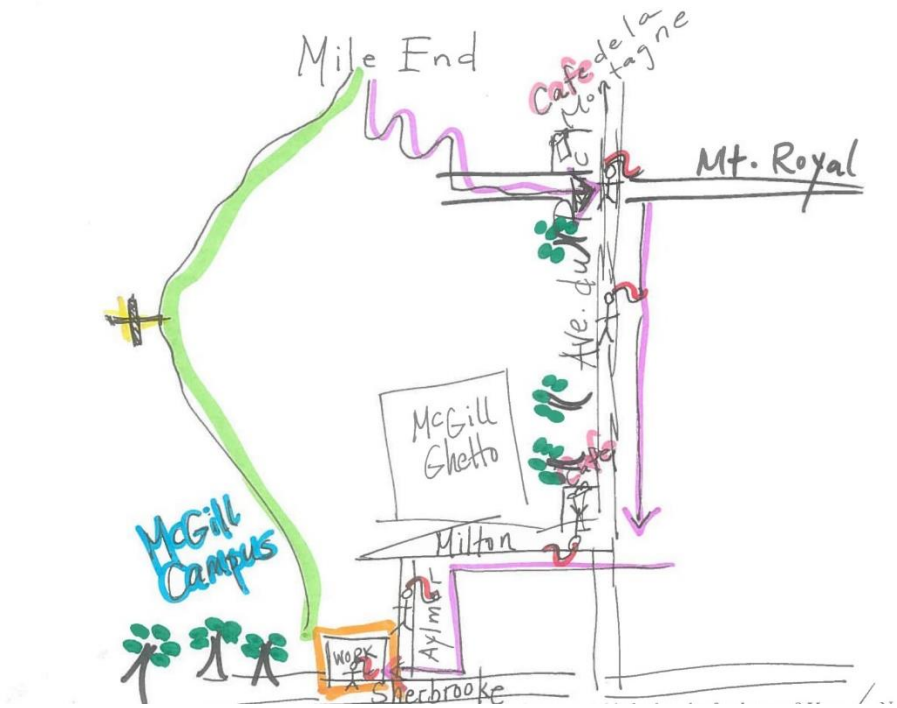
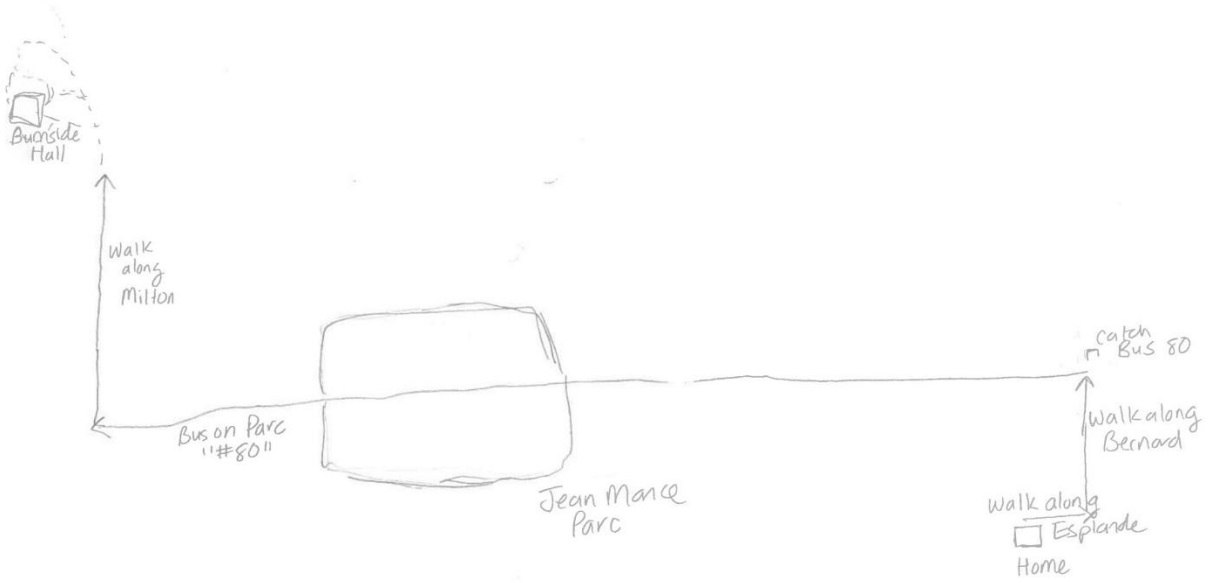


Figure 8: Drawing by participant 160804
Cyclist & Transit Rider (Note: Participant used two pages)



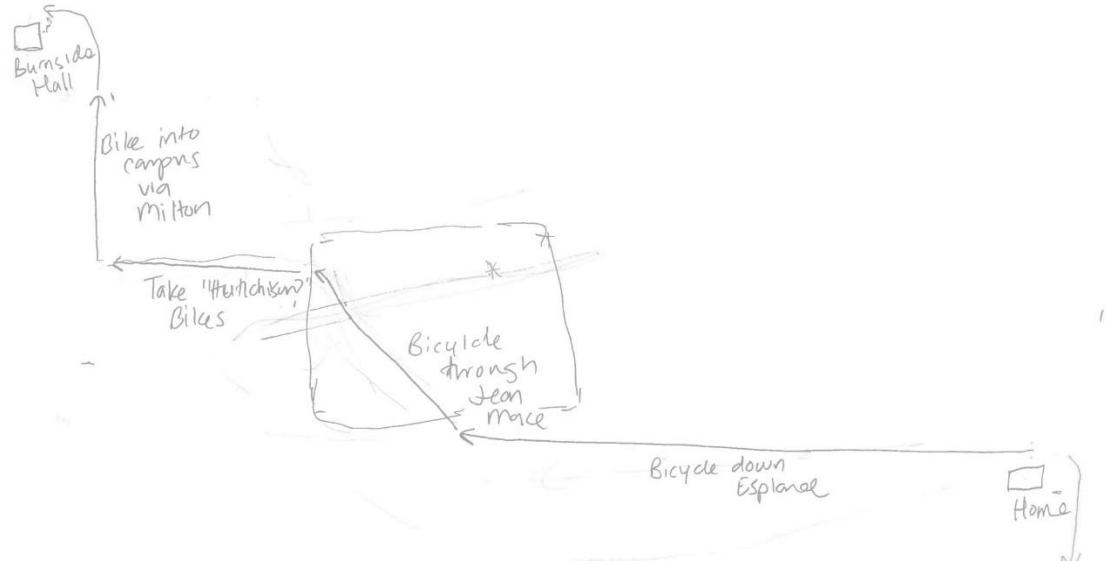


Figure 9: Drawing by participant 190801
Cyclist

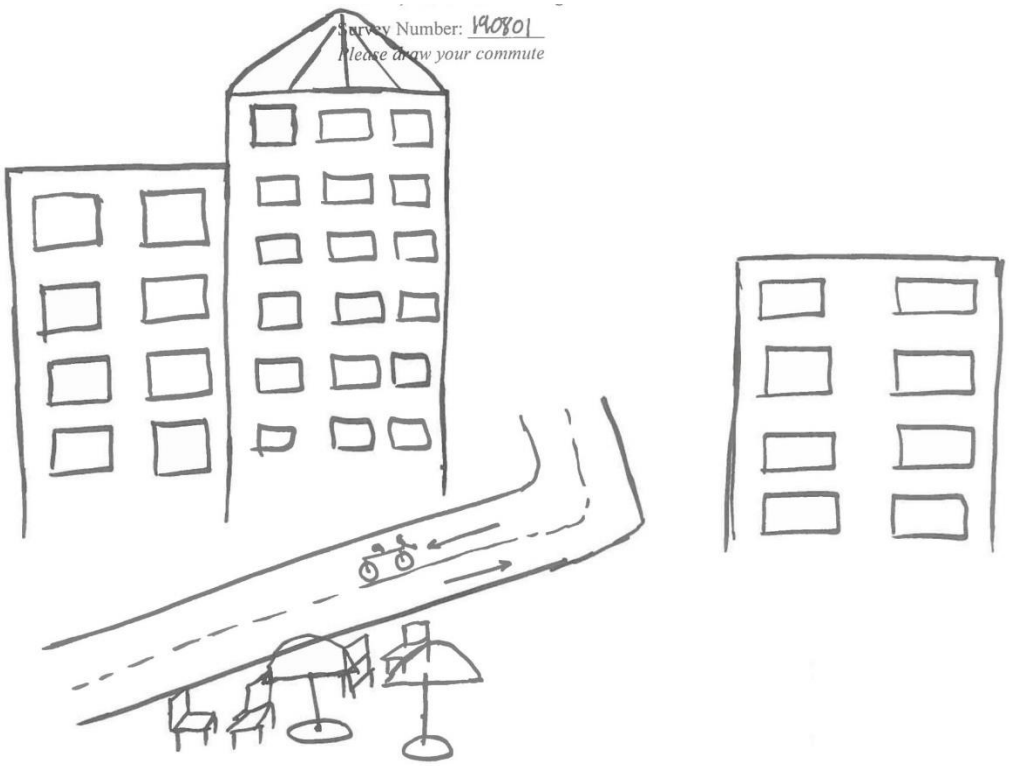


Figure 10: Drawing by participant 200801
Motorist

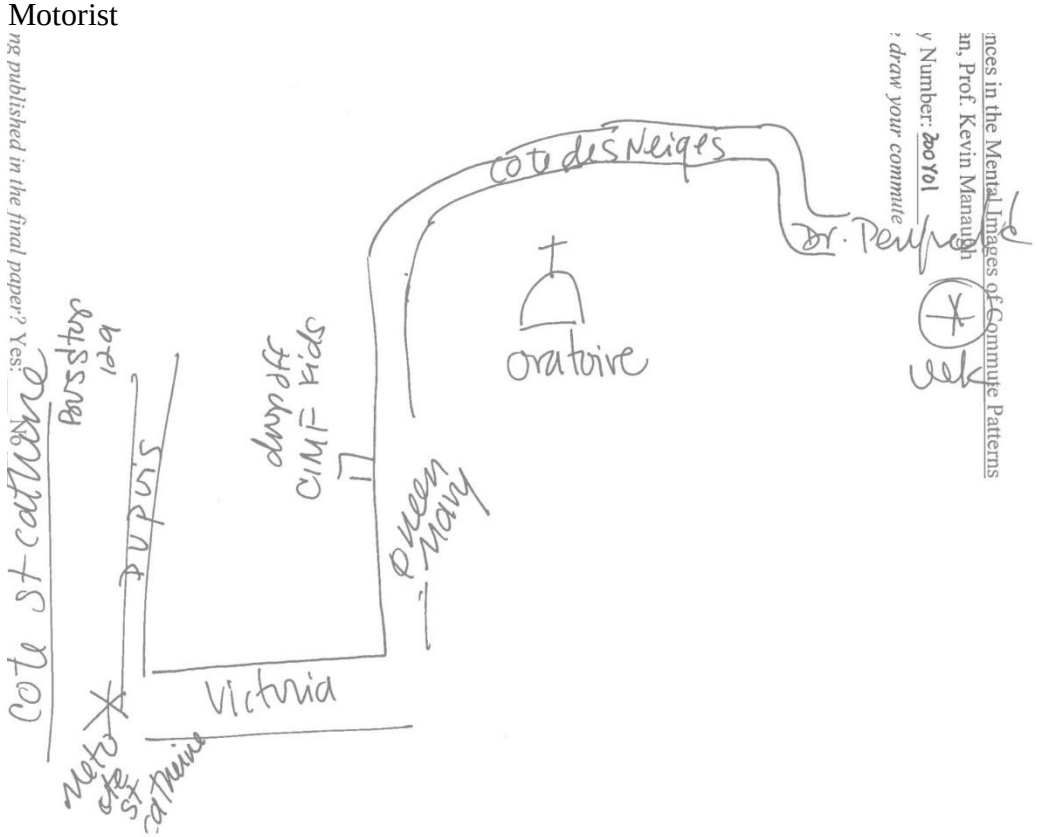


Figure 11: Drawing by participant 200802
Cyclist

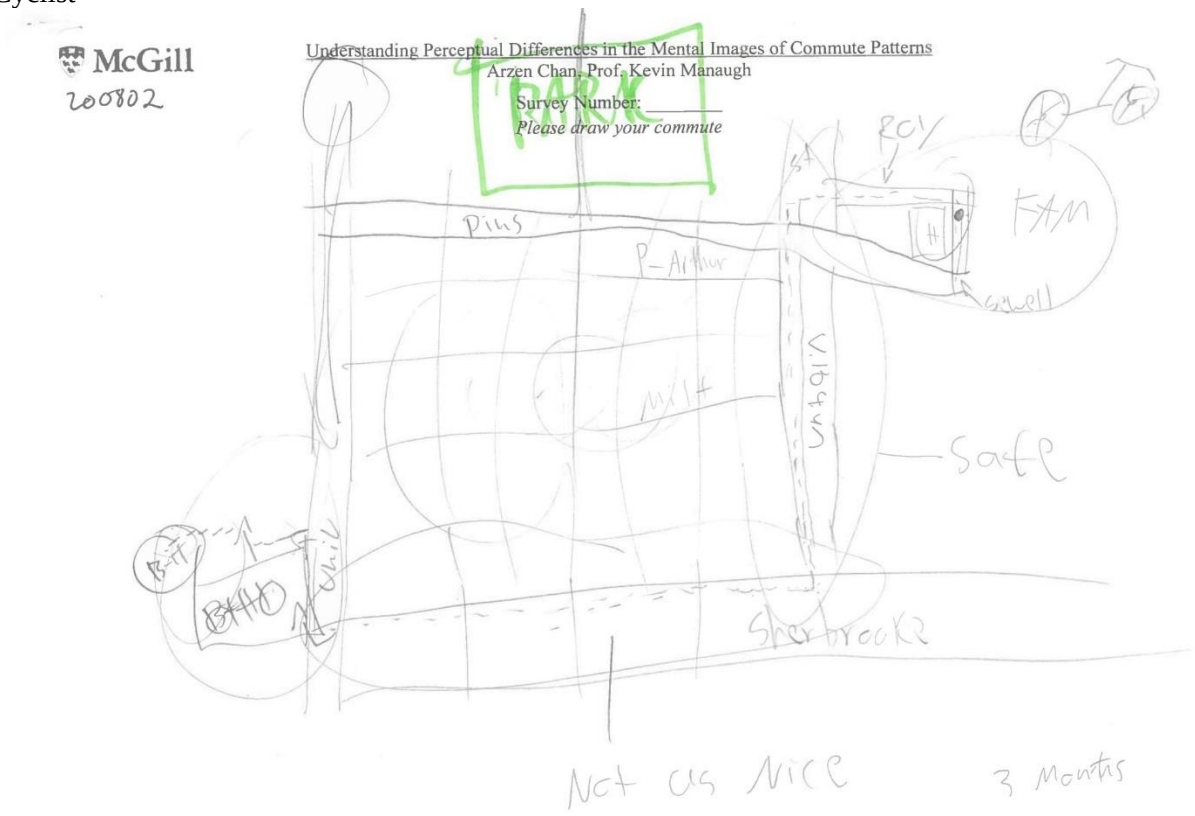


Figure 12: Drawing by participant 200803
Transit Rider

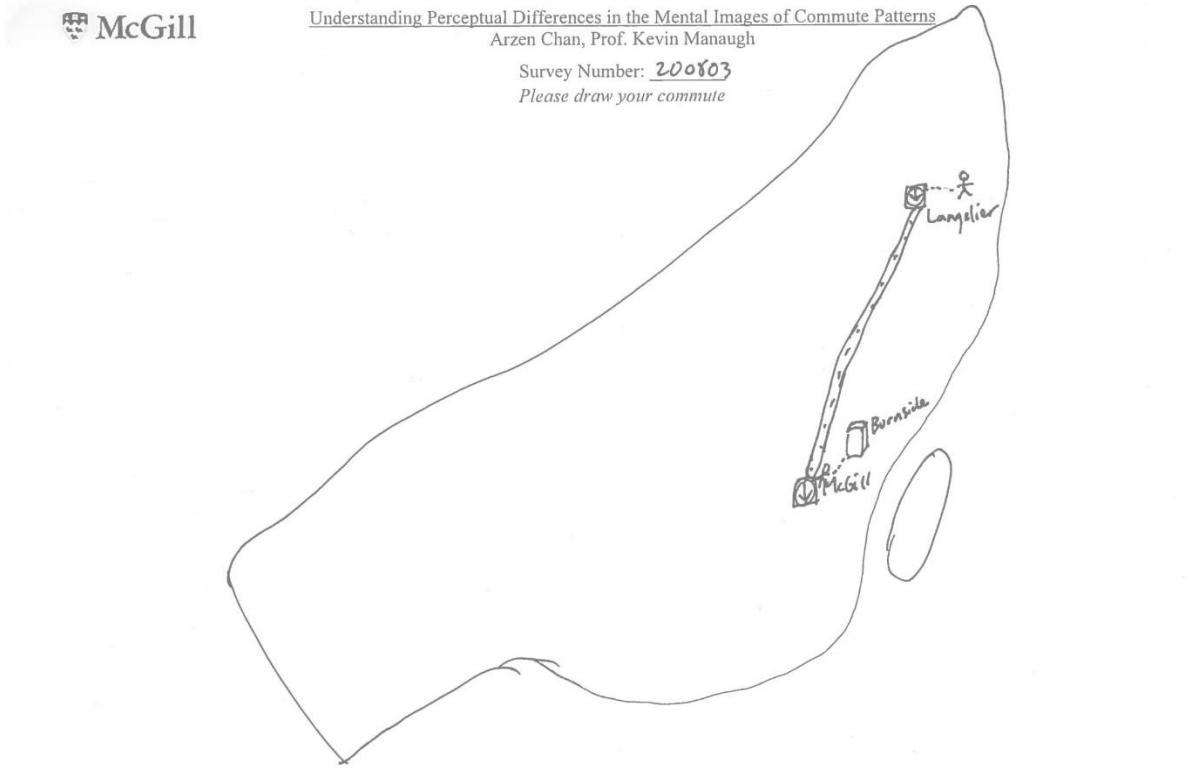


Figure 13: Drawing by participant 210801
Transit Rider

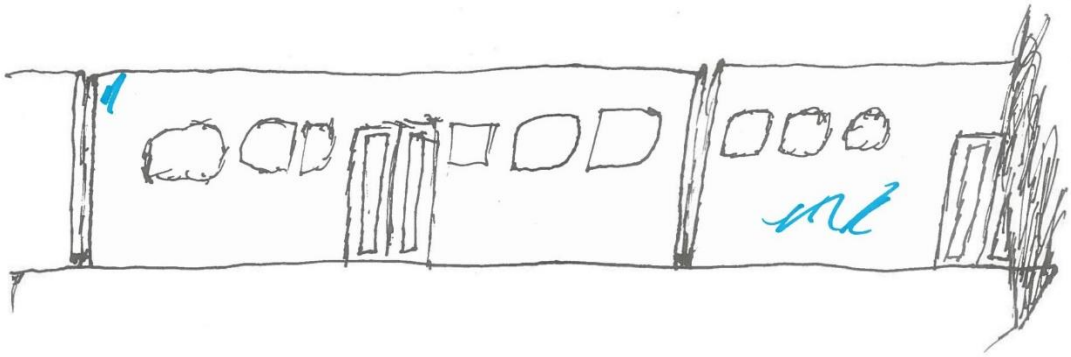


Figure 14: Drawing by participant 210802
Pedestrian

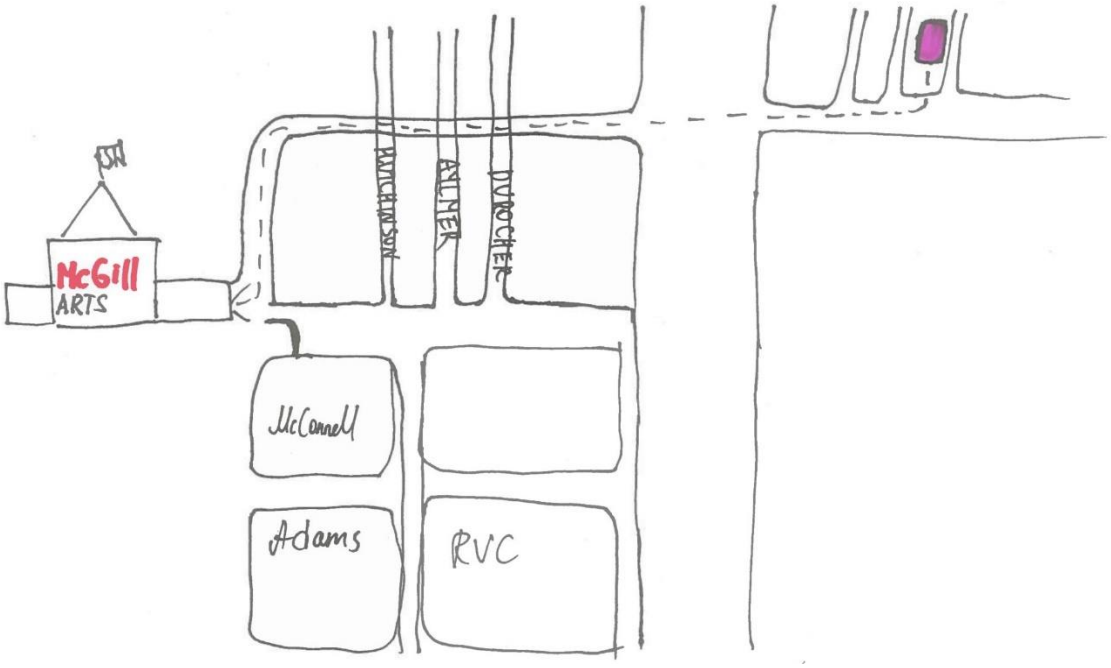


Figure 15: Drawing by participant 210803
Pedestrian

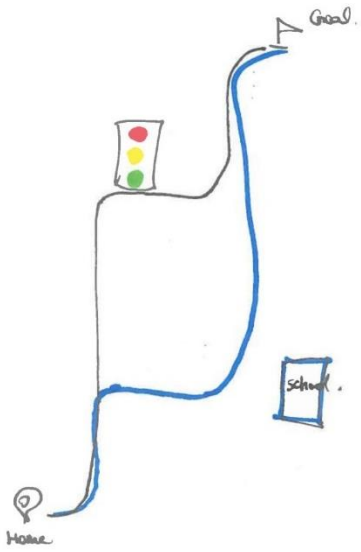
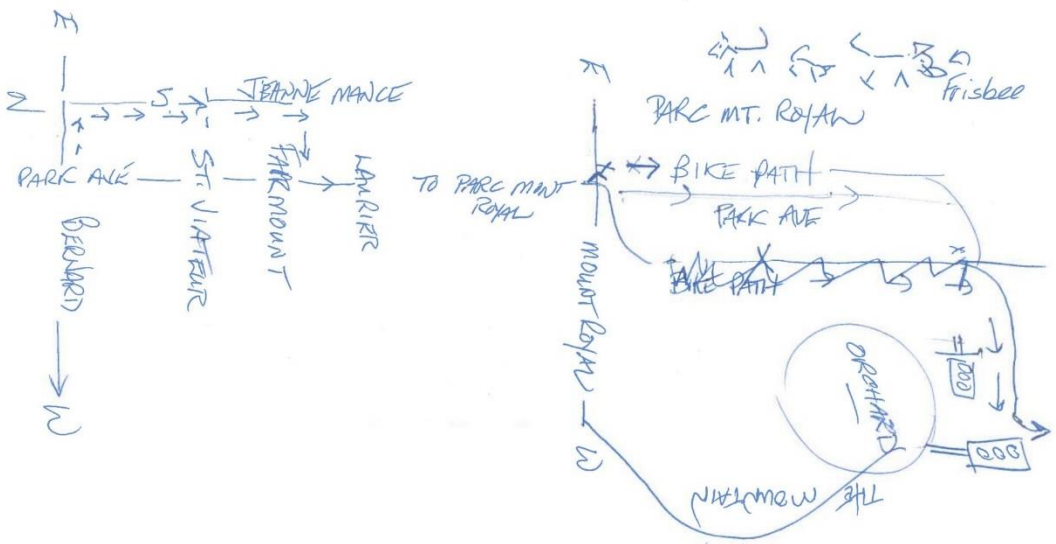
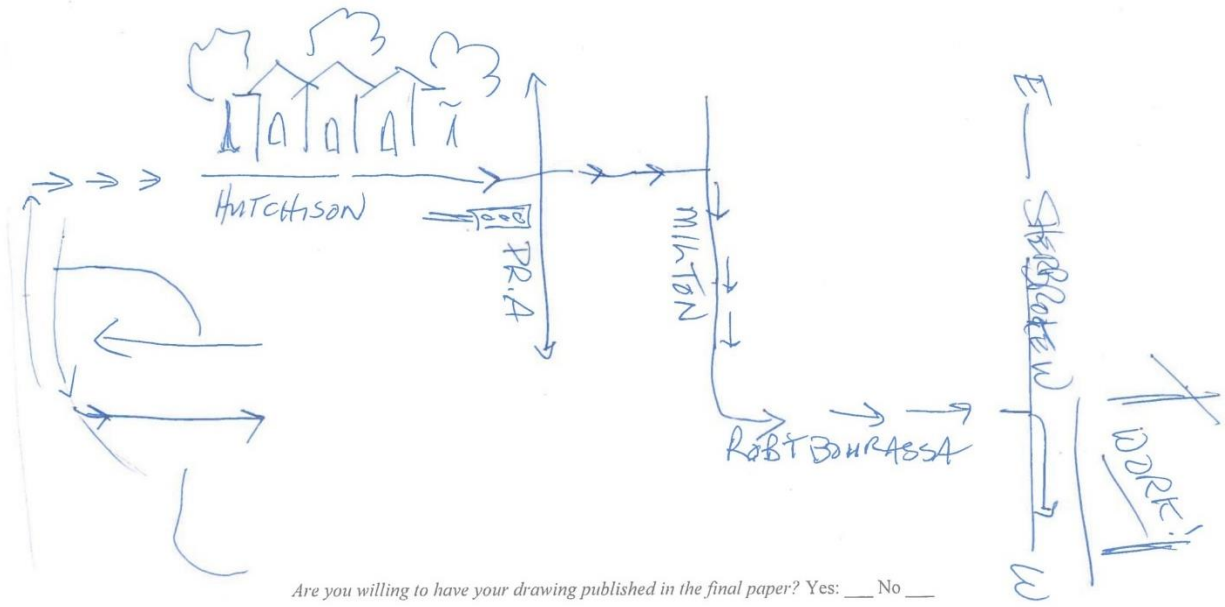


Figure 16: Drawing by participant 210804
Cyclist



Are you willing to have your drawing published in the final paper? Yes: ✓ No



Are you willing to have your drawing published in the final paper? Yes: ___ No ___

Figure 17: Drawing by participant 220801
Pedestrian

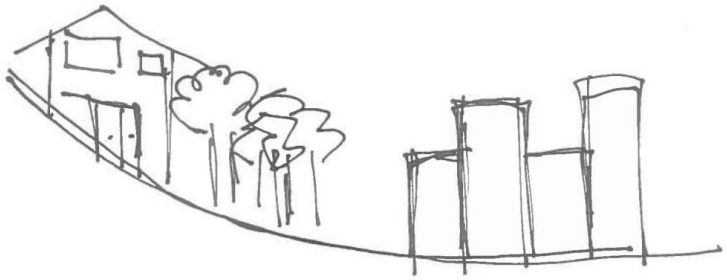


Figure 18: Drawing by participant 220802
Pedestrian

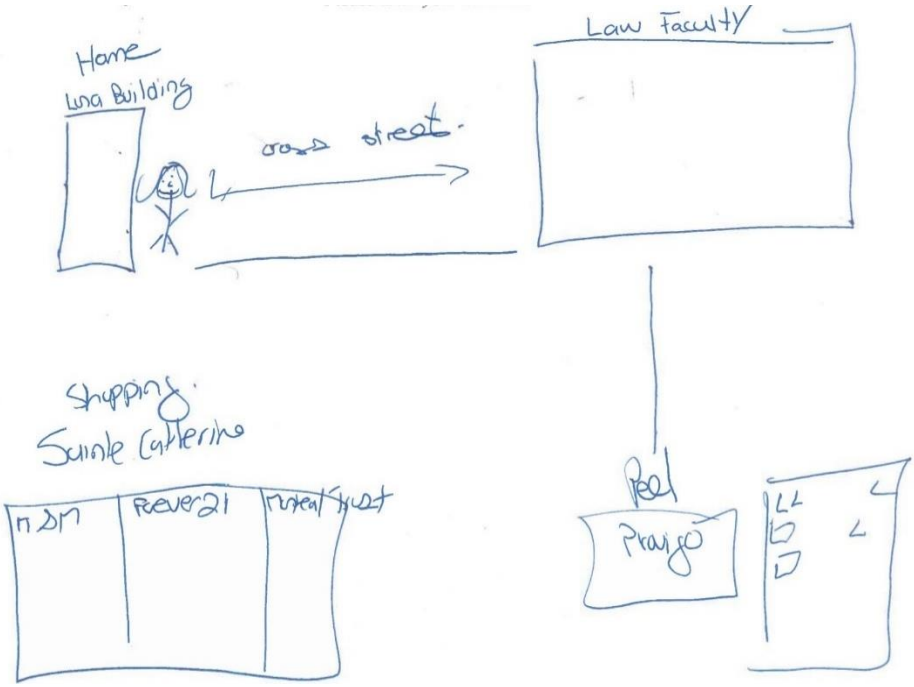


Figure 19: Drawing by participant 260801
Cyclist

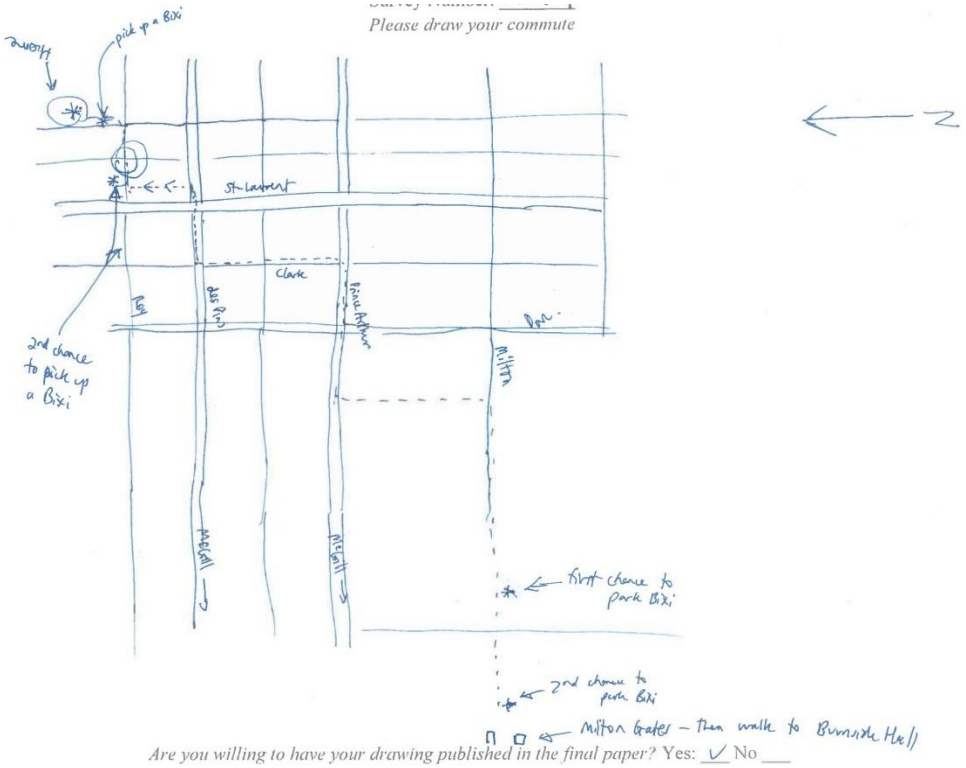


Figure 20: Drawing by participant 260802
Pedestrian

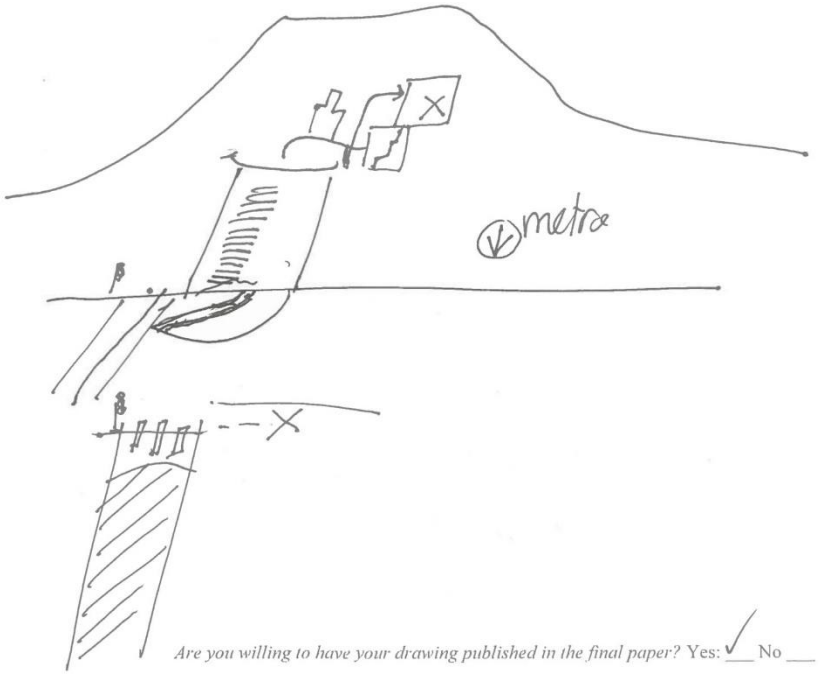


Figure 21: Drawing by participant 280801
Pedestrian

Figure 22: Drawing by participant 280802
Cyclist & Transit Rider

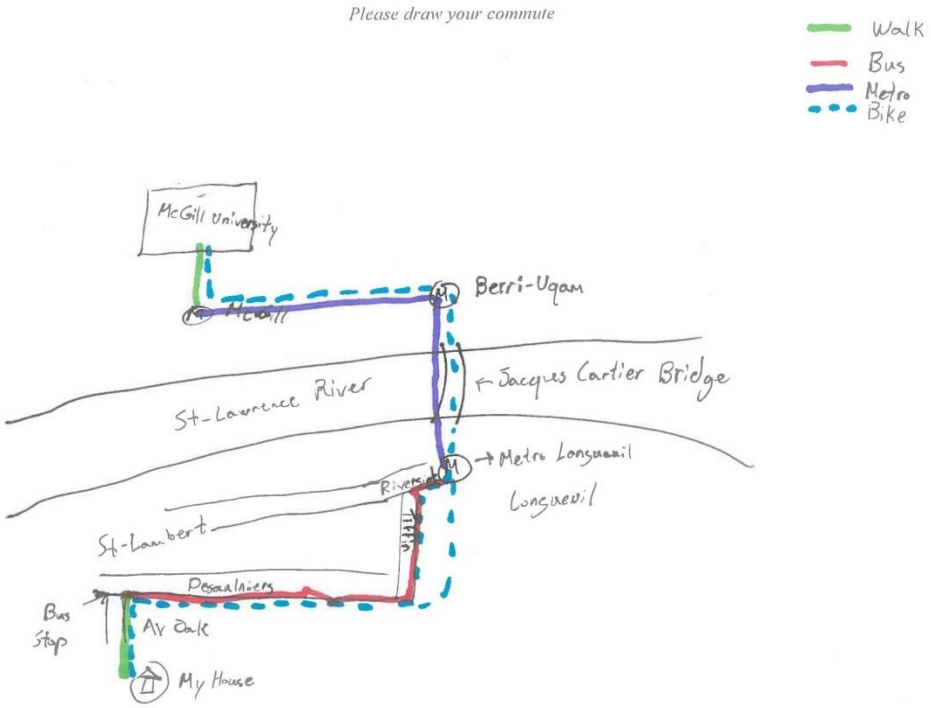


Figure 23: Drawing by participant 280803
Pedestrian

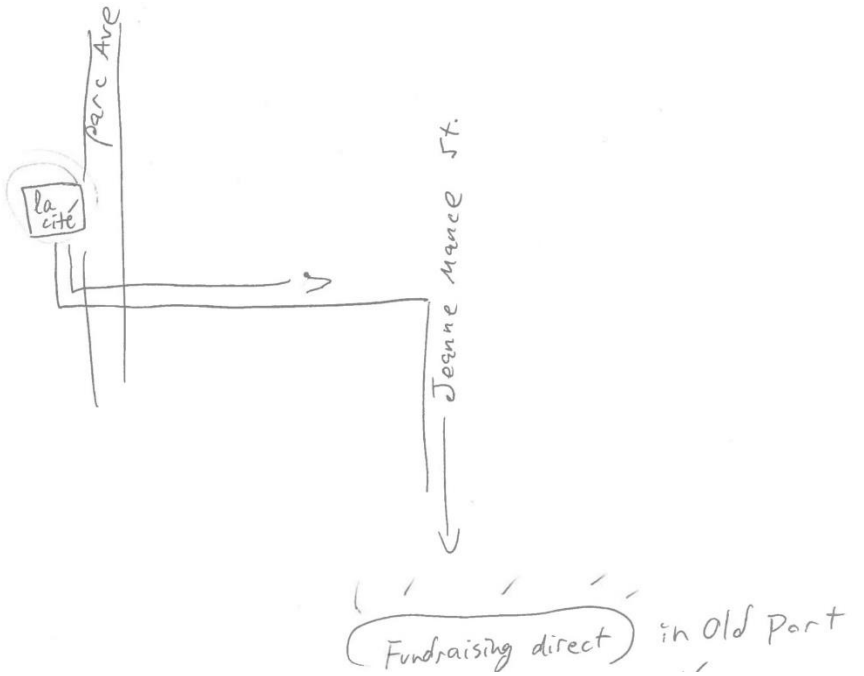


Figure 24: Drawing by participant 290801
Cyclist

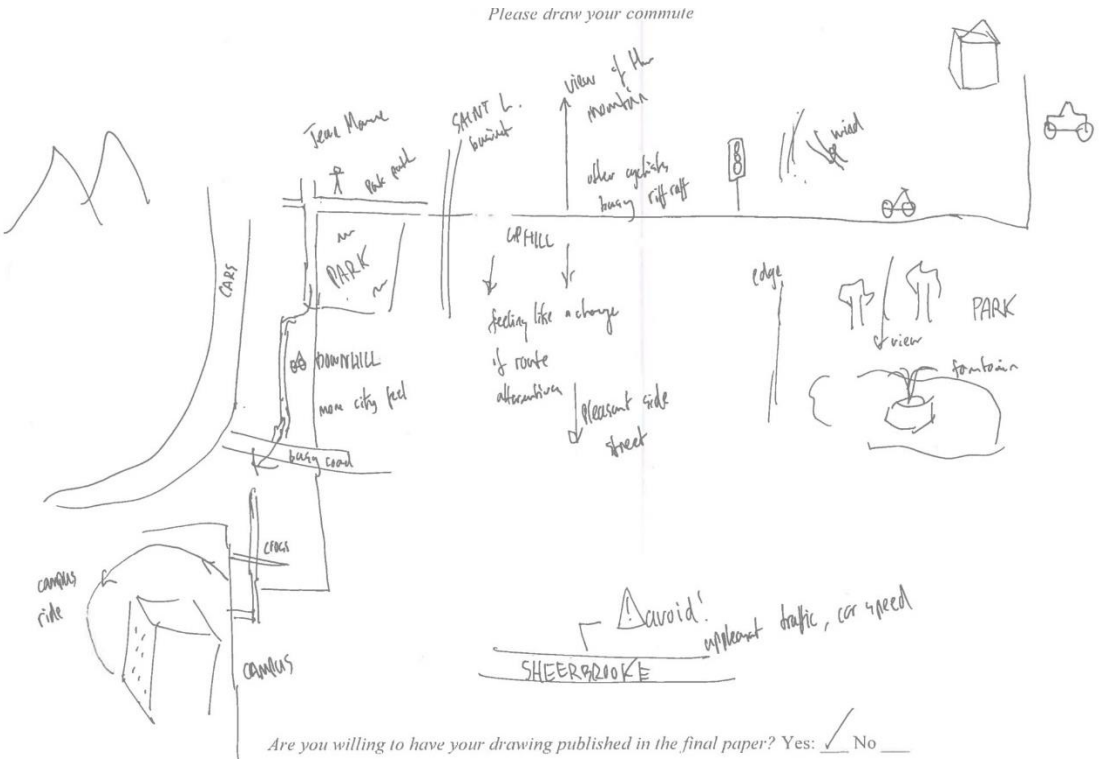


Figure 25: Drawing by participant 290802
Pedestrian

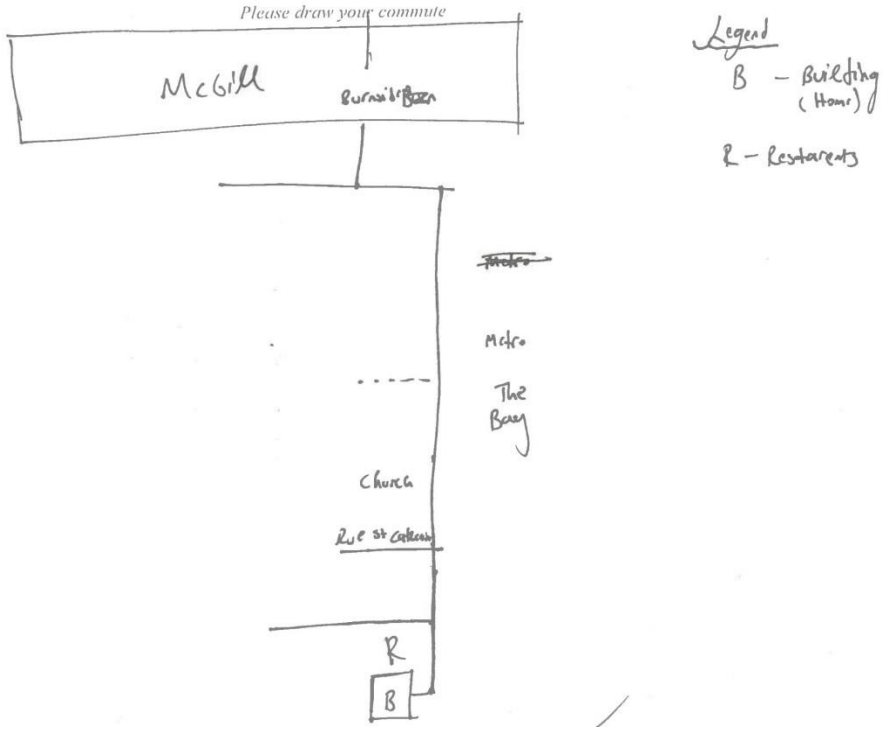


Figure 26: Drawing by participant 300801
Cyclist

Figure 27: Drawing by participant 300802
Pedestrian

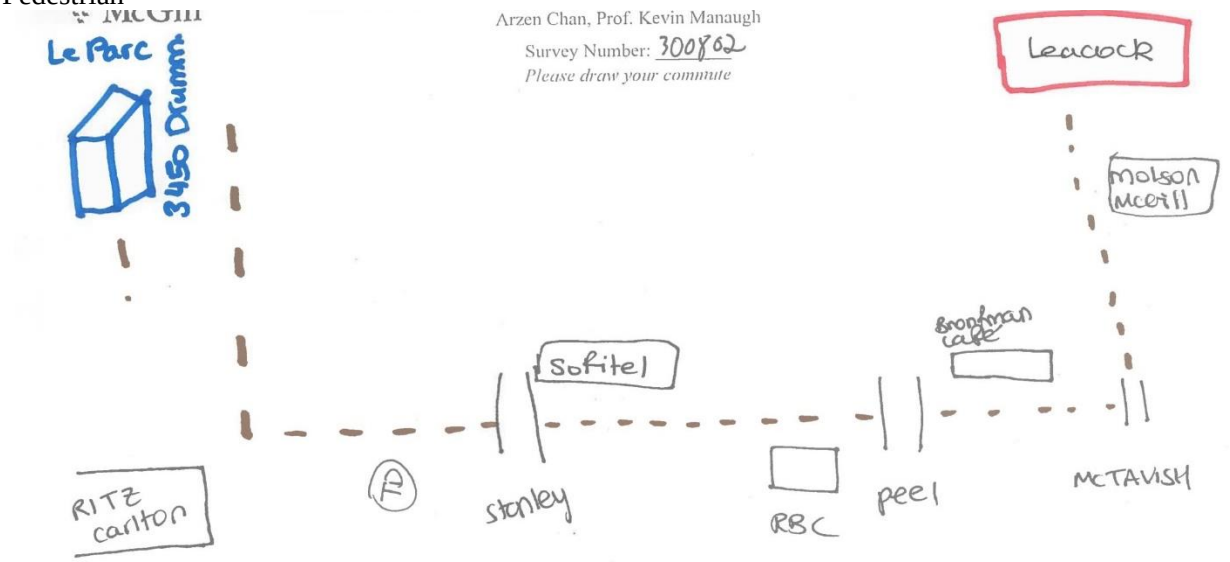


Figure 28: Drawing by participant 300803
Transit Rider

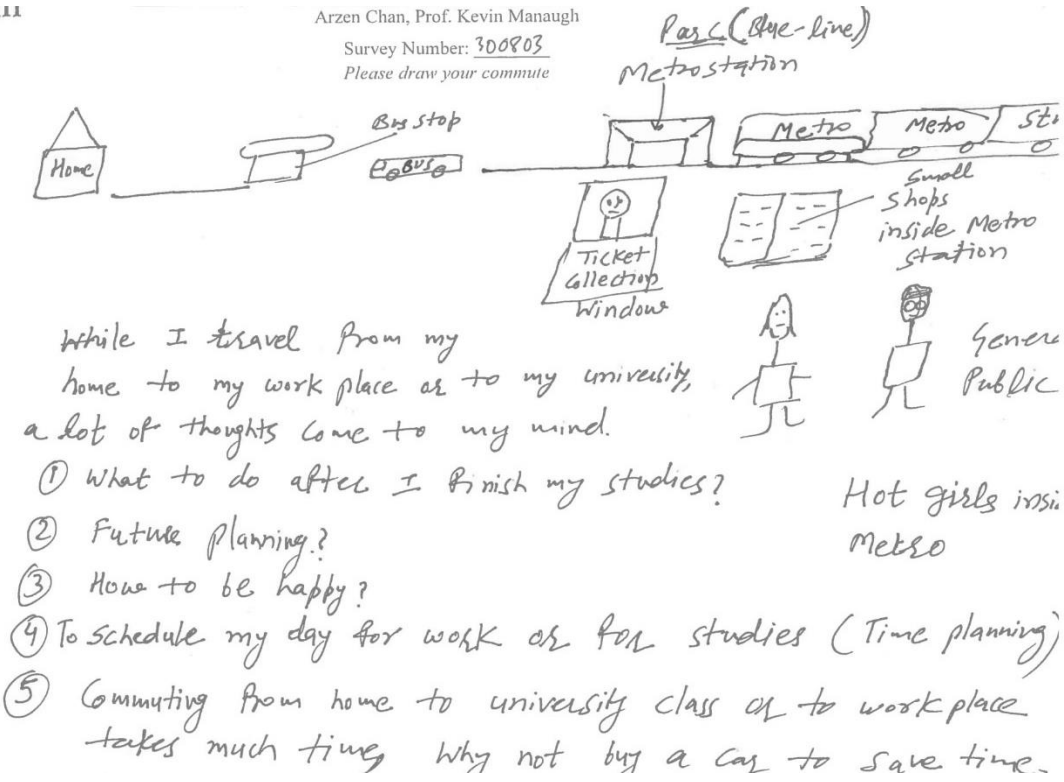


Figure 29: Drawing by participant 300805
Pedestrian

Appendix B: Interview Guide and Survey Forms

Interview Guide

1. Please draw your commute in the space below.
   Add as much detail as you like, adding aspects that you find interesting, important or both.
   Adding labels are helpful for details and any landmarks as well.
   It does not need to look nice but take you time with this, details are what's important.

2. Please describe the sketch that you have create in words, noting anything of interest or that stands out to you.

3. Walk me through your commute.
   What do you feel about these sections? Are they good, bad? Beautiful, ugly?

4. What method(s) of transportation do you use on this commute?

5. How long have you had this commute? How did you chose/form this commute? Did technology play a role such as using mapping apps like Google Maps?

6. Do you have any other usual commute patterns? Please sketch this one as well on another copy of this survey.

7. After you have completed the prior questions, please let me know. Select a map that best encompasses your commute and trace your route on the map.

8. Please describe anything notable on the map and/or any particular differences you find notable.

9. If you wish view the thesis upon completion, write an email address I can contact you by on the email list. You may also email me at arzen.chan@mail.mcgill.ca if you wish the request this at a later date.

Blank Survey

Understanding Perceptual Differences in the Mental Images of Commute Patterns

Arzen Chan, Prof. Kevin Manaugh

Survey Number: _____

Please draw your commute

Are you willing to have your drawing published in the final paper? Yes: ___ No ___

Consent Form

Department of Geography

Participant Consent Form

Researcher:
Arzen Chan, Undergraduate Student, Department of Geography at McGill University
647-890-1998
arzen.chan@mail.mcgill.ca.

Principal Investigator
Prof. Kevin Manaugh, Department of Geography at McGill University
514-709-7853
kevin.manaugh@mcgill.ca

Title of Project: Understanding Perceptual Differences in the Mental Images of Commute Patterns

Purpose of the Study:
The purpose of this study is to investigate factors that create differences in perceptions of people's commutes. By asking you to draw your commute, I hope to be able to find patterns in the sketches of your commute along the other participants.

Study Procedures*:*
In this study, I will be asking you to draw your commute. After which, I will ask you to point out several elements of the commute that you have drawn. During this process, audio will be recorded for accurate note keeping of your responses during the data analysis. These recordings are important for the faithful reproduction of what you said during the interview and are therefore important to the study's accuracy. The recordings will be transcribed and attached to the maps you have drawn, though no names of other identifiable information will be attached to the responses.

Your participation in this study is completely voluntary. If at any time you wish to withdraw from the study, or do not wish to answer a question, there is no obligation to do so. If you wish to withdraw from the study during the survey it will be destroyed if you so wish. Due to participation in this survey being anonymous, it is not possible to withdraw after the survey is completed and submitted.

Potential Risks:
The maps you draw may expose a predictable and regular portion of your life. If you do not wish the maps to be published in the thesis, you will be able to select whether or not your maps will appear. It is not required to have your maps published to participant in this study.

Potential Benefits:
There are no direct benefits for participants of this study

If you decide to participate in the interview you also must know that:

1. Information gained for this project will be used for the purpose of a McGill undergraduate thesis project
2. You must be 18 years of age or older to participate in this study.
3. Your participation in the survey is entirely voluntary.
4. You may withdraw from the interview at any time and answers that you have completed can be destroyed should you wish.
5. Upon completion of the survey and submission, you will not be able to retract the information as, in effort to maintain anonymity, I have no way of identifying your submission specifically.

Confidentiality:
You will not be asked their name or any contact information aside from an email if you so wish to receive a copy of the completed study. Surveys will be coded numerically to protect participant identity. The email addresses will not be associated with any survey. They will be recorded on separate sheet of paper, making them unlinked to any specific survey. Place of work and residence may possibly be extracted from the maps drawn, depending on detail. Upon release, only the maps of those who are willing to have their maps released will be included as you will be able to opt out of the maps being published.

Raw recordings will only be used by the researcher and not disseminated to the public. Quotes of transcriptions may be included in the final report with any identifiable material removed. Access to the recordings, full transcripts, and any notes made by the researcher will only be available to the researcher Arzen Chan and supervisor Dr. Kevin Manaugh. Emails for copies of the completed survey will also be only available to the research and supervisor.

All data will be retained for 7 years as per McGill policy. During the data analysis, data will be held in the private residence of the researcher, Arzen Chan, behind lock and key. Digital data will be held only on a password protected computer, with audio data being temporarily held on a password protected smart phone which will be used for recording before being transferred to the computer. Upon Arzen Chan leaving McGill, data will be transferred to the stewardship of the supervisor Dr. Kevin Manaugh where the same security procedures will be done on the data.

Results will be disseminated as an undergraduate honours thesis with a public presentation at McGill University. The thesis will potentially be published in an academic journal as well.

Questions*:*
If you have any additional questions or clarifications about the project, please feel free to contact the researcher, Arzen Chan, or supervisor Dr. Kevin Manaugh, for more information.

Arzen Chan, Undergraduate Student, Department of Geography at McGill University
647-890-1998
arzen.chan@mail.mcgill.ca.

Doctor Kevin Manaugh, Department of Geography at McGill University
514-709-7853
kevin.manaugh@mcgill.ca

If you have any ethical concerns or complaints about your participation in this study, and want to speak with someone not on the research team, please contact the McGill Ethics Manager at 514-398-6831 or lynda.mcneil@mcgill.ca Research Ethics Board file number 58-0619

Please sign below if you have read the above information and consent to participate in this study. Agreeing to participate in this study does not waive any of your rights or release the researchers from their responsibilities. A copy of this consent form will be given to you and the researcher will keep a copy.

Participant's Name: (please print) _____

Participant's Signature: _____ Date: _____
