Fear of Cycling: Social, Spatial, and Temporal Dimensions

Léa Ravensbergen, Corresponding Author
University of Toronto Mississauga, Geography and Programs in Environment
Room 3211 Davis Building, 3359 Mississauga Rd. N.
Mississauga, On., L5L 1C6
Email: lea.ravensbergen@mail.utoronto.ca

Ron Buliung
University of Toronto Mississauga, Geography and Programs in Environment
Room 3264 Davis Building, 3359 Mississauga Rd. N.
Mississauga, On., L5L 1C6
Tel: 905-569-4419; Email: ron.buliung@utoronto.ca

Nicole Laliberté
University of Toronto Mississauga, Geography and Programs in Environment
Room 3292 Davis Building, 3359 Mississauga Rd. N.
Mississauga, On., L5L 1C6
Tel: 905-569-4854; Email: nicole.laliberte@utoronto.ca

Acknowledgements:
Léa Ravensbergen received the Joseph-Armand Bombardier Graduate Scholarship from the Social Sciences and Humanities Research Council of Canada (SSHRC).

Fear of Cycling: Social, Spatial, and Temporal Dimensions

Abstract

Objective and perceived risk, danger, and safety concerns are often identified as barriers to taking up cycling. While a vast literature examines cycling safety, risk, and danger, little research examines relationships between fear and cycling, i.e. the emotional experience of risk, danger, and safety concerns. This paper addresses this research gap by exploring the fears reported by recent immigrants who are new cyclists in Toronto, Canada. Cyclists expressed many different types of fear; their fears were dynamic and possessed social, temporal, and spatial qualities. The two most frequent fears participants described were fear of injury and fear for personal safety. Fear of injury varied across the city and by time of day. It was also shaped by past cycling experiences, while appearing to attenuate with the accumulation of cycling experiences. Fear of injury can also be social; and the primary focus herein is on how it can be gendered. For instance, gendered access to opportunities to cycle throughout the life course can shape cycling fear(s). Fear for personal safety was primarily expressed by women, was often shaped by past experiences of street harassment, and changed throughout the day, across the city, and was understood in relation to other places. Participants also described fears related to bicycle theft, getting lost, encountering mechanical problems, and getting in trouble with law enforcement.

Keywords: cycling; fear; injury; personal safety; gender; immigration

"*I thought, wondered maybe the car will… crush me or something*" - Zang

"*they [men] would call you out … I don't look at them because I am shit scared*." - Avani

1. Introduction

Objective and perceived risk, danger, and safety concerns are consistently identified as major barriers to people taking up cycling for transport (Dill, 2009; Dill & Voros, 2007; Sanders, 2015; Winters et al., 2011). These barriers are recognized within multiple academic disciplines (Jacobsen, Racioppi & Rutter, 2009) and in different geographic contexts, but they are especially present within places with low cycling rates. In Canada, for example, findings from the National Active Transportation Survey indicate that weather and safety are the top ranked barriers to cycling (Winters et al., 2011).

While a large body of work focuses on objective or perceived cycling risk, safety, or danger, in this paper we take a different approach by examining cycling fear, as a social, spatial, and temporal process and outcome of cycling experiences. This paper is inspired by the fears described by new cyclists enrolled in a cycling mentorship program designed for immigrants and refugees in the City of Toronto, Canada. We frame fear of cycling using perspectives from emotional geographies. Rather than conceptualizing emotions as a mental state residing "inside" people, some geographers think about emotions in terms of their social and spatial mediation and articulation (Davidson, Bondi & Smith, 2005). In this paper fear is broadly defined as the range of emotions and experiences associated with cycling expressed by research participants related to discomfort, safety concerns, or anxiety. By exploring how fear of cycling can be experienced across different mobile bodies, places, and times, this paper moves beyond reductive descriptions of cycling safety, danger, and risk. While a wide range of social positionalities affect one's experience of cycling, this paper focuses on gender. Not only was gender a prominent theme during the interviews, but men have been found to cycle more than women in many low-cycling contexts and researchers have hypothesized that this 'gender-gap' may be due to women's greater concern over safety (Buehler & Dill, 2016; Delmelle & Delmelle, 2012; Heinen et al., 2010; Ravensbergen et al., 2019). Much of this research uses a binary conceptualization of gender and, in doing so, fails to capture the social processes that shape cycling experiences such as concern over safety (Ravensbergen et al., 2019). This paper responds to this gap in the literature by highlighting,

through participant-accounts, some of the underlying social processes shaping gendered fear of cycling.

Literature Review

A large body of cycling research has focused on 'objective' (i.e. derived from collision or injury data) or 'perceived' (i.e. self-reported) safety, risk, or danger, both at the individual and built environment scales. Research on objective safety, risk, or danger, typically indicates that cyclists experience greater injury risk than motorists in countries where cycling for transportation is less common (Beck et al., 2007). The risk narrative, however, is complemented by work indicating that the health benefits of cycling outweigh health risks (Andersen et al., 2000; Pucher et al., 2010). In the North-American context, objective cycling safety research conducted at the individual-scale has emphasised helmet design, regulation, and use (Reynolds et al., 2009). Another key finding from this literature is that injury incidents decrease as cycling behavior increases; i.e., the "safety in numbers hypothesis" (Buehler & Pucher, 2012; Forsyth & Kriezek, 2010; Jacobsen, 2003; Prati et al., 2018; Pucher et al., 2010). Many studies examine the objective safety or risk of cycling by looking into the built environment to study intersection safety, or by comparing crashes and injuries before and after-infrastructure was built (Thomas & DeRobertis, 2013). Overall, findings indicate that the presence of cycle infrastructure associates with reduced collisions and injuries (as well as injury severity) and lower objective risk (Prati et al., 2018; Reynolds et al., 2009; Teschke et al., 2012; Thomas & DeRobertis, 2013).

Another common approach taken in the cycling literature is to examine perceived safety, risk, or danger. Perceived safety, risk, and danger are typically self-reported and have been found to associate with cycling and route choice decisions (Winters et al., 2011; Dill & Voros, 2007; Dill, 2009). More recently, perceived safety has been studied at the individual-level by examining the impact of 'near-misses', i.e. non-injury incidents between cyclists and other road users (Aldred, 2016; Aldred & Crosweller, 2015; Sanders, 2015). Others have studied 'near-misses' to examine objective safety (e.g.: Nelson et al., 2015). Studies about perceived safety have also looked into built environment effects. For instance, bicycle infrastructure has been found to be associated with lower perceived concern over safety (Delmell & Delmell, 2012). Perceived safety has also been found to vary across different streetscapes (Jensen, 2007; Parkin et al, 2007; Winters et al., 2012).

Though perceived and objective safety, risk, and danger are measured differently, some research has found that there is little discrepancy between perceived and objective measures (Winters et al., 2012). Furthermore, the presence of bicycle facilities has consistently been linked to greater cycling participation (Buehler & Dill, 2016; Buehler & Pucher, 2012; Dill & Carr, 2007; Parker et al., 2011; Pucher et al., 2010), which could be due to both perceived and objective safety. Taken together, this body of work on objective and perceived cycling safety, risk, and danger has made important contributions to the literature on road safety, and has been influential in the realm of advocacy and public policy where it has informed policy creation and street design. However, these studies do not capture the affective qualities of cycling decisions and practices, or the emotional experience, for example, of cyclists involved in bicycle-motor vehicle interactions. The few authors that directly examine fear, the emotion, in relation to cycling have broadened the literature by considering fear of cycling beyond that of being injured by a motor vehicle. For instance, Horton (2007) hypothesised that different types of fear of cycling exist beyond that of injury, such as the fear of being "on view" (p. 134) while cycling, i.e., fear of moving your body in the public realm, and fear for personal safety. Unlike driving, where one can withdraw from the 'scary' public city, Horton (2007) highlighted how cycling involves putting one's body back into the urban 'fearscape'. Furthermore, in a qualitative study about the barriers and facilitators to cycling for transportation in Bogota, Colombia, research participants discussed not only their fear of injury associated with the built environment and infrastructure, but also their fear of bike theft and personal attacks (Mosquera et al., 2012). Further, female interviewees and focus group participants stated that they felt more vulnerable to personal attacks, injuries, and theft while cycling than male participants (Mosquera et al., 2012). In another study drawing on intercept surveys in Black and Hispanic communities in New Jersey, Brown (2016) found that cyclist's top two stated fears were traffic collision (identified by 27% of respondents) and fear of robbery/ assault while cycling (17%). Other fears included: pavement conditions, fear of being stranded with a broken bicycle, fear of being profiled by the police, fear of verbal harassment, cost of bicycle maintenance, and pregnancy/ small children. Brown (2016) argues that transportation planners design roads in a manner that is "traffic safety-rich and personal safety-bankrupt" (p. 23). By examining the fears described by new cyclists in Toronto, Canada, this paper provides novel insight into a broader range of experiences, materials, and mobilities that produce fear among cyclists – and in this case, cyclists who may be new to cycling but who have also recently

immigrated to a large global city. We also highlight the dynamic nature of multiple types of fear of cycling and demonstrate their spatial, temporal, and social dimensions.

Gender emerged as a key social dimension of fear in this study. This is perhaps unsurprising as many studies have found that those who identify as women tend to rate safety considerations as a barrier to cycling more frequently than men in places with low cycling rates (Buehler & Dill, 2016; Delmelle & Delmelle, 2012; Heinen et al., 2010; Ravensbergen et al., 2019). Much of this work compares men and women's cycling perceptions, behaviours, or correlates, but does little to uncover the gendered processes that underly gender differences in cycling (Ravensbergen et al., 2019). By focusing on fear, this paper uncovers how fear of cycling can be shaped by patriarchal power relations. It does so by drawing on Young's (2005) work on feminine bodily comportment and the literature on the urban geographies of fear. In her essay *Throwing Like a Girl: A Phenomenology of Feminine Body Comportment, Motility, and Spatiality*, Young (2005) discusses differences in men and women's bodily comportments, motility, and spatiality. She argued that these differences are not due to anatomy or physiology instead, "they have their source in the particular *situation* of women as conditioned by their sexist oppression in contemporary society" (p. 42, emphasis original). In patriarchal societies, some women are not given the opportunity and encouragement to use their full bodily capacities and to develop specific bodily skills, resulting in subtle differences in male and female bodily comportment. Young's (2005) theory is applied to gendered access to cycling in this paper.

Further, this paper draws on literature about the gendered urban geographies of fear to explore fear for personal safety while cycling. This literature focuses on how women are more fearful than men in public spaces, though they are often at lower risk of danger in these spaces than others such as racialized men, an experience said to be related to women's sense of physical vulnerability to crime, particularly to rape and sexual murder (Bondi & Rose, 2003; Dunckel Graglia, 2016; Loukaitou-Sideris & Fink, 2009; Valentine, 1989). The spatial and temporal components of this fear are found to echo in the experiences told by many research participants.

3. Methods

This article draws on the fears described by participants of a larger study about gender, identity, and cycling. In the larger study, semi-structured interviews were completed with participants of the 2017 Bike Host program, a cycling mentorship program that targets Toronto-based immigrants

and refugees. Participants are loaned a bicycle, helmet, and lock and are matched with a mentor who is comfortable riding in the city. Over the course of the summer months, the newcomer participants and their mentors engage in bicycle-based social outings around the city, both as part of their mentor's group, and by attending events organized for all participants in the program. Among other research activities, these participants were invited to take part in two interviews: one at the beginning of the program that focused on the participant's mobilities life history and perceptions of cycling in Toronto and one at the end of the program meant to capture the new cyclists' experiences biking over the summer. All interviews were transcribed and data analysis was approached inductively whereby the interview transcripts were coded to distill the vast amount of data into key themes, to organize the data, and to engage in data exploration, analysis, and theory-building (Cope, 2016).

A total of 56 semi-structured interviews were completed: 26 participants participated in the interview at the beginning of the program and the same 26 participants and 4 additional participants completed the interview at the end of the program. The interviewees were diverse in regard to self-reported age, gender, and country of origin (Table 2). Bike Host participants also had varying skill levels and comfort on a bicycle. At the beginning of the program, thirteen had little experience or had not ridden a bicycle in years, three of which had never learnt how to ride a bicycle. None of the interviewees used a car as their primary mode of transportation, though six (20%) had access to a household personal vehicle. The University of Toronto Research Ethics Board approved the research protocol used for this work. In order to comply with the board's guidelines, pseudonyms are used for all participants. Interviews took place in English, though none of the participants were native English speakers. Their exact quotes are included to fully represent participant's active voices.

Table 2. Interviewee Characteristics

		Nb.	%
Gender	Men	13	43%
	Women	17	57%
Place of Origin	South Asia	10	33%
	East Asia China	7	23%
	Middle East	6	20%
	Americas	4	13%

	Africa	2	7%
	Russia	1	3%
Age Distribution	20-29	3	10%
	30-39	17	57%
	40-49	6	20%
	50-59	3	10%
	> 60	1	3%
Educational Attainment	Elementary School	0	0%
	Secondary School	2	7%
	College	4	13%
	University	9	30%
	Graduate School	15	50%

4. Results

Bike Host participants discussed many different types of fear including: fear of injury, fear for personal safety, fear of bicycle theft, fear of getting lost, fear of encountering mechanical problems, and fear of law enforcement. Participants revealed that fears related to cycling change across time and place; there was also variation in the fears expressed across the sample, and the same fears were experienced or described differently by different people. Beyond being social, spatial, and temporal, types of fear interacted. Take, for example, how some participant's reported that their fear of getting lost on a bicycle was greater in Toronto than in their home country because, as newcomers, they are less familiar with Toronto's streets. For one participant, Arjun, this fear of getting lost as a newcomer, increased his fear of getting injured while cycling because it made him choose more direct and simple routes to reach his destinations, routes that tended to involve major roads with heavy traffic. While there are more examples of these fears, along with their spatial, social, and temporal dimensions, this results section is devoted to the two fears most commonly discussed during the interviews: fear of injury and fear for personal safety.

4.1 Fear of Injury

4.1.1 Space and Fear of Injury

Every participant mentioned fear of getting hurt while cycling, though some discussed how others might experience this fear, rather than discussing their own experiences. When it was discussed, it was usually in relation to being injured by a vehicle. There were clear spatial dimensions to the

fear of being injured while cycling: participants also often associated this type of fear with the built environment. This result was expected because, as noted in the literature review, safety, risk, and danger are often discussed in relation to the built environment (e.g.: Delmelle & Delmelle, 2012; Jensen, 2007; Manton et al., 2016; Parkin et al, 2007; Prati et al., 2018; Reynolds et al., 2009; Teschke et al., 2012; Thomas & DeRobertis, 2013; Winters et al., 2012). Every participant mentioned this cycling-environment linkage citing things like lack of cycling infrastructure, poor connectivity of existing infrastructure, or heavy traffic. Eighteen participants directly stated that places with poor cycling infrastructure made them fearful. For example, Lily shared an experience on a street without a bike path where "*the car just near you and…and it's SO NEAR, it's SO DANGEROUS*" (emphasis original) and Avani expressed how she was at times "*scared because the car is very close to me*" something which didn't happened often, but "*without a bike lane, it happened more frequently*". Though this was a major theme identified in this study, this topic has been covered at great lengths elsewhere (Delmelle & Delmelle, 2012; Jensen, 2007; Manton et al., 2016; Parkin et al, 2007; Prati et al., 2018; Reynolds et al., 2009; Teschke et al., 2012; Thomas & DeRobertis, 2013; Winters et al., 2012). Therefore, this paper will move on to other, less commonly discussed, dimensions of the fear of injury.

Beyond the built environment, respondent thinking about the geography of fear scaled from the local to the global, moving from their present situation to their past. In this way, fear of injury is scalable across space and time. For instance, the suitability and safety of the bicycle infrastructure in Toronto was often compared to what they had experienced in other cities they had lived in. For example, Youssef said he found Toronto very safe for cycling, at least compared to his home city in Egypt where: *"you cannot [bike], you cannot, it's not safe and ah people will just get mad, get mad at you because it's really busy and they are late so they don't need a bike to hold them up"*. Zang, on the other hand, explained how Toronto felt unsafe compared to her experiences living in China. When asked how her first ride in Toronto was, she responded: "*Scared! (laughs) Because in my back home it is different, like the bike lane, it is separate from cars, so that's why it's very different from here."*

4.1.2 Time and Fear of Injury

Participants also identified temporal dimensions of the fear of being injured. Most participants viewed cycling at night as more dangerous than cycling during the day. Night-time was viewed by

twelve participants as more dangerous due to the lack of daylight resulting in lower visibility. Of these participants, eight stated that they felt safe cycling at night as long as they felt visible due to street lighting or their own bicycle lights and/or reflective clothing. Five participants stated that they actually felt safer cycling at night than during the day, even though visibility was worse, because there was less traffic. For four of these five participants, this fear was spatial as well as temporal because they live on busy roads with a heavy concentration of traffic during the day. For example, Paola, who lives at the intersection of two major Toronto streets with four lanes of traffic and no bicycle infrastructure explained how cycling at night was unexpectedly preferable than during the day because "*there is cars, but not too much*".

Looking beyond participants' past and present relationship with place and cycling, another temporal aspect that emerged was evidence suggesting that fear diminished for most participants over the course of the program. During fieldwork, it became apparent that riding a bicycle in traffic requires more skill than knowing how to ride a bike. While all but three interviewees knew how to ride a bicycle before the program started, many indicated that they were not confident cyclists. Observations over the course of the program and participant interviews illustrated how many participants had trouble riding in a straight line, removing one hand from their handlebar to signal (without swerving), or performing shoulder-checks before turning. During the interviews as the program began, many of the participants who expressed a strong fear about riding a bicycle on the road were those who had trouble mastering these skills. These interviews also revealed that this level of comfort on the bicycle was strongly associated with past experience. Those participants who indicated they had accumulated ample experience cycling in their home countries had no problem completing these skills, and little trouble confidently sharing the roads with traffic. For example, Sajit, who commuted almost daily by bike in his home country had little trouble overcoming his fear of riding with traffic in Toronto. He explained that for him it was easy "*'cause I have ridden bicycle for many years, right? Not much of a change*."

Most participants, however, had little previous experience riding a bicycle. For them, riding confidently on the roads was more of a challenge. For example, Rasha said how she joined the program for precisely that reason:

> I know how to ride a bike, but not anything further than that really… and I really want to, like, get really confident enough to be able to ride on the street so that's kinda, like, what I'm afraid of…most

Before joining this program, Rasha had but a few weeks experience riding a bicycle, all of which took place in a parking lot when she learnt to ride at 14 years old. She believed that practice would make her more confident and less fearful: "*the more time I will spend on a bike, the more confident with the bike I'll be*". Her goal was to practice a lot over the summer so that she could "*graduate to the streets*" by the end of the program. Rasha was not alone: many participants knew how to ride bicycles, but had so little experience cycling that they had little confidence to ride in the streets, and this lack in confidence resulted in fear.

While the interviews at the beginning of the program revealed that past cycling experience(s) were positively associated with confidence, which was associated with less fear of cycling on roads, it became clear during the interviews at the end of the program that many participants had overcome their fear of being injured and became more confident by participating in the program. In this way, fear was temporal: it changed over time, through experience. For example, Rasha did end up "*graduating to the streets*" as she had hoped by participating in the program. In fact, fifteen of the thirty participants said that the program gave them the opportunity to practice cycling and instilled a confidence in their abilities, which attenuated their fears of cycling on the roads[1]. For example, Sumaiya said: "*now after this training I got rid of my fear!*" while Michael explained:

"*the program gave me the confidence to go on the road. I knew how to cycle, but I would never go on the roads".*

4.1.3. Gendered Fear of Injury

Fear of injury while cycling also has social dimensions. Participants who had less opportunity to cycle over the course of their lives had not developed their cycling skills as much as those who had many years of practice. While this lack of opportunity was found for both men and women, it was more commonly reported by women in this study: nine of the seventeen women (53%) who participated in this study had no or little past experience cycling before the Bike Host program began compared to four of the thirteen men (31%). Fear of injury can be understood as gendered in spatiotemporal contexts where gender-based discrepancies in access to cycling opportunities exist.

[1] Others may have experienced this, but did not state this is how they felt during the interviews

Young's (2005) theory of feminine bodily comportment is invoked here to understand a component of the gendered fear of being injured while cycling: if men are encouraged to cycle more than women in certain patriarchal societies, and men also start cycling earlier in the life-course than women, then more than women, men are given the opportunity to develop cycling skills which may result, through an uneven accumulation of experience and tacit knowledge, in greater confidence and less fear of being injured.

Take, for example, Aafreen's experience of fear after an accident during the Bike Host program. Unlike her brothers, Aafreen's father never taught her how to ride a bicycle. She explained that this was the case because women are strongly discouraged from cycling in Iran, her home country, through social pressures, and even legal restrictions. Instead, she privately taught herself how to ride on her brother's bike when she was seven. She stopped cycling as she hit puberty because this was a "*sensitive time for my age*". Her riding caused much gossip in her neighbourhood. In her words, she gave up cycling because: "*I didn't like to bother my parents*". She started cycling again at the age of twenty, when she would borrow a household bike after midnight and cycle in a big park near her house. Here, she felt safe riding because her brothers and father could watch from their house and at "*that time the street is empty*".

When Aafreen moved to Canada she joined the Bike Host program. The day Aafreen picked up her bicycle from Bike Host, she had an accident. As she was cycling home, her bicycle wheel got caught in the streetcar tracks on a street and she fell down. She explains how she was in a rush and that she "*didn't know about the …line tracks for the streetcar*". To her, this accident was very serious: "*during that time I ah thought "ok, I am going to die, I am going to die" because it was very ah bad accident, you know?"*. Aafreen remained an active participant in the program after this accident but she did not ride alone: "*Alone. No. Never. Alone, no, that time I was alone, you know?*"

Her husband, Hamid, witnessed this accident as he was following his wife in a car. Unlike Aafreen, Hamid said he was not scared of cycling, or even streetcar tracks, after witnessing the accident. He explained how he knows to cross these tracks "*close to 90 degrees, you know? Not parallel to the track*" (Hamid). Unlike his wife, Hamid started biking as a young child. He explained how as a child he was *"good in bicycling and know[s] how to ah control the bicycle"* because he rode on a regular basis, both recreationally and to travel (notably, his independent trip from home to his grandparents'). His bicycle remained his primary mode of transport throughout

childhood and adulthood, though he relied on it less for travel when he began university and had to resort to public transit to complete his long commute. Hamid explained how his continued confidence to ride after witnessing his wife's accident came from past experience:

> you know, when I was child I fall from the bicycle a lot, I injure my knees, my elbow, you know, lots, so it's usual for me […]. So and I can control the bicycle in any situation, you know? It's not hard for me

Aafreen and Hamid's stories demonstrate how fear of being injured while cycling can be produced socially, in this case this fear was shaped by gendered access to cycling opportunities throughout the life course. By the end of the program, Aafreen was more fearful of cycling than Hamid. Aafreen had so little experience cycling before she joined the program because she was expected to comply to gendered norms of appropriate femininity that she had not had the same opportunities as Hamid to develop bodily cycling skills, to "*control the bicycle in any situation"*. She "*didn't know about the …line tracks for the streetcar*", as Hamid did. She did not have the embodied skills required to cross streetcar tracks "*close to 90 degrees*" to avoid a fall. This resulted in an accident that made Aafreen give up cycling, at least alone, out of fear of injury.

4.2 Fear for Personal Safety

The second most commonly discussed fear during the interviews was a fear for personal safety; a fear of being assaulted, mugged, or attacked while out in the street on a bicycle. There was a clear gendered component to this fear. Not only did more women (n= 11 of 17) than men (n = 5 of 13) mention this type of fear, only two of the five men who discussed this fear reported that they felt personally vulnerable. The other three discussed how others might feel vulnerable on a bicycle, though they themselves did not. The women in the study who discussed this fear felt personally vulnerable. For instance, Cindy said how she sometimes "*worr[ies] about some bad men hide somewhere"* when cycling.

While fear of assault or attack in urban spaces is rarely discussed in the cycling literature, a large body of literature on the gendered urban geographies of fear exists (Bondi & Rose, 2003; Dunckel Graglia, 2016; Loukaitou-Sideris & Fink, 2009; Valentine, 1989). Rather than solely focus on the actual source of danger, "dangerous people", women are said to fear "dangerous places" (Valentine, 1989). Valentine (1989) argued that the tendency for women to be blamed for

being attacked encourages women to transfer threats from the actual source of danger (people, usually men) to the places of danger. Time is also influential in the production of this fear. There are "dangerous places" and "dangerous times" - some places are only dangerous at certain times (Dunckel Graglia, 2016). Participants also expressed these spatial and temporal dimensions of fear while cycling. Many participants stated that they felt safer during the day than at night. For example, Ariana explained: *"I think it is the day, the daytime, it is for women to ride bicycles is safe…in the ah night, maybe after 11 o'clock, not safe"*. Furthermore, some participants expressed how they felt safe in parts of the city, but not others. For example, Hassan said of Toronto: *"it's safe, but it's not safe".* When asked what he meant by that, he explained how he thought that small roads were not safe at night because his roommate had been mugged while cycling on small roads at night. There were not only "dangerous places", but also "safe places". For instance, Emily explained how she was not scared of biking home at night because every time she did, she *"did enough homework. To see how to get there, what's the neighborhood"*.

Furthermore, beyond being more fearful at night, participants' fear also diminished over the course of the program. In fact, seven women and three men shared how they felt safer cycling than walking or taking transit because they could get away faster on two wheels than by foot. For example, Kate said: "*It's easier for the bad people to attack you when you're walking I think … because you can run away on your bike faster*". Most came to this realization over the course of the program, as they tried cycling in the city. These results show the importance of moving away from thinking about gender and fear in a spatially fixed manner, to understanding gendered fear of cycling as produced while on the move, within a mobile space, as a fear that is changing as one travels along their route and as one gains experience cycling.

The literature on gendered urban geographies of fear has identified how women's fear of urban public places is inconsistent with the reality of danger. For one, women tend to be fearful of male strangers in public spaces when statistics demonstrate that violence against women is more common within domestic spaces and perpetrated by men known to the assailed (Bondi & Rose, 2003; Dunckel Graglia, 2016; Valentine, 1989). Valentine (1989) argues that women experience this spatial paradox, in part, due to their limited control over whom they interact with in these spaces. Being catcalled, stared at, and groped in public spaces affects your perception of safety in public spaces (Bondi & Rose, 2003). In the interviews, three of the women who shared this fear specifically mentioned experiences being cat-called in Toronto as a source of this fear. Avani

explained how her experiences being cat-called make her feel unsafe: *"I was commented on here […] which is scary, you know"*.

The literature also highlights how those with the highest levels of fear (typically older women) experience a lower risk of danger in public spaces than many others (notably racialized men) (Bondi & Rose, 2003). In this study some participants mentioned their fear of getting in trouble with law enforcement while cycling in the public realm, and two participants described how their immigrant "status" heightened this fear. Michael explained this relationship between fear and being a newcomer by saying:

> I'm new in this place. I've spent so much to get here. I'm trying to make a new life here. I don't – The last thing I want is anything that will make me on the wrong side of the law. So, if it's a bicycle that's gonna' do that, I'd rather not cycle.

Michael's fear of law enforcement in public spaces, a fear that has social dimensions as it is shaped by his newcomer status, demonstrates how urban geographies of fear are not exclusively associated with women. There is, however, a prevailing narrative that women are not safe alone in public. This narrative existed amongst some interviewees. For instance, Jessica who did not feel safe cycling alone at night contributed to this discourse, she said "*Every day I tell my daughter … "careful! Safety"*. It is important to note that this fear is a symptom of a larger system of gender inequality, a "spatial expression of patriarchy" (Valentine, 1989, p. 389), and that this constrained mobility due to fear is closely tied to gender norms which dictate women's role in society as an immobile mother /daughter /caretaker whose duties are limited to the home (Dunckle Graglia, 2016).

5. Discussion and Conclusion

While objective and perceived risk, danger, and/or safety concerns are consistently identified as a barrier to cycling, little research examines fear, the emotion, while cycling. This paper focused on the dynamic nature of fear, its multiplicity, and some of its spatial, temporal, and social dimensions. While the cycling literature has identified and explored one spatial dimension of fear of injury while cycling at length, i.e. the built environment, this paper highlights other spatial dimensions of fear. For instance, many participants experienced and engaged with the city street relationally when it came to cycling, by understanding their fear of injury in Toronto in relation to past experiences in other places in other cities. Also, different bodies engaged with the same streets

differently: for some the street was constructed as a place they could get in trouble with law enforcement, for others it was a place where they could be assaulted.

This paper also showed a discrepancy between being able to ride a bike and feeling confident enough to ride in traffic without fear. This finding is consistent with the concept of self-efficacy in the physical activity literature, which concerns one's belief in their abilities to successfully complete a task (Mcauley & Blissmer, 2000). One's sense of self-efficacy is shaped by past accomplishments, social modeling, persuasion, and physiological arousal (Mcauley & Blissmer, 2000). Participants who had accumulated more experience cycling throughout their life-course (more often male in this case) made statements aligned with a greater sense of self-efficacy, i.e. the belief that they would be able to successfully cycle in Toronto, and expressed less fear. By gaining experience cycling, participant's self-efficacy increased. This result highlights how cycling mentorship programs such as Bike Host can perhaps diminish the fear of being injured that many new cyclists face by instilling confidence in new cyclists, especially those with limited past experience.

There were also social components to the fear of being injured while cycling. Notably, many women reported having limited opportunities to cycle throughout their lives, an experience that resulted in less developed cycling skills, lower confidence, and greater fear of injury. While some men had similar experiences, it was more common for women to have been discouraged from cycling or in some cases entirely restricted from the practice. Previous work has established that boys cycle more than girls as children in many countries with low cycling rates, including Canada (McDonald, 2012). In cycling research, women have been found to cycle less than men in cities with low cycling rates. One of the main explanatory hypotheses is that women are more concerned about safety than men (Buehler & Dill, 2016; Delmelle & Delmelle, 2012; Heinen et al., 2010; Ravensbergen et al., 2019). In many of these studies, women are reduced to simply being labelled as the more "risk-averse" type of cyclist – with less attention given to how perceived risk is possibly socially constructed (Ravensbergen et al., 2019). The upshot of that work seems to be, (a) the labelling of women as risk averse, resulting in (b) the need to produce better infrastructure to alleviate such concerns with the goal of reducing the gender-gap in cycling and increasing ridership overall. By framing gendered concerns over safety using Young's (2005) theories of embodiment, this paper offers a different interpretation: one that understands gendered experiences of fear as socially constructed and rooted in patriarchal power relations replete with restrictive

spatial and temporal practices. This finding builds on previous work that discusses cycling skill (Handy, Xing & Buehler, 2010), how cycling confidence can grow through experience (Gatersleben & Appleton, 2007), and how access to skill development activities can be shaped by gender (Mosquera et al., 2012). Furthermore, this finding points to the possibility that the intervention needed to reduce the gender-gap in cycling should go beyond the provision of infrastructure, by also focusing on the ways in which the bodies, behaviours, and actions of women are affected by patriarchy and power, limiting exposure to opportunities for active transport in the first place.

Besides contributing to the literature that examines cycling fear(s) in relation to injury, this paper also contributes to the limited literature that examines cycling fear(s) in relation to personal safety, a fear that emerges as spatial (varies across the city), temporal (night or day, diminishes over time/through experience), and social (shaped by gender). This study found that this fear for personal safety attenuated as participants began cycling and realized they felt safer on two wheels than on foot or public transit. This indicates that this fear may be an initial barrier to cycling, one that may be overcome through an accumulation of cycling experience(s). It is important to note that most participants in this study did not have access to a car. Therefore, this fear may be experienced differently for those transferring from car to bike travel rather than from travel by foot or transit to bicycle travel. The ways in which stories about women's safety are maintained and taught across generations, such as Jessica's warning to her daughter about being unsafe alone in public at night, could be the focus of future research. Further, fear of safety in relation to law enforcement, a fear expressed by some participants in this study, deserves further attention in transportation research. Finally, all participants were recent immigrants or refugees. As such, future work could expand upon this work by examining the dimensions of fear of cycling amongst the general population.

Cycling, of course, elicits more emotions than fear. It is also associated with positive emotions such as excitement, freedom, and joy (Byrne, 2009; McIlvenny, 2012). For instance, one participant felt so elated her first day cycling she said she was "*on the sky that day"* (Prisha) while another shared: "*I feel liberated when I am on the bike, you know?"* (Avani). In fact, research on travel behaviour and well-being has found that active modes such as walking and cycling are associated with more positive emotions and contribute to higher levels of travel satisfaction than motorized modes (Morris & Guerra, 2015; Wild & Woodward, 2019). Cycling, in particular, has

been found to contribute to a happier mood than other modes as well (Morris & Guerra, 2015; Wild & Woodward, 2019). While fear of cycling was the focus of this paper, we do not mean to reinforce cycling's image as "scary" and "dangerous". In fact, is it our hope future work examines the geographies of joy, and other positive emotions, while cycling, emotions less commonly studied than fear, safety, risk, or danger (Wild & Woodward, 2019).

References

Aldred, R. (2016). Cycling Near Misses: The Frequency, Impact, and Prevention. *Transportation Research Part A*, 90, 69-83.

Aldred, R. & Crosweller, S. (2015). Investigating the Rates and Impacts of Near Misses and Related Incidents Among UK Cyclists. *Journal of Transport & Health*, 2, 379-393.

Andersen, L., Schnor, P., Schroll, M., Hein, H. (2000). All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. *Arch. Intern. Med*. 160, 1621–1628

Beck L.F., Dellinger, A.M., O'Neil, M.E. (2007). Motor vehicle crash injury rates by mode of travel, United States: Using exposure-based methods to quantify differences. *Am J Epidemiol*, 166(2):212-18.

Bondi, L., & Rose, D. (2003). Constructing gender, constructing the urban: A review of anglo-american feminist urban geography. *Gender, Place & Culture, 10*(3), 229-245. doi:10.1080/0966369032000114000.

Brown, C. T. (2016). Fear: A Silent Barrier to Bicycling in Black and Hispanic Communities. *Institute of Transport Engineers Journal*.

Buehler, R., Dill, J. (2016). Bikeway Networks: A Review of Effects on Cycling. *Transport Reviews*, 36(1), 9-27.

Buehler, R., Pucher, J. (2012). Cycling to Work in 90 Large American Cities: New Evidence on the Role of Bike Paths and Lanes, *Transportation*, 39 (2), 409-432.

Byrne, D. (2009). *Bicycle Diaries*. Penguin Books Ltd. London: England.

Cope., M. (2016). *Organizing and Analyzing Qualitative Data*. Chapter 18 in Hay, I. (ed.) Qualitative Research Methods in Human Geography (pp. 373-393). Oxford University Press. Don Mills: Canada.

Davidson, J., Bondi, M., Smith, L. (2005). *Emotional Geographies*. Cornwall, U.K.: Ashgate Publishing Company.

Delmelle, E. M. & Delmelle, E. C. (2012). Exploring spatio-temporal commuting patterns in a university environment. *Transport Policy*, 21, 1-9.

Dill, J., 2009. Bicycling for transportation and health: the role of infrastructure. *J. Public Health Policy*, 30, S95–S110.

Dill, J., Carr, T. (2007). Bicycle Commuting and Facilities in Major U.S Cities: If You Build them, Commuters Will Use Them. *Transportation Research Record,* 1828(1), 116-123

Dill, J., Voros, K., 2007. Factors affecting bicycling demand: initial survey findings from the Portland, Oregon, region. *Transport. Res. Rec*. 9–17.

Dunckel Graglia, A. (2016). Finding mobility: Women negotiating fear and violence in mexico City's public transit system. *Gender, Place & Culture, 23*(5), 624-640.

Forsyth, A. and Krizek, K. (2010). Promoting Walking and Bicycling: Assessing the Evidence to Assist Planners. *Built Environment*, 36(4), 429-446.

Gatersleben, B., & Appleton, K. M. (2007). Contemplating cycling to work: Attitudes and perceptions in different stages of change. *Transportation Research Part A: Policy and Practice*, 41(4), 302–312. doi:10.1016/j.tra.2006.09.002

Handy, S., Xing, Y., Buehler, T. (2010). Factors Associated with Bicycle Ownership and Use: A Study of Six Small U.S. Cities. *Transportation*, 37, 967-985.

Heinen, E., vanWee, B., & Maat, K. (2010). Commuting by bicycle: An overview of the literature. *Transport Reviews*, 30(1), 59–96. doi:10.1080/01441640903187001

Horton, D. (2007) Fear of Cycling. Horton, D., Rosen, P., Cox, P. (Eds.). *Cycling and Society* (p.133-152). Aldershot, England: Ashgate.

Jacobsen, P. (2003). Safety in numbers: More walkers and bicyclists, safer walking and bicycling. *Injury prevention*, 9(3): 205-209

Jacobsen, P.L. Racioppi, F., Rutter, H. (2009). Who Owns the Roads? How Motorized Traffic Discourages Walking and Bicycling. *Injury Prevention*, 15(6), 369-373.

Jensen, S. U. (2007). Pedestrian and Bicyclist Level of Service on Roadway Segments. *Transportation Research Record: Journal of the Transportation Research Board*, No. 2031, 43–51

Loukaitou-Sideris, A., and Fink, C. (2009). Addressing women's fear of victimization in transportation environments: A survey of US transit agencies. *Urban Affairs Review,* 44(4), 554–87.

Mcauley, E., Blissmer, B. (2000). Self-Efficacy Determinants and Consequences of physical Activity. *Exercise and Sport Sciences Reviews*, 85-88.

McDonald, N.C. (2012). Children and Cycling. In Pucher, J., & Buehler, R. (Eds.), *City Cycling* (235-255). Cambridge, MA: MIT Pres.

McIlvenny, P. (2015). The joy of biking together: Sharing everyday experiences of vélomobility. *Mobilities*, 10(1), 55-82. doi:10.1080/17450101.2013.844950

Morris, E. & Guerra, E. (2015). Mood and mode: does how we travel affect how we feel? *Transportation*, 42: 25–43 DOI 10.1007/s11116-014-9521-x

Mosquera, J., Parra, D.C., Gomez, L.F., Sarmiento, O., Schmid, T., Jacoby, E. (2012). An Inside Look at Active Transportation in Bogotá: A Qualitative Study. *Journal of Physical Activity and Health*, 9, 776-785.

Nelson, T., Denouden, T., Jestico, B., Labaree, K., Winters, M. (2015). BikeMaps.org: a global tool for collision and near miss mapping. *Frontiers in Public Health*, 3(53), 1-8.

Parker, K.M., Gustat, J., Rice, J.C. (2011). Installation of Bicycle Lanes and Increased Ridership in an Urban, Mixed-Income Setting in New Orleans, Louisiana. *Journal of Physical Activity and Health*, 8(1), S98-S102

Parkin, J., Ryley, T., Jones, T. (2007). *Barriers to Cycling: An Exploration of Quantitative Analyses.* Chapter 3 in Cycling and Society, Eds Horton, D., Rosen, P. and Cox, P, 67-82.

Prati, G., Puchades, V.M., DeAngelis, M., Fraboni, F., Petrantoni, L. (2019). Factors contributing to bicycle–motorised vehicle collisions: a systematic literature review. *Transport Reviews*, 38:2, 184-208, DOI: 10.1080/01441647.2017.1314391

Pucher, J., Dill, J., Handy, S. (2010). Infrastructure, Programs, and Policies to Increase Bicycling: An International Review. *Preventative Medicine*, 50, S106-S125.

Ravensbergen, L., Buliung, R., Laliberte, N. (2019) Toward Feminist Geographies of Cycling. *Geography Compass*, 1-24.

Reynolds, C., Harris, M.A., Teschke, K., Cripton, P.A., Winters, M. (2009). The impact of transportation infrastructure on bicycling injuries and crashes: a review of the literature. *Environmental Health*, 8(47). d oi:10.1186/1476-069X-8-47

Sanders, R. L. (2015). Perceived traffic risk for cyclists: The impact of near miss and collision Experiences. *Accident Analysis and Prevention*, 75, 26-34.

Teschke, K., Harris, M., Reynolds, C., Winters, M., Babul, S., Chipman, M., et al. (2012) Route infrastructure and the risk of injuries to bicyclists – a case-crossover study. *American Journal of Public Health*, 102(12), 2336-2343.

Thomas, B., DeRobertis, M. (2013). The safety of urban cycle tracks: A review of the literature. *Accident Analysis and Prevention*, 52, 219-227.

Valentine, G. 1989. The geography of women's fear. *Area* 21, 4, 385–90.

Wild, K., Woodward, A. (2019) Why are Cyclists the Happiest Commuters? Health, Pleasure and the e-bike. *Journal of Transport & Health*, 14, Article 100569. https://doi.org/10.1016/j.jth.2019.05.008

Winters, M., Davidson, G., et al., (2011). Motivators and deterrents of bicycling: comparing influences on decisions to ride. *Transportation*, 1–16.

Winters, M., Babul, S., Becker, J., Brubacher, J. R., Chipman, M., Cripton, P., Cusimano, M.D., Friedman, S. M., Harris, A., Hunte, G., Monro, M., Reynolds, C.C.O., Shen, H., Teschke, K. (2012). Safe Cycling: How Do Risk Perceptions Compare With Observed Risk? *Canadian Journal of Public Health*, 103(3), S42-S47.

Young, I., M. (2005). Chapter 2: Throwing Like a Girl: A Phenomenology of Feminine Body Comportment, Motility, and Spatiality. In *On Female Body Experience: Throwing Like a Girl and Other Essays*. New-York, NY: Oxford University Press.