Gender, Safety and Cycling: gendered perceptions of cycle safety in Ōtautahi, Aotearoa (Christchurch, New Zealand).

"Are there gendered differences in the needs of cyclists to feel safe on Christchurch roads?"

Authors:

Ambika Malik*, Jessica Weston*, Kathleen Wong*, Lily McSweeney*

GEOG402
Department of Geography, College of Science, University of Canterbury - Te Whare Wananga O Waitaha, Ōtautahi, Aotearoa

Supervisors:

Dr. Rita Dionsito & Prof. Eric Pawson

Stakeholder:

Anne Heins on behalf of the Christchurch City Council

*Ambika, *Jessica, *Kathleen and *Lily (in alphabetic order) have equally contributed to the paper.

Contents

Abstract

This research aims to cultivate discussion around the ways in which people of different genders perceive safety when cycling in Ōtautahi (Christchurch) and experience the environment. The objectives of this research are to (1) collect data on different gendered behaviours surrounding cycling in Ōtautahi; (2) establish whether people of different genders perceive their safety differently when cycling; (3) assess what infrastructure may be needed for everyone to feel safer when cycling in Ōtautahi; and (4) distinguish what safety barriers inhibit people from cycling. Ōtautahi served as the study site. Data was collected and analysed from a survey and focus groups. This data was then used to create a heat map to visualize areas where people felt safe or unsafe cycling, and a word cloud to reveal the common themes in responses. The results indicated that females felt more unsafe when cycling due to the behaviours associated with cycling rather than cycling infrastructure. Therefore, infrastructure does not seem to impact how safety is perceived between people of different genders in this research, concluding that the social factors associated with cycling may have a greater impact to the way genders interact with public space. To conclude, we recommend that steps are taken to improve acknowledgment of cyclists as legitimate road users.

Keywords

Good abstract: very clear!

Participatory Stakeholder

The research was conducted with the support of Anne Heines, a member of the department of transport planning at the CCC. She advised which areas to focus on and which transport related issues would be of interest to research. The CCC is invested in creating a cycling network which is safe for every user. Therefore, the differences in gendered perceptions of safety is important for the CCC to consider. During the research period Anne Heines was the primary contact and reviewed the survey to ensure the questions were of topic and would result in answers for the gap in knowledge.

Introduction

Cycling in 2019 is largely used for two things, commuting and recreation. The percentage of people who use bikes for either use differs from country to country (Taylor, 2009). In the Netherlands, cycling is a major form of utilitarian transport, with cycling making up 26% of all trips (Pucher & Buchler, 2012). In New Zealand, that figure is only 1.3% (NZ Cycling Safety Summit, 2016). New Zealand, while low on utilitarian cycling, has a much higher percentage of people who cycle for recreation. A third of all New Zealanders cycle at least once a year, and 65% of all bicycle trips are for social or recreational purposes (Koorey & Teather, 2016). This forms a large group of people who can cycle in a utilitarian way but are not. Very interesting!

In this paper, we will look at Ōtautahi (Christchurch) in the South Island of New Zealand, which has roughly 400,000 residents and the largest urban surface area in New Zealand. Ōtautahi has more people cycling than any other city in New Zealand, with more than double the number of kilometres cycled per person than any other urban area in New Zealand (Koorey & Teather, 2016). The flat topography makes Ōtautahi a city that is prime for cycling, something that the Christchurch City Council (CCC) has taken advantage of with a range of highly developed cycle routes that run through and around the city. These routes vary from cycleways, shared pathways and cycle lanes. As explored later in this paper, one of the major barriers for people to take up cycling is the risk of safety??, something that the CCC is addressing through the creation of an integrated and connected cycling network (CCC, 2019). This network must work for all people on bikes who use it. Thus, this paper examines the differences in gendered experiences and requirements for the safest cycling network possible. With these concepts in mind, our research question for this paper is "Are there gendered differences in the needs of cyclists to feel safe on Ōtautahi roads?"

Key definitions

Gender is an important consideration in how people approach, experience and interact with the environment. Firstly, it is important to clarify what is meant by 'gender' for this research. The definition of gender is more than the biological sex one is born with – it is whom one believes themselves to be based on how much they align, or don't, with what is understood to be the options for gender (Killermann, 2019). Statistics New Zealand (2013) recognises the gender identity categories of male, female, and gender diverse (including but not exclusively transgender, non-binary and gender fluid people). For consistency throughout our study, we have included these same categories.   good

This research investigates risk perception across different gender identities. Risk perception is defined as an intuitive judgment as opposed to a technical assessment about risk (Gore and Kahler, 2012). It is about how an individual interprets their exposure to danger while cycling. Furthermore, discovering differences amongst risk perceptions across genders helps identify vulnerabilities on the road. There are two main

types of safety which need to be addressed by the infrastructure in Ōtautahi, the actual safety of cyclists and the perceived safety of cyclists. Actual safety is the risk which is faced by a person when they are cycling using one of the infrastructures and is usually based upon the interactions with other road and path users. Perceived safety is how safe people feel when using the infrastructure, and this can greatly impact their behaviours (Parkin, 2007). Perceptions are unique to each person and are defined by many factors such as their age, socioeconomic class, and their gender (Taylor, 2009). The difference in risk perception and perceived safety is significant, with women often being found as significantly more risk adverse than men (Frater & Kingham, 2018).

The majority of infrastructure across Ōtautahi includes cycleways, shared pathways and cycle lanes. These three different modes of infrastructure for cyclists all have different meanings. A cycleway is characterized by its separation from the road (Christchurch City Council [CCC], 2019). Shared pathways are also separated from the roadway (CCC, 2019). However, they share the path/usage? with pedestrians. Cycle lanes, on the other hand, are painted on the roadway (CCC, 2019). Each of these infrastructure types have varying levels of both actual and perceived safety. The Cycling Network Guidance of New Zealand suggests that new roads with cycling infrastructure have separated cycle lanes, and low volume neighbourhood streets have shared spaces or use "invisible cycle lanes" to encourage cycling on the road through traffic calming methods such as chicanes (NZTA, n.d.).

Barriers to cycling

Although cycling is positive for the environment, overall well-being and health, and economically, there are many barriers to getting a person riding their bike. Most barriers vary person-by-person. However, there are many consistent categories which many non-cyclists cite. These include: the distance to travel, expected dress, weather, fitness levels, road safety, and need for a car for errands (Taylor, 2009). While some of these such as weather or distance, cannot be accounted for in policy, there are many which could be. The most commonly expressed concern about cycling is safety (Taylor, 2009). Many local councils in New Zealand are attempting to address safety concerns by implementing cycling infrastructure throughout their cities. Furthermore, there are many ways in which people are encouraged to improve their personal safety, such as through their clothes when cycling. Aldred and Woodcock (2015) explore themes of safety perceptions through clothing in their paper "Reframing safety: An analysis of perceptions of cycle safety clothing". Their study recommended that policymakers carefully consider ways in which promoting safe clothing options may impact the uptake of cycling. To normalise cycling, the literature suggests that the promotion of cycle safe clothing is a barrier, and that normal clothing should be encouraged, proposing that alternative safety strategies work best. Schleinitz, Petzold, and Gehlert's 2018 study "Risk compensation? The relationship between helmet use and cycling speed under naturalistic studies" also explores the themes of safety surrounding helmet usage. Their study looks at the assumptions that people are more likely to cycle with higher speeds and erratic behaviours if they are wearing a helmet. The results of this study showed this hypothesis was incorrect. The speed and behaviours of cyclists are impacted more by the length of a cycle trip, age of a cyclist and the type of bike used (Schleinitz, Petzoldt, Gehlert, 2018). Geographic location is important when reviewing literature of this kind. In Aotearoa it is a legal requirement to wear a helmet which makes it unique when looking at what safety measures can be used, outside of the usual items of high visibility and helmets. Thus, it is important to understand what the barriers to cycling in Aotearoa are, and understand the dynamics of the vulnerability.

Gendered experiences of cycling have been explored in Christchurch reasonably extensively, often exploring the barriers and motivators women have to cycle. It was found that school aged girls are far less likely to cycle to school than boys in the same class, and their decision not to cycle is impacted more by social implications than boys (Frater & Kingham, 2018). Girls held concerns about being social, their image of being feminine, confidence on a bike, and exercise (Frater & Kingham, 2018). Some of these attributes can be a result of parental views of a girls risk assessment ability, viewing them as more vulnerable than a boy. These concerns often play into their adulthood and is compounded by females being typically more risk adverse than men (Frater & Kingham, 2018; NZTA, 2011). Adult women cite some similar barriers to young girls, such as image and cycling ability, as well as not being confident with the maintenance of a bike (Beecham & Wood, 2013).

Benefits to cycling

There are many benefits to cycling. This includes environmental, physical and economical. Cycling is a form of resilient transport as, at the time of use, it does not produce any pollutants (Puncher & Buehler, 2017). To limit global warming to 1.5° C above pre-industrial levels, carbon-free modes of transport are needed, and cycling is one of them (Masson-Delmotte et al., 2018). Furthermore, cycling is a form of physical activity which is positive for the overall health and wellbeing of an individual (Tight, 2015). Regular physical activity can lower the risk of many diseases such as diabetes, obesity and coronary disease. Moreover, the health benefits from walking have a flow-on effect of reducing costs associated with health such as doctor visits (Tight, 2015).

Since the mid-20th century, there has been an observed global temperature warming. Global warming, caused predominantly by human influence, has led to climate change. Fossil-fuel consumption, specifically greenhouse gases (GHGs), is a significant contributor to climate change. The increase in droughts, floods, and other extreme weather events; sea-level rise and biodiversity loss are all threats of climate change (Masson-Delmotte et al., 2018). In order to limit the severity of the danger of climate change, the Intergovernmental Panel on Climate Change (IPCC) argues that global warming needs to be limited to a 1.5° C warming above pre-industrial levels (Masson-Delmotte et al., 2018). However, in order to do this, significant changes need to be made to the way humans consume energy. Transport is a major sector that needs to be considered in the discussion about climate change as energy is the largest contributor to gross global greenhouse gas emissions. Within the energy sector, electricity releases the most GHGs, followed closely by transportation (see Figure 1) (Statistics New Zealand, 2013). For this reason, it is important to consider sustainable forms of transport in the context of climate change.

Figure 1 : Showing the sectors greenhouse gas emissions, 2013, Statistics New Zealand.
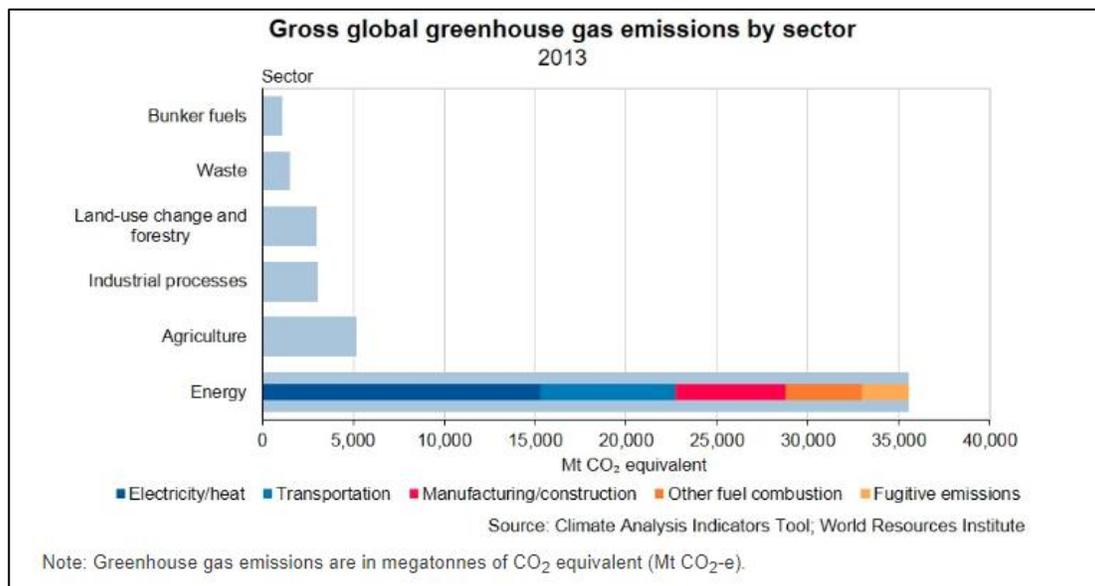
Material and Methods

Survey and Focus Groups

The methods that were conducted for the data collection in this report were through focus groups and a survey. These methods were based on a framework created by Iain Hay (2016). A survey was designed on Maptionnaire with questions which allowed for quantitative and qualitative answers (see appendix 1). The topics asked about in the survey included feelings of safety in Ōtautahi; aspects which impacted willingness to cycle in Christchurch; how safe they feel when cycling in different areas; and their feelings of safety with different common cycling infrastructure. Development of the survey was done with careful consideration of the aims and purpose in mind, which helped gain substantial responses.

Iain Hay (2016), writes about the importance of participation selection of focus group members and stresses that the precision of the selection can impact the outcome of the results. The style of this reasearch is purposive sampling. Thus, the focus group participants were drawn out of the survey, as respondents of the survey were able to leave their email address stating that they were willing to be a part of a focus group. Potential focus group participants were then contacted, female, male and gender diverse were corresponded with separately. The first people to respond to the email chain were selected to be a part of the focus groups. Two focus groups were conducted on the 11th day of May 2019; they consisted of one focus group with female and gender diverse and one focus group with male and gender diverse. The participant pool was split into genders as this was expected to? brought a stronger understanding of the differences between gender perceptions on cycle safety. The focus groups that were held were small, consisting of two people in each group.

Ethics

Ethics was granted through derived ethics through our course, and as such, the research was undertaken with the consultation of the supervisors; who reviewed the survey before it was deployed. An in-depth outline of the project and its aims were discussed with the supervisors and stakeholder. An ethical

disclaimer was posted at the beginning of the survey, with a contact provided. Participants of focus groups were given consent forms in line with the human ethics template and requirements, and signed consent was provided to researchers.

Data Collection

The survey was available from the 22nd of April till the 6th of May, and due to the short time of the data collection, the survey was specifically sent to targeted groups. Although available for anyone, it was aimed at groups on social media. The outreach was on specific neighbourhood community groups, cycle groups, university and office notice boards. Specifically, the survey was distributed to relatives who distributed the survey to their workmates/people they knew who also cycled and advertised on various Facebook groups; groups were: Women in Urbanism, the UCSA Noticeboard, the UC PGSA Noticeboard, Cyclists in NZ1, Beckenham Community, St. Martins Community, Riccarton Neighbourhood Updates, and Avonhead/Russley Community Page.

Data Analysis

The quantitative data from the survey was analysed using Microsoft Excel software. The qualitative comments from the survey were put through a thematic analysis where themes were then compared with the results of the survey. The qualitative data from focus groups was transcribed and used as supporting evidence for both the qualitative and quantitative results of the survey.

Results

Survey

A total of 209 people completed the survey in the two weeks which it was open. 69% of respondents were female, 30% were male, and 1% were Gender Diverse. 90% of respondents were bike riders, while 10% were not. Of those who cycled, the majority used it for utilitarian transport – accounting for 51% of uses. Leisure (24%) and exercise (23%) made up the rest of uses. Most people did, however, use their bike for more than one use. Those who identified as "Gender Diverse" have been removed from the following graphs and tables, due to the sample being so small ~~it presents confusing and inflated results~~. As the main focus of this report is to explore the gendered differences of safety in cycling, the rest of the result section will be broken into Male and Female results, unless otherwise stated. For ~~ease of~~ readability, we have colored the genders differently to aid in avoiding confusion.

Most people who cycle have felt unsafe while cycling in Christchurch at some point – 78% of all respondents. However, the percentage of women who have felt unsafe is 14% points higher than males, as seen in Figure 2. Based on the comments of respondents on feelings of unsafety, there are some common reasons why people feel unsafe. The major themes of these responses are broken down in Figure 3 and 4. Women focused a lot on motor vehicles (Cars, Drivers, Cyclists) and had a strong emphasis on cars driving close by, and being seen by the car drivers. Men also focused on Cars and Drivers. However, they also felt unsafe when the normal state of a road changed due to roadworks.
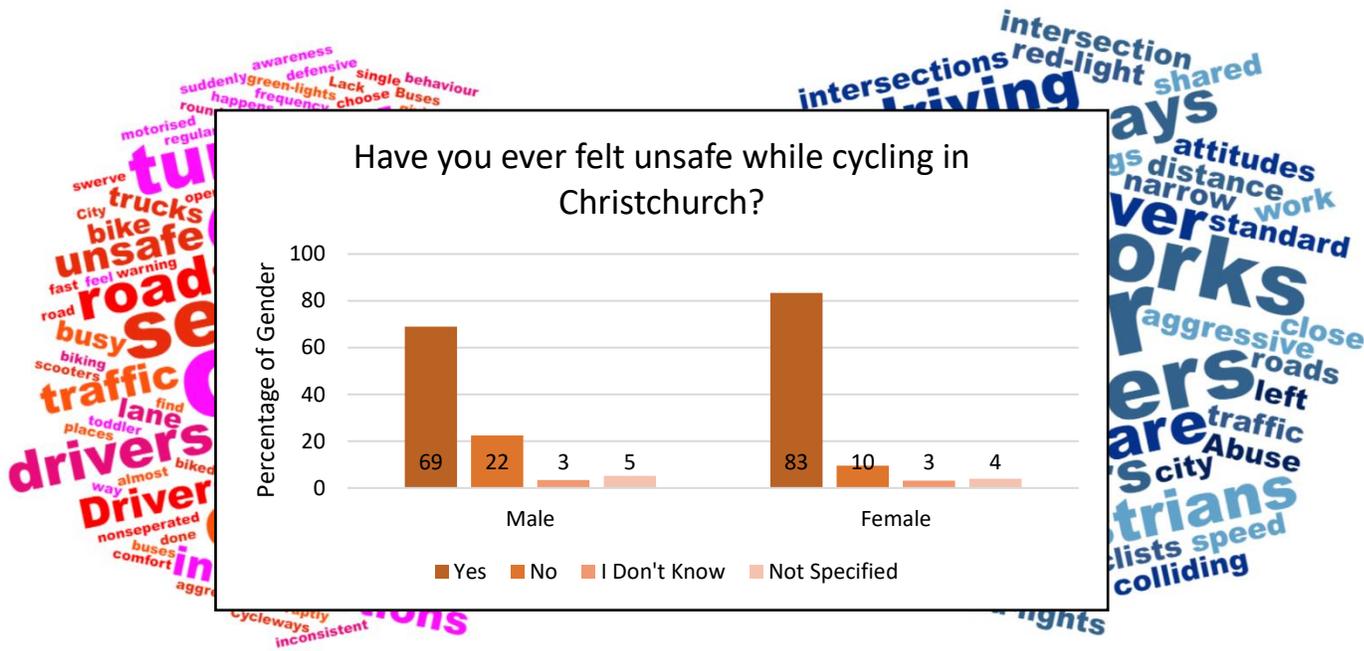
Figure 2: A graph showing survey participant response to the question "Have you ever felt unsafe when cycling in Christchurch"

Figure 3: (Left) A World cloud of common themes stated by Women in the survey when asked "What are some reasons you feel unsafe when Cycling"

Figure 4: (Right) A World cloud of common themes stated by Women in the survey when asked "What are some reasons you feel unsafe when Cycling"

Both cyclists and non-cyclists were asked about aspects of safety which reduce their willingness to cycle. The negative impact of bike confidence on willingness to cycle was low for those who currently cycle, with 86% of men and 59% of women either strongly disagreeing or disagreeing. However, in those who do not cycle, this jumps to 66% of men and 67% of women. The quality of infrastructure impacts those who cycle – 50% of men and 55% of women agree that it negatively impacts their willingness to cycle. Of those who don't cycle, this increases to 66% of men and 87% of women. It was made available for people to give comments on other safety aspects which make them unwilling to cycle. Common themes were:

- Having somewhere safe to park their bike
- Time of the day
- Distance
- Cars and Car drivers
- Cyclist behaviours

Those who do cycle were also asked about common cycle infrastructures and their features, and how they see them as improving/affecting? their safety. As these are commonly used cycle infrastructures, the responses were almost always in agreement that they aid in improving safety, <mark>however looking at the differences in the genders distributions between strongly agree and agree is useful</mark>.?? Cyclists were asked about two different kinds of separated cycleways – one which is separated from motor vehicles (but not from pedestrians) and one that is separated from both pedestrians and motor vehicles. Men and women were both roughly equal in considering separation from pedestrians and motor vehicles in terms of agree/strongly agree. However, females had a much higher strongly agree (67%) than males (49%).

Lighting is known to be an important factor of safety when cycling at night time. 100% of men and 98% of men either agreed or strongly agreed that it was important to improve safety. However, 71% of women strongly agreed, compared to 59% of men. For wider cycleways improving safety, 94% of men and 95% of females agreed, with 61% of females strongly agreeing, and 41% of males strongly agreeing. Well, Connected?? cycleways are seen to be incredibly important for a cyclist to feel safe – with 98% of responses in agreement. However, those that strongly agreed were 53% of men and 78% of women. Having adequate signage also shows a large disparity – with 78% of men thinking it helps, compared to 91% of women. 64% of women strongly agreed, compared to 35% of men.

When looking at the results of how people feel when cycling in parks and roads during the day and the night time, it becomes clear that there are some stark differences where men and women feel comfortable and when. Almost everyone feels safe cycling through parks during the day, with 100% of men and 96% of women saying they either feel very safe or safe. During the night, however, 65% of women feel either unsafe or very unsafe – higher than 29% of men. When cycling on main roads during the day, men feel much safer than women – with 64% of men feeling safe or very safe, compared to 38% of women. At night time on main roads, most people feel unsafe regardless of their gender, with 67% of men and 70% of women saying they feel either unsafe or very unsafe. Very interesting

Table 1: Shows the percentage answers to survey questions about Cyclist safety in Christchurch.

*All percentages in the table are non-inclusive of non-response.

Cyclists

	Male					Female				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Aspects which reduce willingness to cycle										
Not being confident on a bike reduces willingness to cycle	65%	21%	4%	8%	2%	46%	23%	5%	21%	4%
Quality of cycle infrastructure reduces willingness to cycle	20%	28%	2%	46%	4%	18%	19%	3%	38%	21%
Infrastructures increasing cyclist safety										
Cycleways seperated from car increase cyclist safety	0%	2%	0	49%	49%	0%	0%	0%	33%	67%
Cycleways seperated from cars and pedestrians increase cyclist safety	0%	0%	2%	55%	43%	1%	3%	1%	42%	53%
Good lighting increases cyclist safety	0%	0%	0%	41%	59%	0%	3%	1%	24%	71%
Well Connected cycleways increase cyclist safety	2%	0%	0%	45%	53%	0%	1%	1%	20%	78%
Wide Cycleways increase cyclist safety	2%	4%	0%	52%	41%	0%	5%	0%	34%	61%
Good Signage increases cyclist safety	5%	11%	5%	43%	35%	1%	7%	1%	27%	64%

	Male					Female				
	Very Unsafe	Unsafe	Neutral	Safe	Very Safe	Very Unsafe	Unsafe	Neutral	Safe	Very Safe
How safe do you feel cycling through a park during the day time?	0%	0%	0%	25%	75%	1%	2%	1%	26%	70%
How safe do you feel cycling through a park during nighttime?	3%	26%	0%	55%	16%	17%	48%	6%	25%	3%
How safe do you feel cycling through main roads during the daytime?	0%	26%	10%	52%	12%	14%	37%	10%	34%	4%
How safe do you feel cycling through main road during nighttime?	17%	50%	13%	47%	3%	25%	45%	7%	22%	1%

Non-Cyclists

	Male					Female				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Aspects which reduce willingness to cycle										
Not being confident on a bike reduces willingness to cycle	0%	33%	0%	33%	33%	13%	13%	7%	47%	20%
Quality of cycle infrastructure reduces willingness to cycle	0%	33%	0%	33%	33%	7%	7%	0%	40%	47%

Focus groups

The focus groups? looked at cycling behaviours and current cycling infrastructure in Ōtautahi. Participants were asked why they cycle on certain routes, why they prefer them, where they feel safe and unsafe cycling in the city, their personal cycling behaviours – such as what they do to keep safe, and what they think would encourage more people to cycle. There were clear similarities and differences between perceived safety from both groups; for the males, perceived safety was more affected by infrastructure than other road users behaviours, and perceived safety for females was more affected by road users behaviours than infrastructure. Two themes emerged from the focus groups: they focused on cycling infrastructure and the behaviours involved and surrounding cycling. Comments were made regarding participants' views on road user interactions in areas they felt unsafe revealed their personal negative interactions with other road users.?? Some of the comments that were made in regards to this are shown below. The men's comments are in blue and the women's comments are in red.

Imbalance of consequence. Cyclists always come off worse in an accident."
"A lot of the time, cars don't consider what it's like to be on a bike."
"There's no such thing as a dangerous intersection, only dangerous users."
"Cyclists are not always given respect."
"I wish more drivers were cyclists."
"Cyclists are often seen as second-class citizens."

Both groups also felt that other cyclists play a negative role in how they felt when cycling, with comments like:

"Cyclists don't help themselves."
"Drive like an idiot, ride like an idiot."

Women also felt that they needed to be more assertive on the road, and men demonstrated that they already feel safe being assertive on the road:

"We need to be more aggressive cyclists to keep safe."
"(We) need to own the road."
"As long as you take up space on the road you should be fine"

People also felt that increased education is needed around roads for cyclists to feel safer.
"We've been brought up to view roads as inherently dangerous places. For roads to feel safer, this view" needs to change.

"More schools should take part in those learning-to-cycle programmes."

Discussion

Analysis of safety perceptions

It can be seen in the results that while men and women both need there to be cycling infrastructures to feel safe when cycling, they do not require different levels of infrastructure to feel safe when cycling. It was found that people had varying views on the social aspects of cycling, such as how cyclists are seen on the road, and how ~~their~~ legitimate their right is to be on the road; however, people expressed similar levels of contentment with the cycling infrastructures. This leads to believe that the differences in safety levels are due to the social impacts of how women are grown to be perceived in society.

Cycling Infrastructure

Results revealed at all participants were willing to cycle anywhere as long as the routes were direct or took them to their destination – however, they would cycle different routes if cycling was for recreation. Females were likely to stick to cycling-designated areas if possible as it gave them "peace of mind" due to the separation between larger vehicles and them. Areas that both groups mentioned they feel unsafe cycling in were narrow cycle ways/lanes, cycle ways/lanes that started in one area and ended in others, areas with road works, and areas with high-density traffic. Poorly maintained areas (i.e. uneven road surfaces, rubbish, litter from construction) also contributed to participants feeling unsafe. Both groups felt safer when cycling in larger open space like parks, wider residential streets, well-lit areas, and places with fewer cars, highlighting the importance of adequate infrastructure and areas that separates them from other larger vehicle users to increase the feeling of safety.

Cycling Behaviours

The behaviours that were described by both groups were (1) having to be more wary of other road users and (2) remembering to keep a situational awareness to feel safer while cycling. They also had to change their behaviours to keep themselves safe – this includes checking for people in parked cars, to avoid confrontations with other road users, including other cyclists. Focus group participants pointed out that negative behaviours were not just in regard to car drivers, but also other cyclists.

From analysis of these responses for both themes, there is little difference between cycling safety perceptions of infrastructure for males and females, however females tended to feel less safe in general. Overall, both groups concluded that there is a much-needed shift from viewing roads as inherently dangerous places, and this can only change through more people cycling to an improved understanding of the challenges that cyclists face daily. As mentioned previously, we also asked both groups what they think would encourage more people to cycle. Again, there was an increased focus on cycling behaviours rather than improving infrastructures. Participants believed that investing in the promotion of cycling events and cycling in general to target non-cyclists would increase the rates of cycling within the population.

Social Factors

Much of what was found through the survey and the focus groups was that there were not many differences between men and women, in terms of how infrastructure can aid their safety. We found that men and women, while they felt differently about being safe, both felt that the infrastructures which were in place were useful for increasing safety. We found that much of the differences in how men and women view their safety is socially based – women feel more uncomfortable cycling due to the way they feel in

society in general. Women tended to have issues with feeling seen by motor vehicles drivers, as well as feeling uncomfortable 'taking the road'. This could play into the ways that they feel when cycling in Christchurch.

Limitations

Our survey and focus groups did not provide sufficient conclusions around the way people of different genders perceive safety in Ōtautahi. Limitations to our study methods may have contributed to this. Firstly, a limitation of our study was that respondents were mostly cyclists and people who currently cycle in Ōtautahi. This skews the conclusions about what impacts people's willingness to cycle. Secondly, the size of the focus groups were two persons per focus group, this is a small number and some of the results did not match those from the survey. Thirdly, another major limitation of this study was our survey distribution. We focused on distributing the survey through social media community groups, meaning people who did not have Facebook or were not in the groups were alienated. Finally, we also only had two gender diverse people participate in our survey, meaning that we had no ability to find significant or useful results for this group.

Recommendations

Upon reflection and consultation of our study, with our participatory stakeholder and supervisors, several recommendations were drawn on/can be made?. Although we acknowledge that it would take a cultural shift in Aotearoa for cyclists to feel safe on the road, we believe there may be a few first and quintessential steps. Firstly, it is our recommendation that stakeholders consider writing awareness of cycling into the auto mobile road code to ensure motor vehicle drivers are considerate and liable of the safety of other road users. This leads on to the second recommendation, to create a shift in culture in Aotearoa we propose that higher incentives are put in place for people to use active modes of transport, such as environmental tax credits, carpool lanes etc. This would lead to a larger uptake of cycling (and other modes of active transport) while also normalizing cycling and thus creating a heightened awareness of it. Third and finally we recommend that future research looks at tying the social factors of who feels more safe in public space and who feels safer cycling together. As our results were minor, we consider the social impacts of public space to be far greater than the implications of cycling in general on the impacts of how genders interact with the public sphere.

Acknowledgements

References

Aldred, R., & Woodcock, J. (2015). Reframing safety: An analysis of perceptions of cycle safety clothing. *Transport Policy, 42*, 103-112. doi:10.1016/j.tranpol.2015.05.001

Agarwal, B. (2000). Conceptualising environmental collective action: Why gender matters. *Oxford Journals, 24*(3), 283-310.

Christchurch City Council. (2019). *Cycle.* Retrieved from https://ccc.govt.nz/transport/cycling/

Frater, J., & Kingham, S. (2018). Gender equity in health and the influence of intrapersonal factors on adolescent girls' decisions to bicycle to school. *Journal of Transport Geography*, *71*, 130–138. https://doi.org/10.1016/j.jtrangeo.2018.07.011

Gore, M. L., & Kahler, J S. (2012). Gendered risk perceptions associated with human wildlife conflict: Implications for participatory conservation. *PLoS ONE,* 7(3), 1-10.

Hay, I. (2016). Qualitative Research Methods in Human Geography. *Oxford University Press.*

Jackson, S. (2006). Gender, sexuality and hetrosexuality: The complexity (and limits) or heteronormativity. *Feminist Theory, 7*(1), 105-121.

Koorey, G., & Teather, K. (2016). *Four Types of Cyclist in Christchurch? A study to determine cyclist user types and their infrastructure preferences*. https://doi.org/10.13140/RG.2.2.20488.72960

Killermann, S. *The genderbread person: Explainers.* Retrieved from http://www.genderbread.org/explainers

NZTA. Cycle route components between intersections. Retrieved from https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/cycle-network-and-route-planning-guide/principles/cycle-route-components-between-intersections/

NZTA (2011). Assessment of the type of cycling infrastructure required to attract new cyclists. *New Zealand Transport Agency research report 449.*

 NZ Transport Agency. (2014). *New Zealand Cycling Safety Summit Briefing notes* [Ebook].

Parkin, J. (2007) *Models of perceived cycling risk and route acceptability. Accident Analysis and Prevention, 39, 364-371.*

Pucher, J., & Buehler, R. (2012). *City cycling*. Cambridge, Mass.: MIT Press.

Pucher, J., & Buehler, R. (2017). Cycling towards a more sustainable transport future. *Transport Reviews, 37*(6), 689-694.

Schleinitz, K., Petzoldt, T., & Gehlert, T. (2018). Risk compensation? the relationship between helmet use and cycling speed under naturalistic conditions. *Journal of Safety Research, 67*, 165-171. doi:10.1016/j.jsr.2018.10.006

Smith, J. S., & Smith, K. E. (2016). What it means to do gender differently: Understanding identity, perceptions and accomplishments in a gendered world. *Humboldt Journal of Social Relations 38*(1), 62-78.

Singh, N., Joe, N., Amey, J., Smith, A., Christey, G. (2019). Cycling-related injuries and cycling promotion: a trauma service perspective. *The New Zealand Medical Journal, 132*(1494). Retrieved 4 May 2019, from https://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2019/vol-132-no-1494-3-may-2019/7868

Statistics New Zealand. (2013). Global greenhouse gas emissions. Retrieved from http://archive.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Atmosphere-and-climate/global-greenhouse-gases.aspx

Taylor, K. J. (2009). *Utilitarian Cycling: Investigating Latent Demand in Christchurch, New Zealand*. Retrieved from https://ir.canterbury.ac.nz/handle/10092/3221

Tight, M. (2016). Sustainable urban transport: The role of walking and cycling. *Engineering Sustainability, 169*(3), 87-91.

This is a nice piece of work, based on excellent reading and some wide ranging data and analysis. Some of the outputs (esp Figs 2, 3 and 4, especially if correctlty labelled) are great! I found the explanation of the data in the text a bit more laboured, and not always clear, as some of my comments indicate. I don't think you picked up the point in Fig 3 that women are not impressed by the beahviour of other cyclists: this seems really interesting and breaks the usual dualism between bikes and cars as the be-all explanation. I'd also have liked a clearer discusson of your recommendations, which deserve teasing out.

Appendix

QUESTIONS FOR NOT CYCLISTS

	Question Type
What is your age?	MultiChoice
What is your gender	MultiChoice
Do you ever use a bike?	Yes/No
Would you ever be willing to cycle in Christchurch?	Yes/No
Being required to wear a helmet reduces my willingness to Cycle.	Slider
Having a lack of facilities to get changed or shower at my end destination reduces my willingness to Cycle.	Slider
Not being confident in riding a bike reduces my willingness to cycle.	Slider
The quality of cycling infrastructure reduces my willingness to cycle.	Slider
Do you have any other comments on what impacts your willingness to cycle?	Open Ended
Please let us know of any other thoughts you have about cycling, or cycling safety in Christchurch?	Open Ended

QUESTIONS FOR YES - CYCLISTS

	Question Type
What is your age?	MultiChoice
What is your gender	MultiChoice
Do you ever use a bike?	Yes/No
What kind of bike do you ride?	MultiChoice
Do you use biking as a form of (Leisure, Commute…)	Multichoice
What kinds of cycling infrastructure have you used?	MultiChoice
Have you ever felt unsafe when cycling in Christchurch?	Yes/No
Have you ever felt unsafe when cycling in Christchurch?	Open Ended
Being required to wear a helmet reduces my willingness to Cycle	Slider
Having a lack of facilities to get changed or shower at my end destination reduces my willingness to Cycle	Slider
Not being confident in riding a bike reduces my willingness to cycle	Slider
The quality of cycling infrastructure reduces my willingness to cycle	Slider
The weather strongly effects my willingness to cycle	Slider
Do you have other comments on what impacts your willingness to cycle?	Open Ended
How safe do you feel when cycling through parks at day time	Slider

How safe do you feel when cycling through parks at night time	Slider
Do you normally cycle through parks alone or with other people?	MultiChoice
How safe do you feel when cycling through main roads at day time	Slider
How safe do you feel when cycling through main roads at night time	Slider
Do you normally cycle along main roads alone or with other people?	MultiChoice
How safe do you feel when cycling through suburban roads at day time	Slider
How safe do you feel when cycling through suburban roads at night time	Slider
Do you normally cycle along suburban roads alone or with other people?	Multichoice
How safe do you feel riding your bike during the week?	Slider
How safe do you feel riding your bike during the weekend?	Slider
Do you normally cycle alone or with others during the week?	MultiChoice
Do you normally cycle alone or with others during the weekend?	MultiChoice
Separated Cycleways from cars increase cyclist safety	Slider
Separated Cycleways from cars and pedestrians increase cyclist safety	Slider
Good lighting on cycle-ways increase cyclist safety	Slider
Cycleways that are well connected to each other increase cyclist safety	Slider
Wide cycleways aid in increasing cyclist safety	Slider
Better signage on cycleways increases cyclist safety	Slider
What do you do personally to improve your safety while cycling?	Open Ended
What infrastructure do you think would improve cycle safety?	Open Ended
Please let us know of any other thoughts you have about cycling, or cycling safety in Christchurch	Open Ended