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**RESEARCH ARTICLE**

# Gender and the E-Bike: Exploring the Role of Electric Bikes in Increasing Women's Access to Cycling and Physical Activity

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In low-cycling countries like Aotearoa New Zealand, women are much less likely to cycle. Previous research has identified improvements to cycling infrastructure and increasing gender equality as key ways to open up cycling to women. The electric bicycle (or e-bike) may be another tool that could be used to lift women's cycling rates. In this paper we explored findings from the Electric City research project in Auckland, Aotearoa New Zealand that touched on aspects of gender and e-cycling experience. We used data from interviews with three groups, e-cyclists, e-bike retailers, and cycling planners and policy-makers, to gain insights into the gendered dimensions of the e-cycling assemblage (rider, bike, environment). The results showed that e-bikes act as a cycling enabler for women in ways that both reinforce as well as challenge aspects of traditional gender socialisation: E-bikes enable women to meet traditional care responsibilities and achieve traditional feminine expectations of presentation on a bike. However, they also increase women's cycling confidence and assertiveness, provide less fit women with more empowering physical activity experiences, improve the quality of bikes available to women, and can create more inclusive bike retail environments. We concluded that these benefits are less likely to be available to lower-income women, due to the high cost of e-bikes.

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**Keywords:** E-cycling; e-biking; electric bicycles; gender; physical activity; cycling; women

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## 1. Introduction

In most low-cycling countries like Aotearoa,<sup>1</sup> women are much less likely to cycle than men. Everyday cycling provides a number of advantages for individuals and communities, including opportunities for gentle exercise (Shaw et al., 2017), improved mental health (Martin et al., 2014, Avila-Palencia et al., 2017), increased neighbourhood social connection, and quieter and more "restorative" local environments (Gatersleben et al., 2013, Appleyard, 2017). Recent research by Shaw et al. (2017) showed that adults in Aotearoa who walk or cycle to their main activity are 76% more likely to meet physical activity guidelines than people who

drive. A recent large cohort study of the whole population in Aotearoa over a 15 year period using Census data found commuting by bicycle was associated with a 13% reduction in all-cause mortality (including suicide) (Shaw et al., 2020).

In low-cycling countries, women have less access to these benefits of cycling. Recent research with Māori and non-Māori women in Aotearoa showed that women often have strong positive associations with cycling as an activity that is “good for the ‘wairua’ [spirit]”: providing ‘freedom’, ‘fresh air’, and ‘contact with nature’” (Russell et al., forthcoming). However, in common with women in other low-cycling countries, they also identified a number of barriers that make cycling less feasible for them: including cost; concerns about sexual assault and risk of injury; and challenges cycling safely with kids. In addition, a lack of comfy bikes for larger bodies; discomfort about being ‘sweaty’ and ‘on display’; and the notion that cycling is generally an activity that is most socially acceptable for Pākehā (white) men are identified as important barriers to cycling amongst women in Aotearoa (Russell et al., 2021).

These findings are consistent with international research that shows that reasons for lower rates of cycling amongst women include: greater domestic responsibilities (Emond et al., 2009, Steinbach et al., 2011); greater vulnerability to and fear of street violence (Frater and Kingham, 2018, Ravensbergen et al., 2020, McCullough et al., 2019); being less likely to be taught cycling skills; lower levels of perceived self-efficacy with negotiating traffic (Emond et al., 2009, Félonneau et al., 2013); difficulties achieving cultural expectations of feminine dress and behavior while cycling (Emond et al., 2009, Akar et al., 2013, Frater and Kingham, 2018); and sexism, racism and exclusion within cycling cultures (Epperson, 1995, Ferguson, 2017).

In this paper we explore the gendered dimensions of a relatively new form of cycling: e-biking, using data from the Electric City project in Auckland, Aotearoa. Using a feminist approach to mobility, we explore how the rise of e-biking may be impacting on the types of cycling experiences and possibilities open to women. We examine how e-biking may be helping women to address some of the barriers to female cycling, such as navigating hostile transport environments, carrying kids, and looking “feminine” on a bike. We also explore how e-cycling is reshaping the broader gendered cycling landscape, including challenging sexist traditions in bike technology and bike retailing. This paper addresses an important gap in the literature: the gendered dimensions of an emergent sustainable transport technology, the e-bike.

## **2. Gender and Cycling Research: A Feminist Approach to Physical Activity and Mobility**

Men make up nearly three quarters (72%) of Aotearoa’s commuter cyclists (Shaw and Russell, 2016). However, it is not the case that women universally have less access to cycling. In a number of European cities there is fairly equal gender participation in cycling as a form of daily physical activity (Aldred et al., 2016). Research has pointed to two key reasons for this: 1) Investment in cycling infrastructure tends to “democratise” cycling, while automobile-centred city planning tends to “masculinise” cycling; and 2) Some research has also suggested that higher levels of gender equality also increase women’s biking by reducing gender-based social barriers to women’s independent mobility, such as the unequal distribution of domestic responsibilities, and violence against women in public and private spaces (Prati, 2018).

Research has shown that automobile-dominant planning and low levels of investment in cycling infrastructure tend to “masculinise” cycling – leaving it open only to cyclists with high levels of fitness, risk-tolerance, and confidence, and advanced cycling skills (Emond et al., 2009, Epperson, 1995). These are all qualities and competencies that traditional gender socialisation tends to encourage in boys and men and discourage in women and girls (Félonneau et al., 2013). Certainly, women within low-cycling countries in particular frequently express less confidence in their bike riding skills; are more likely to report being

deterred by distance and poor weather (Akar et al., 2013, Heinen et al., 2012); and express greater fear of experiencing violence (Dickinson et al., 2003) or injury while riding (Aldred et al., 2017). Women are also much more likely to prefer separated cycle lanes that do not require them to mix with car traffic (Akar et al., 2013, Aldred et al., 2017, Garrard et al., 2008). It is interesting to note that many of these factors do not appear to act as barriers to cycling amongst women in high-cycling cities, implying that different physical and cultural environments shape women's experiences and perceptions of cycling in diverse ways.

Traditional transport research has tended to adopt a fairly uncritical approach to women's cycling preferences, understanding gender as a "demographic variable" rather than a cultural construct (Steinbach et al., 2011). Thus women's cycling needs are often "naturalised" as just another type of individualised travel preference to be catered to, rather than a historically constructed and contingent social phenomenon (Law, 1999, Ravensbergen et al., 2019, Hanson, 2010). As a result, cycling planning has tended to be overly focused on how cycling infrastructure and environments can be tweaked to enable women to manage their "natural" fearfulness or timidity, as well as meet their traditional domestic responsibilities on a bike. (Sersli et al., 2020, Ravensbergen et al., 2019) Susan Hanson notes that despite twenty years of efforts to encourage transport researchers to engage with feminist scholarship on the social construction of gender, there has been little movement (Hanson, 2010).

In this paper we utilise a feminist approach to mobility to explore the gendered dimensions of a new type of cycling: e-cycling, or riding an electric bicycle. A feminist approach to mobility recognizes that "how people move (where, how fast, how often etc.) is demonstrably gendered and continues to reproduce gendered power hierarchies." (Uteng and Cresswell, 2008: 2) It recognises that gender norms shape the potential for mobility and physical activity amongst women, and that cycling practices have the potential to challenge or sustain these norms. As Brabazon (2006: 79) notes, the way women move their bodies is a feminist issue:

Fitness is a feminist issue. ... Physical movement encourages "unfeminine" behaviour such as sweating, aggression, strength, and body competency. While weight reduction is a domestic activity, locked in the cupboards and kitchens of the home, exercise releases women onto the streets, gym and track —sites saturated in patriarchal histories and truths.

We are interested in how e-cycling affects women's cycling experiences and their opportunities for mobility and physical activity. But we are also interested in the ways that women's use of e-bikes is shaping the wider gendered cycling landscape, including bike technology, bike retailing, and biking environments. Here, in line with McCullough et al. (2019) we move beyond a focus on the cyclist, towards an understanding of cycling experience as an "assemblage" of people, places and things: or rider, bike, and environment. We are interested in the ways that e-biking is shaping the wider *gendered cycling assemblage*. We understand gendered transport behavior to be a site of ongoing construction, negotiation and contestation (Hanson, 2010). We also acknowledge the centrality of intersectionality (Denis, 2008) to women's transport experiences: women (and men) are not a homogenous group, and sex, race, class, dis/ability, and sexuality interact in ways that produce different transport meanings, desires and outcomes for different women (Steinbach et al., 2011, Hanson, 2010).

### 3. Methods

We used Auckland as a case study site to examine the question of what it is like to use an e-bike for everyday travel, as well as to explore the potential for e-bikes to promote wider mode shift within the city.

### **3.1. The study site**

Like many other urban centres, Auckland faces long-standing problems with automobile dependence, and growing problems with network congestion (Ministry of Transport, 2018). While the number of Aucklanders who report that they would like to ride a bicycle is growing, there is limited availability of separated cycling infrastructure, and sprawl and local topography mean that distance and hilliness represent ongoing barriers to new cyclists (Kingham et al., 2011, Smith et al., 2011). Situated on a series of old volcanoes, Auckland's topography is both a source of beauty and a challenge for active transport promotion (Auckland Council, ND).

### **3.2. The interview participants**

We completed in-depth interviews with electric bike users, electric bike retailers, and cycling planners/policy makers to explore their understandings of what it is like to use an e-bike for everyday transport, and what challenges and opportunities this group of transport users experience. In line with our understanding of e-cycling as an assemblage of rider, bike, and environment, we chose these three groups of participants because they each had specialist insight into the three important dimensions of e-biking (e-bikers – rider), (retailers – bike), and (planners/policy-makers – environments). These three domains of expertise were obviously not entirely mutually exclusive, and many participants had expertise in more than one dimension of the e-cycling assemblage. The inclusion of the three groups; however, was considered to contribute a richness and depth of understanding of e-cycling experience that could not be achieved by interviewing only one of these groups.

The e-bike users were recruited through local bike shops and online cyclist social media networks. All but two of the participants were using their bike to commute to work (two were retired); however, the majority also used their bike for other types of everyday travel, particularly leisure and shopping. Of the 24 experienced e-cyclists, thirteen were women, and eleven were men. Two of the female e-cyclists were using cargo e-bikes to carry children. Another one of the female e-cyclists was using her standard e-bike to carry her baby. Twenty of the participants identified as NZ European/Pākehā, one person identified as Samoan, one as Indian, and four as other European.<sup>2</sup> The biggest age category was 35–44 years (**Table 1**). The participants were asked to reflect on the best and worst things about using an e-bike, as well as prompted to share details about how, why and where they use their bike, accidents and near misses, impacts on fitness, and their ideas about how to support and promote e-bike use. The interviews were approximately one hour long and took place between March and July 2017.

We also interviewed seven e-bike retailers and six cycling planning/policy key informants during the same period. Four of the retailers were specialist e-bike retailers, and three were general bicycle retailers with some experience selling e-bikes. The key informants were selected due to their expertise in cycling planning and/or policy: they included staff from local government, central government, bike-friendly businesses, and bicycle advocacy organisations.

### **3.3. Interview methods**

Because this was an exploratory research project designed to increase understanding of an area of travel experience about which there is little existing knowledge, open-ended, semi-structured qualitative interviews were considered to be the best research method to utilise (Clifton and Handy, 2003). A dialogical, participatory interview approach was used with all three groups that enabled the researcher to ask key research questions, as well as providing important opportunities for participants to share their knowledge and experience around what they considered to be most important for advancing knowledge in this area of research (Fontana and Frey, 2003, Guest et al., 2012).

**Table 1:** Participant characteristics.

<b>Type of participant</b>	<b>Participant characteristics</b>	
E-cyclists (n = 24)	<b>Gender</b>	
	Male	11
	Female	13
	<b>Ethnicity</b>	
	Pākehā	20
	Samoaan	1
	Indian	1
	Other European	4
	<b>Age</b>	
	24 or under	0
	25–34	2
	35–44	10
	45–54	4
	55–64	4
65–74	3	
75–84	0	
85 and over	1	
Bike retailers (n = 7)	<b>Gender</b>	
	Male	6
	Female	1
Cycling planners/policy makers (n = 6)	<b>Gender</b>	
	Male	3
	Female	3

We used a similar interview schedule for all three groups of “experts”. We looked for areas of commonality as well as divergence or “misunderstanding” between the three groups. Ethical approval for the project (including procedures for obtaining informed consent) was provided by the University of Auckland Human Participants Ethics Committee (018040).

### **3.4. Data analysis**

Thematic analysis of the data was completed, using a hybrid deductive and inductive coding process (Fereday and Muir-Cochrane, 2006, Roberts et al., 2019). Thematic analysis is the most widely used form of data analysis within qualitative studies (Guest et al., 2012). A hybrid inductive/deductive coding process involves three stages: 1) the development of an

initial deductive codebook based on themes identified within previous research, followed by 2) the iterative generation of new “inductive” codes developed through close or “immersive” reading of interview transcripts. Text is coded and then 3) analysed and grouped together to identify key themes (topics, ideas, patterns of meaning) within the data (Braun and Clarke, 2006, Guest et al., 2012). Data analysis was completed using NVivo 11.

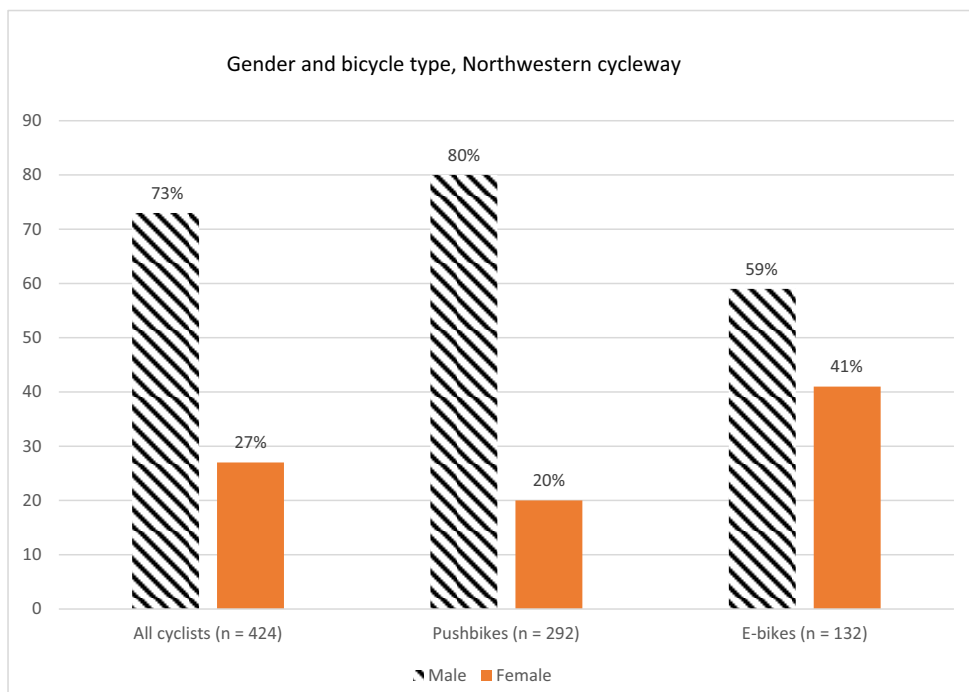
Because we employed a feminist approach to exploring mobility, we were committed to ensuring that women’s experience of e-biking received equal attention within the study. This commitment included ensuring that our initial codebook was based on an in-depth knowledge of previous studies on women’s cycling and gendered aspects of cycling.

### 3.5. Researcher positionality and contributions

All of the authors are public health academics and everyday cyclists. Two of the authors are female cyclists who use an e-bike sometimes. The lead author (KW) conducted the interviews, completed the interview analysis and contributed to the writing of the article. The other two authors (AW and CS) contributed to the writing of the article. The authors all have a commitment to bike justice, or ensuring that inequities in access to cycling, including gendered inequities, are understood and addressed.

### 3.6. Bicycle counts

We also did some gender bicycle counts on the Northwestern cycleway (a popular off-road cycleway with high levels of e-bike use) during the study period (**Figure 1**). The counts were conducted between 7.30–9.30am on March 21<sup>st</sup> 2018, and they highlighted the popularity of e-biking amongst female cyclists in Auckland. While women made up 27% of all cyclists using the cycleway, they were 41% of all e-cyclists using the path.



**Figure 1:** Gender and bicycle type, Northwestern cycleway, Auckland, March 2018.

## 4. Results and Analysis

### 4.1. Introduction

In this section, we discuss the key gendered dimensions of e-biking that emerged in the study: e-bikes challenging sexism in bike design and retail environments; e-biking and gendered cycling competence; motherhood and e-cycling; and e-biking and opportunities for exercise amongst women. We also reflect on how these findings relate to previous studies on the gendered dimensions of cycling and physical activity.

### 4.2. *Cycling as a man's world: Enter the e-bike*

#### Introduction

That the bike industry is so male-dominated is ironic in a way, considering the role the bicycle played in liberating women. I for one am grateful for the path laid by those rebellious, split-skirt wearing, escort-shunning women of the 1890s but wonder how that momentum was lost in the following century to the extent that bicycling and bike biz became so male-dominated. (Grover in Blue, 2010: para 10)

There is little academic literature devoted to exploring sexism within the bike industry; however, women within the sector have written extensively about the ways in which, despite its emancipatory beginnings, the bicycle has come to be understood as a technology for men (or boys) in English-speaking countries (Furness, 2010). Here the everyday cultural association of transport with maleness also comes to rest on the bike's shoulders: as Law (1999: 579) writes "Of all everyday technology, transport technology probably has the most deep-seated and wide-ranging connection to gender distinctions, as everyone who has ever heard a joke about women drivers or noted the prevalence of images of trucks and cars on clothing for little boys will recognize."

Engineering and mechanical competence are largely seen as (white) masculine skills within Western societies (Stitt and Happel-Parkins, 2019), with women less likely to learn car or bike maintenance or repair skills; and bike shops are largely male dominated work and retail spaces. As a result women often feel less confident or comfortable in these environments. There are parallels here with women's experience of visiting male-dominated car retail and repair environments. Research shows that not only are women much more likely to be overcharged in these environments, but that they often feel belittled within them. One US survey found that as a result women would rather opt to go to the dentist than have to take their car in to be repaired (AutoMD, 2014).

#### Challenging sexism in bike retailing

Sexism within bike retailing is an important and under-recognised barrier to women's access to cycling. It affects both the ability and desire of women to access bike technology as well as to maintain and repair their bikes. Feeling invisible or belittled in bike retail environments is a persistent problem for women. Sarah Goodyear, an experienced cyclist and prominent NYC bike advocate talks about the common experience of male bike shop staff overlooking all the signs of her cycling experience and competence (the battered panniers, the high quality bike), to address her as a "beginner cyclist" in need of basic advice on how to ride a bike (Goodyear, 2019). One of the study authors (KW) had a similar experience recently in a local bike shop when buying a new bike. Despite being in her mid-forties, having ridden a bike for over twenty years, and engaging in what she assumed to be a fairly technical conversation about her bike needs, the male bike shop staff member then went on to suggest she buy some lights, "since this is the first time you are riding a bike".

Sexism and the bike retail environment was a common theme within our e-biking research: raised by both female e-cyclists, as well as both women and men who work in the industry. The e-bike was positioned by many as an important new technology that is challenging this sexism and opening up possibilities for women's cycling in a number of ways: including creating more inclusive bike retail and repair environments, reducing the "gendering" of bike technologies, and improving the quality of bike technology available to women.

Of the seven bike retailers we interviewed, only one was a woman. She talked a lot about gender and the challenges of being a woman working in the bike industry:

One of my classic situations is the MAMILS. You know, middle aged men in lycra, eh. I love them, they are some of my favourite customers, we have such a blast. First off I'm a female, so that when they come into the shop, they want to talk to a man, cause you know, he knows, "what you know, lady?" (E-bike retailer 3)

For both this retailer, as well as one of the female key informants, who also stood out as a rare female in her profession within the bike industry, there was an underlying sense of frustration, anger even, with the daily sexism they experienced. Both women, however, expressed a sense of excitement around the ways they believe e-bikes are challenging some of the sexist conventions in cycling. This female retailer argued, for instance, that the fact that e-bikes are commonly designed as step-through bikes to improve stability is "degendering" bike technology. She felt that e-bikes were pushing the bike industry to develop more inclusive bike terminology. She talked about how e-bikes are encouraging retailers to move away from talking to customers about "male" or "female" bikes. This is consistent with calls from inclusive cycling advocates who urge the industry to move past gender-specific terminology to more "use-specific" bicycle terminology (Giddings, 2015).

I get guys, that, sometimes that I don't have any more throw your leg over the, you know, the male bikes, some people might call them, [and I suggest they try a step through]. I call them the throw your leg overs as opposed to the step throughs, because our bikes should be unisex (E-bike retailer 3)

#### Better bikes for women

Several retailers as well as e-cyclists also felt that e-cycling was enabling women to access higher quality bike technology. Women's bike technology often has a tendency to emphasise form over function. Right from the start, women's bike technology was often less functional, with the step through cutout, for instance, adding an extra ten pounds to the early safety bicycle, due to the need for additional strengthening in the frame (McLachlan, 2016). As this male retailer highlights, the quality of women's cycling experience continues to be degraded by the poor quality of bikes (particularly entry-level bikes) available to women. Here he understands this emphasis on appearance over function as a response to the desires of women, rather than as a result of gendered social processes or sexism within the bike industry:

Evolution Cycles in Pukekohe absolutely truck through their Reid bikes that look like a bicycle, have a basket and that's what's important to a lot of women. It looks like a bicycle and has a basket. Well, I've seen them eighteen months later and they are literally falling apart. But a lot of the people use them a few times and go, you know what, I'm not sure I enjoy this cycling, but their cycling experience is based upon a bike that is really, really shit. (E-bike retailer 1)



For this retailer, e-bikes were opening up new possibilities for women to access higher quality, more functional bike technology that makes everyday cycling more realistic. The inferiority of women's entry-level bike technology is highly evident when visiting local bike stores in Auckland. When buying a new bicycle recently one of the authors (KW) discussed the issue with the retailer, after being unable to find an entry level step-through bike with more than three gears. In a hilly, spread out city like Auckland, three gears is likely to be inadequate for all but the very fittest of cyclists. She raised this issue with the retailer, asking him "what happens when women take one of these bikes out and need to ride up a hill?". He shrugged and said, "they use them twice, then put them in the garage and never use them again."

#### **Making bike shops more inclusive**

As well as reducing the gendering of bike technology and increasing the quality of bikes available to women; the female e-cyclists themselves felt like the fact that e-bikes were considered a more "gender neutral" technology suitable for a wider range of cyclists meant that e-bike shops were often more inclusive, more empowering, less sexist bike retail and repair environments:

Especially like fat chick on bike, you do feel like a numpty when you go into some bike shops and you're like, "I wanna ask you a simple question and I'm worried that you're gonna laugh at me." I didn't buy my bike from [e-bike retailer] 'cause I don't think he'd set up by the time I bought it, but god, I wish I had 'cause he's been so nice. He doesn't laugh at you when you go and ask a stupid question like, "How do I change my flat tyre?" or, "Spokes breaking, is that normal?" It would be nice to have that information there in a user-friendly way so at least you could find some stuff out for yourself." ... I bought my bike online from [large bike retailing chain] ... And so I had to take the bike back so they could replace the wheel. ... And when I walked in with the bike they talked to [my husband] 'cause [he] was with me, he'd driven, and it is like, "Well no, it's my wife's bike." Okay, so talk to me. But compared to the experience I'd had dealing with [e-bike retailer], which is the only other face to face bike experiences I'd had, it was like chalk and cheese. It was completely different and the people in the [large chain] bike shop were clearly the people that don their lycra and their shiny hats. (E-cyclist 9).

Another important issue raised by both retailers and female e-cyclists was the notion that e-bikes are challenging gendered notions of female cycling incompetence.

### **4.3. The 'Equalizer': E-bikes, Gender and Cycling Competence**

#### **Introduction**

Both male and female retailers commented on the ways that e-bikes were challenging the idea that women are slower, and less competent cyclists than men.

#### **'Keeping up'**

The two women working in the bike industry, who regularly had to personally contend with sexist assumptions about their own cycling competence, explained how e-bikes are enabling women to 'keep up' with (or overtake!) other (male) riders:

If you [as a woman] are cycling with people who are really good cyclists and you're intimidated, it expands your playground. It means you can keep up first of all and you can go further. So, for a lot of people that I've met over the last two years it's mostly

men buying bikes for their wives, for their little wives who can't keep up. Switch a room now 18 months later, the boys are coming in to buy bikes 'cause they can't keep up with their wives. [laughs] (Key informant 7)

[L]isten the reason why I'm here, cause I obviously don't need it for myself, ah, I go out riding with my mates and the missus, she's getting a bit demanding. She wants to come out with us every so often, but she doesn't like to ride, so I figure, you know, if I let her join me, and we do a trip once a month, then she will be alright with me to go out the rest of the time with my mates.' I go, 'okay, that's all good, darling'. So he's looking for something for her. That's fine, 'kia ora to you. That's lovely' So we go through, and then he really quickly realizes that if she is on a five hundred watt motor, she is going to be leaving him for dust. You see, 'no, no, no, we can't be allowing that to happen.' And so he comes back to the, you know, street legal 300 watt, or, do you know. ...[S]o, he buys her that bike and it's great. And she loves it, but then invariably she will come in to see me a couple of months later, she's looking for a bike for her husband, why? Because she never gets to use her bloody bike because he's always out on it. (E-bike retailer 3).

#### Confidence

The female e-cyclists themselves often commented on the ways that e-biking had improved their confidence on a bike. Indeed being able to keep up with (or pass) partners or friends when they were used to "holding people up" was particularly valued by women, and mirrors findings from previous studies on e-biking experience (Popovich et al., 2014, Dill and Rose, 2012, MacArthur et al., 2013). However, women most valued the ways that their increased speed and ability to "accelerate out of danger" enabled them to equalise their relationship with drivers. They reported feeling more confident taking the lane, less anxious about holding people up at the lights, and more able to choose safer routes, even if they were hillier. Most of the e-cyclists, but particularly the female e-cyclists felt like more "equal" road users:

I think it's just more the idea of being able to get out of the way of things faster, that would be one thing ...You can, yeah, save yourself or whatever. I think that's it, and like you do feel like more of a vehicle on the road I guess, and yeah it is keeping out of people's way because, a lot of the angst from drivers is that they get held up by cyclists, but I feel like I don't really hold them up as much ..., so that makes me feel safer I guess. (E-cyclist 15)

As well as enabling female cyclists to feel more "equal" – with both male cyclists, as well as with drivers – e-bikes were particularly valued by many of the women in the study because they made biking and parenting more compatible.

#### **4.4. Being a mum on a bike: E-biking and motherhood**

##### Introduction

I have done nothing but have babies for the last few years and I haven't really been interested in cycling until I got this new bike. (E-cyclist 22)

As noted, three of the women in this study were using their e-bike to carry kids. Two of them were using an electric cargo bike (One was carrying two kids, and another carrying three), and one woman was carrying her infant on her e-bike, biking alongside her two younger children

on their own bikes. Consistent with other studies in English-speaking countries many of the women talked about how pregnancy, birth and motherhood were key events that led to them giving up cycling (Sersli et al., 2020, Bonham and Wilson, 2012, Sullivan and O'Fallon, 2006). For many of the women in this study, e-biking had made it possible to start again.

#### Getting back on a bike

As one of the women noted, becoming a mother meant she was both less fit and had more to carry when she got on a bike: a double whammy that made cycling especially difficult. She considered her electric cargo bike to be an important “democratiser” for women, and especially for mothers:

I think for me, apart from the cost, I just see it as this democratisation of cycling – it makes people who are unfit and unstrong like me and can't get up a hill on a normal bike let alone with a child on it can do it. It just makes the whole process of travelling on a bike more democratic ... it takes those fitness or strength-related concerns away. (E-cyclist 22).

#### Family time

While in English-speaking countries, everyday cycling when pregnant, or cycling with kids is generally rare, women in higher cycling countries often report cycling with their children to be an important and enjoyable part of their day when they get to spend time with and chat to their kids (Eyer and Ferreira, 2015). This sense of joy was evident amongst the women in this study who were carrying kids on their e-bikes. They not only enjoyed the (largely positive) attention that their “novel” transport option attracted from other commuters, but they found it to be an enjoyable opportunity for ‘family time’. They shared stories about the ways in which the bike ride was an opportunity for fun and “connection”:

Yeah, well the girls do this thing, so you know there's two seats, you face forward they've both got handles, but frequently I'll feel some jiggling and she has done it when we're moving, but mostly when we're stopped at the lights or something, [My oldest daughter] will turn around so that she and [the youngest one] can have a meeting. They have a meeting on the back of the bike, which normally involves like a singing contest or something (E-cyclist 21).

#### Expanding the family mobility radius

One of the other women who was carrying her kids on her bike talked about how family e-biking was often more enjoyable than “chasing after” her older kids with a baby in a stroller. She found it less tiring than walking, and found they could access more of their neighbourhood:

Getting the kids on a bike as opposed to anything else is fun and it in that sense it gives us a little bit more freedom as opposed to walking. We are able to go to places where I wouldn't walk because it would take too long to get there. Okay we could get there but then by the time you walk back it is too late or I am too tired or whatever. (E-cyclist 22)

#### Carrying all the stuff!

Even when mothers were not carrying kids on their e-bike, they often appreciated how it made it easier for them to do the job of carrying their children's stuff:

We ... always have cycled as a family at the weekends. Having the e-bike means that I can be the person who's carrying all the gear for all the kids and the waterproofs and the drink bottles and the snacks. I'm not having to really deal with extra weight on the bike without the power to carry as well. (E-cyclist 11)

#### Managing the double day

As well as making it easier for mothers to carry children and their stuff, the other important way that e-biking made it possible for mothers to start biking again or continue biking was the way that it enabled them to manage their tight time budgets: the higher bike speeds, and the fact that they didn't necessarily need to change clothes at the other end, meant the e-bike allows them to "fit in" their double day. As this participant, who bikes her two older kids to school, with her baby on her e-bike, drops her baby off at day-care, then bikes 15 km into the city to her job, relayed, when you are a working mother every minute counts:

I have got another bike with a bike seat on the back that I was always riding with him [the baby]. Because he is now in the front seat it is not so much helping with the baby because I have to ride at the pace of the four and the six year old anyway. But it does mean that once I am at day-care I can leave straight from day-care and I am gone. [*I: And get in really fast.*] Yeah. So in terms of that, yeah. Otherwise I probably couldn't take them, I would end up in the car. I thought about not buying a bike seat for the e-bike because of the battery, my existing one wouldn't fit so I had to buy a brand new one. And I thought about not doing that and riding with them on my regular bike, then riding home and getting on the e-bike and going but it is an extra probably 10 minutes. (E-cyclist 5)

#### Being 'reliable'

Just importantly, not only was the e-bike valued by mothers because it was faster than a push-bike, but because it was seen as more reliable, time-wise, than a car. Both retailers and female e-cyclists raised this issue:

I could pull one example about a lady who lived in Mt Albert and worked in the city said, I can leave work at 5pm and I might be home in 20 minutes or I might be home in an hour. And I want to be able to tell my babysitter that I am going to be home at this time, and in my car, I can't do it. On an E-bike, I'm home at exactly the same time every time. (E-bike retailer 1)

You could leave for work [in a car] and sometimes it is 15 minutes and sometimes it is 45 minutes, and if you are going to pick the kids up you can't be plus or minus an hour. (E-cyclist 5)

Finally, the last important theme around gender and e-biking was the ways in which the e-bike opens up new opportunities for exercise that are experienced as enjoyable and empowering for women, including women with larger bodies.

### **4.5. More empowering opportunities for exercise**

#### Introduction

Much has been written about the ways that cultural standards of female beauty and dress act to reduce opportunities for exercise amongst women (Young, 2005). Feminist sports and physical activity scientists have described the ways that gender socialisation tends to encourage women

to experience their body as a thing to be looked at rather than a thing to feel, control and use, and the ways that this discourages the development of coordination, muscular strength, and physical self-efficacy in women. As Young (2005: 40) notes “The timidity, immobility, and uncertainty that frequently characterize feminine movement project a limited space for the feminine ‘I can’”. These authors have also highlighted the ways that exercise spaces such as a gyms often play a central role in maintaining cultural ideals of female beauty, thinness and dieting. Brabazon (2006) describes the culture of “wretching and stretching” that often characterises women’s gym environments. Unsurprisingly many women, and particularly larger women often report feeling disempowered in these environments (Coen et al., 2018, Pridgeon and Grogan, 2012). E-bikes may provide valued new opportunities for exercise for some women.

#### **An alternative to the gym**

Several women in this study, and particularly larger women, talked about how e-biking was a much more enjoyable and empowering opportunity to get regular exercise.

I used to be a bit heavier than this years ago and my doctor would say to me, “Oh, look, have a green prescription and you can go to the gym and you can go there,” and the idea of me going to a gym back then when I was 25 ks heavier was like, “Are you out of your fucking mind?” I would rather die than go anywhere near that kind of thing. Yes, there was the fear of being mocked getting on a bike and riding to work, even now, but it was a lot less scary than that kind of thing. ...There was still a bit of a fear of being mocked and laughed at, especially like you combine being the fat chick on the bike with the e-bike, like, “Oh, maybe you could do with some more pedalling on your own.” But I haven’t really encountered that. Whereas the gym thing, I don’t know why the gym thing is so frightening. (E-cyclist 9)

#### **‘Fitting in’ time for exercise**

As well as finding e-biking a more empowering experience than going to the gym; several of the mothers pointed out that e-biking was important to them, because the “efficiency” of building their exercise into their commute (while carrying kids, but also not arriving sweaty at work) provided the only way they could “fit in” any exercise to their day:

I hated when I was having to do the drop offs, because the girls aren’t locally at school, I was just hating it, I don’t get to kind of move, you know, and I sit on my arse on the way, with everybody else whose sitting on their arses, in little air conditioned bubbles, I just hate it, it starts making me a bit grumpy, whereas you feel quite happy when you have a bit of a cycle to work. And I don’t have to exert, I go to work now dressed for work, pretty much every time, whereas I used to, I started off thinking well I will get a little bit hot and flushed, and I’ll get changed or showered at work if I need to, and I’ve stopped doing that because I just don’t need to (E-cyclist 21).

#### **Looking ‘professional’ as a woman**

The fact that they could use their e-bike to control their level of exertion so that they could get some exercise without getting so sweaty that they needed to change was particularly valued by women in this study. This was because not only were they more likely to have particularly tight time budgets (especially the mothers), but they also found it more difficult to get changed at work, because they needed to bring in and store more “stuff” to look feminine, and they didn’t necessarily have decent shower/changing rooms that made this possible:

[I] use the full assist because my aim is to get to work in the clothes I am wearing at work without having to shower in between. We do have showers here but it is such a pffaff (bother). It feels like... we have workshop showers and they are all a little bit blokey and there is no hair dryers or anything like that, and I just think [about] the amount of paraphernalia I would have to keep at work. (E-cyclist 8)

## 5. Discussion and Conclusion

Our research suggests that electric bikes are reshaping the cycling landscape in ways that both *reinforce* as well as *challenge* traditional gendered mobility and physical activity ideals. This new bike technology makes it easier for women to meet their traditional domestic responsibilities, as well as stay looking “nice” on a bike. But e-bikes are also challenging sexism in cycling in important ways: making bike retail and repair environments more inclusive for women, challenging sexism in bike design and marketing and increasing women’s sense of confidence and entitlement to occupy the road space. They are also opening up more empowering and enjoyable opportunities for physical activity to a wider group of women.

Feminist geographer Robin Law (1999) points out that as well as having different transport experiences to men, there is more variation in mobility experiences between women, due to variations in possibilities for movement across the life course related to pregnancy, birth and motherhood, as well as women’s longer life expectancy. However in high cycling countries, cycling is experienced as a possibility for most women across the lifespan. In low-cycling English-speaking countries like Aotearoa, pregnancy, birth and motherhood (as well as puberty and adolescence) are commonly experienced as key moments when women stop cycling (Frater and Kingham, 2018, Bonham and Wilson, 2012, Sullivan and O’Fallon, 2006). There is a tendency for transport researchers from these cultures to position this transition as a kind of “inevitability” based on an inherent “unsuitability” of the bicycle for the greater proportion of “escort” trips, trip-chaining, and carrying stuff that mothers are required to do. Bonham and Wilson’s (2012) Australian research on the experience of women’s cycling throughout the lifespan noted that mothers in particular often seemed “defeated” in their efforts to travel by bike with children. This research highlights the ways in which e-biking can open up or “reopen” opportunities for movement and physical activity for women at all stages of life in new and important ways.

It is important to note, however, that e-biking is a technology that is less open to certain groups of women. Several researchers have written about the ways that Black women, and women from non-Western cultures are particularly likely to view cycling in general as culturally unsuitable. This is in part due to associations between cycling and poverty, as well as varying cultural ideals around femininity and mobility, and the fact that these women often have larger families and greater responsibilities for transporting elderly relatives and vulnerable community members (Steinbach et al., 2011, Law and Karnilowicz, 2015, Russell et al., 2021).

Lower-income women are also much less likely to benefit from e-bike technology. Electric cargo bikes are particularly expensive and are likely to be out of reach for most low-income or even middle-income families (Sersli et al., 2020, Riggs and Schwartz, 2018). The two women in the study who owned e-cargo bikes were both from middle-higher income households. Despite having a higher income, however in both cases they reported that the decision to buy an e-bike had involved considerable discussion and a degree of conflict and stress in their relationships due to the substantial cost involved. Subsidising or creating low-cost rental or ownership pathways for electric bikes and electric cargo bikes in particular would be an important way to extend the benefits of e-biking beyond middle-high income women to the women who would potentially experience the greatest health benefits from e-biking. One of the women in the study had previously worked in a community law centre, and she made the case for e-bike subsidies well:

I used to be a lawyer at a community law service, and the clients that I used to see were beneficiaries and lower socioeconomic people with multiple health problems, constant interactions with WINZ (Work and Income NZ), costs of living in Auckland and all that kind of stuff, and I just thought, ... God, a lot of the clients that I used to see, it would solve their petrol problems. It doesn't cost hardly anything to charge. Most of the people that I used to help as a lawyer didn't have regos or warrants<sup>3</sup> so they'd get traffic infringement fines and that would build onto their cycle of debt and mental health and wellbeing, and I was like, God, can you give every beneficiary an electric bike? It would be not a quick fix for everything, but it would be great. That's a pipe dream. I don't know how you'd get that. Unless they come down in price and it's something that's subsidised, that I could see it would be lower economic people really benefitting from it as well as people that can afford to buy them at the moment. (E-cyclist 9)

It is important to note, however, that access to e-bike technology is likely to act as necessary but not sufficient to enabling many low-income women, and low-income mothers especially, to take up e-biking. A US study of (traditional) cargo-bike users concluded that having extra time and flexibility around journey making, as well as access to off-road bike lanes or low traffic streets, were as critical as being able to afford the cost of a cargo bike (Riggs and Schwartz, 2018). Previous research has identified less flexible activity routines, shaped by more rigid work hours, greater job insecurity, more dispersed employment and longer work hours as additional barriers to cycling within low-income families (Tranter, 2010, Thorne et al., 2020).

It is also worth acknowledging that there may also be losses associated with efforts to "speed" women's cycling up, so that that they can "keep up" with male cyclists and motorists, as well as manage their "double day". Popan (2019) in particular, argues that the trend towards promoting fast cycling, including e-cycling, strips biking of some of the key pleasures associated with using a slower, open-air form of transport: namely greater opportunities for sensory engagement and social connection. And certainly research on women's experience of cycling with their children points to a desire amongst many women for more safe spaces for *slow cycling* that matches the pace and needs of kids and family groups (Sersli et al., 2020).

Finally, this work highlights some of the challenges associated with continuing sexism or gender stereotyping in both cycling retailing as well as cycling research. This is a microcosm of the transport sector in general, which tends to be dominated by men at all levels (Kronsell et al., 2016). While the e-bike is challenging gender norms from the ground up, to truly harness the potential of this technology the transport research community needs to become more diverse and to incorporate insights from feminist approaches to exercise, transport and mobility.

The key strength of this research is that it utilises a feminist approach to mobility that goes beyond a simple exploration of women's experience, to examine the impact of e-biking on aspects of the wider *gendered bicycling assemblage*, i.e. bike technology and bike retailing. It also brings together a range of experts who understand different aspects of e-cycling experience: i.e. e-cyclists, bike retailers, and cycling policy-makers/planners, providing for a rich and in-depth examination of the phenomenon.

One weakness of the study is that the data was collected three years ago, and anecdotally at least there appear to have been some changes to e-bike technologies during that time. In Aotearoa at least, there has been an increase in more traditionally "masculine"-looking e-bikes that mimic some of the aesthetics of motorcycle and mountain bike technologies. This may at least partly undermine some of the conclusions made about the ways that e-biking may be "de-gendering" bike technology. However the rise of more "gender-neutral" looking step through bikes has not been completely displaced by these new more "macho" looking men's e-bikes. As with all qualitative studies, the numbers in this study are small, and the reliability of the

results could be further tested through larger scale surveys of e-bike users. Future research could also explore the gendered dimensions of men's e-biking, and how this new technology reinforces or disrupts the traditional relationships between cycling and masculinity.

## Notes

- <sup>1</sup> Aotearoa is the Indigenous name for New Zealand.
- <sup>2</sup> Pākehā is the Indigenous term used to describe people born in Aotearoa, who are of European descent. 'Other European' is used to describe people who are born overseas, who are of European descent. Ethnicity was self-identified by participants.
- <sup>3</sup> Car owners in Aotearoa are required to pay for an annual safety inspection, or "warrant of fitness", as well as an annual registration fee, or "rego".

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## Competing Interests

The authors have no competing interests to declare.

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