

1 **Women’s Cycling Journeys: A Preliminary Case for the Role of Cycling HCI in**  
2 **Improving Gender Equity**  
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7 Cycling is an excellent way for people to be physically active. However, cycling faces a tremendous equity problem: women ride bikes  
8 less often than men due to a variety of factors, and cycling promotion efforts have disproportionately benefited men and marginalized  
9 women. One way to understand how to address this problem is to examine women’s journeys who have overcome the barriers to  
10 successfully become cyclists. This position paper reports on a preliminary analysis of an interview study in which six female cyclists  
11 shared their experiences. We specifically examine the ways in which the women describe technology as supporting their cycling  
12 journey. We identified three important themes: building a supportive cycling community, feeling a sense of belonging as a cyclist,  
13 and addressing women’s concerns with their safety. The findings suggest that there is an important opportunity for HCI research to  
14 address the marginalization of women in cycling.  
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17

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24 **1 INTRODUCTION**  
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26 Cycling is an excellent way for individuals to achieve their recommended daily and weekly total amounts of moderate-  
27 to vigorous-physical activity [20]. Cycling can provide cardiovascular health benefits [17] and is sustainable throughout  
28 the lifetime of most individuals [8]. Due to its tremendous benefits, there are efforts to make cycling more accessible to  
29 all people, but there is a tremendous equity problem: cycling promotion efforts have historically disproportionately  
30 benefited men and marginalized women [2]. Women are less likely to feel comfortable riding a bike due to gendered  
31 constraints: for example, women are more likely than men to face harassment for riding a bicycle [18]. A recent study  
32 of bike share usage in New York City found that women do not use Citi Bikes as often as men [15]. Another recent  
33 study found that men are 1.4 times more likely to ride a bicycle for leisure than women, and twice as likely to commute  
34 by bicycle than women [6].  
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36  
37 There is significant evidence that technology plays a vital role in promoting cycling and providing safer cycling  
38 experiences in a variety of ways. Cyclists already use multiple devices while riding bicycles, including specifically  
39 designed bicycle computers, smartphones, and smartwatches [14]. Research suggests that gamification of bicycle  
40 riding has the potential to motivate individuals to ride a bicycle more than factors such as health or the environment  
41 [11]. Another recent study demonstrated augmented reality’s capacity to provide safer cycling experiences in urban  
42 environments, specifically how cyclists can more safely navigate dangerous intersection crossings [10]. In another  
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53 example, a team of researchers used smartphones combined with commercially available portable speakers to create a  
54 detection system that helped prevent crashes [9].

55 Despite this emerging body of research in Cycling HCI, there is a significant gap in understanding women's unique  
56 needs and challenges. For example, Porcheron et al.'s [14] study established ways in which technology is an integral  
57 part of how people use bicycles, but their sample consisted entirely of male cyclists. To begin to bridge this gap and turn  
58 the conversation toward gender equity in cycling, this position paper reports on a preliminary analysis of an interview  
59 study in which we asked six female cyclists about their experiences as they overcame obstacles to become cyclists. This  
60 paper examines how these women describe using technology in their cycling journey.  
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63 We found three important themes emergent from the six interviews: technology can help women build a supportive  
64 cycling community, feel a sense of belonging as a cyclist, and address women's concerns with their safety. Our analysis  
65 suggests that there is substantial room for improvement in the current state of the art in commercial technologies, and  
66 many open research questions regarding women's needs as cyclists and prospective cyclists. The findings suggest that  
67 there is an important opportunity for HCI research to address the marginalization of women in cycling.  
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## 70 2 METHOD

71 The first author interviewed women from across the United States via zoom in semi-structured interviews ranging  
72 between 45 to 75 minutes in duration. The first, second, and third authors co-designed the interview questions that  
73 were used. The study received an Institutional Review Board exempt approval as a low risk study. We compensated  
74 participants with a \$30.00 Amazon eGift Card.  
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77 The current set of participants represent a convenience sample: the authors recruited participants initially via  
78 direct contact from our own networks, and additional participants were gathered from word-of-mouth through the  
79 initial participants. So far, there have been six participants in this study. Their average age is 34.83 (SD = 6.40). All  
80 six participants have identified as female, Caucasian/white, a resident of the United States, and someone who rides a  
81 bicycle for recreation and/or fitness. As a group, the six participants vary drastically in terms of their cycling experience:  
82 participants' experiences with cycling range from only 6 months to over 10 years.  
83

84 After the interviews were completed and transcribed (via Zoom automated transcription with manual cleaning as  
85 needed), the first author performed the initial inductive thematic analysis [16], following the six steps of thematic  
86 analysis: data familiarization, initial code generation, searching for themes within the codes, theme review, defining  
87 and naming themes, and reporting [4, 5]. The second author conducted independent data review and her own code  
88 generation, then the first and second author collaborated on theme review and defining and naming themes.  
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90

91 **Positionality Statement.** The first author is a male cyclist with more than ten years' experience in recreational  
92 and competitive cycling. His professional training is in gender identity and communication. He holds a PhD in Mass  
93 Communication and is a research scientist in a Computer Science department at a large research university in the  
94 southern United States. The second author is a female cyclist with five years' experience in recreational and amateur  
95 competitive cycling, with formal training in computer science and HCI. She is a professor in Human-Centered Computing  
96 at the same university as the lead author. The third author is a female behavioral scientist who is an assistant professor  
97 of Health Education & Behavior at the same university.  
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## 100 3 RESULTS

101 The thematic analysis suggested three prominent themes in how technology interacts with women's unique experiences  
102 in adopting cycling for recreation and/or fitness: community, belonging and safety.  
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105 **Community.** The first time each participant rode a bicycle for recreation and/or fitness, it was prompted by someone  
106 else. P1 describes how she started to ride a bike over ten years ago: “when I met (P6)... She rode, and ... she took me on  
107 the (trail-name) trail, and... As soon as we did that ride like the next week I got a road bike, and then I started riding  
108 with her, and she just she got me like really into it, into the scene.” Similarly, P2 describes starting her cycling journey  
109 during the pandemic, “And we were all just like me and my brother and my partner and my dad... So then it was just  
110 mostly them that facilitated it. So they say that they’re going, and then they’d invite me. So then I’d go with them.”  
111

112 As participants began to ride bicycles, they describe using technology to help them find a community of cyclists to  
113 ride with. P3 described her experience finding other cyclists in her city, “I didn’t realize how big cycling was (and) just  
114 how connected people are with cycling until I started Googling like Facebook groups...It makes me feel like, no matter  
115 where I’ll go, this could be an option for me.” Likewise, P5 also used social media to help find her current riding group,  
116 “I’ve looked on like Facebook for group rides. I mean, and that’s kinda like how I found this group that I’ve been riding  
117 with for the past year.” Having this community has other benefits, as P4 described, “I definitely have used, like social  
118 media, to connect with people to like, ask about conditions, maybe conditions in a certain way. like trail conditions or  
119 road conditions.” The cycling community becomes highly important for participants, as P3 stated, “I think that that’s  
120 been a huge shift for me is realizing how much I need community and how much I need my bike.”  
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123 **Belonging.** After participants have connected with someone to help them start their cycling journey, they describe  
124 the need to feel like they belong in the cycling community or identify themselves as a cyclist. P4 stated that “the first  
125 like couple of years before I started mountain biking, I don’t think I would have referred to myself as a cyclist.” But she  
126 “definitely found a good community in the mountain bike world,” one that is made up primarily of other female cyclists.  
127

128 Not all participants are able to ride with a large cohort of other female cyclists. When asked about the gender  
129 distribution of her group rides, P5 stated that they were “way more men. Sometimes, most of the time, I’m the only  
130 woman.” and that “men are like very macho aggressive. And it’s kinda scary. So it makes me really not want to ever  
131 race men.” P2 noted that she “felt like I had to prove that I could keep up with them.” P2 identified the need to prove she  
132 belongs as a significant challenge in her cycling journey, “I found that people don’t wanna like, talk to you, or they  
133 don’t really take you seriously until they realize that you actually can ride... I shouldn’t have to prove myself to you.”  
134

135 The use of technology can help female cyclists overcome hurdles that prevent them from feeling a sense of belonging.  
136 P3 said she had set a goal for herself to “learn how to fix my own bike and what the different parts mean... (On) my  
137 pinterest, there was this really cool picture of a bike and all of its parts.” P2 has more experience than P3, but still faces  
138 similar challenges with bicycle maintenance, “if I have like really elementary questions that I’m kind of too embarrassed  
139 to ask anybody, I’ll just go do a quick Google search on that. Or like very elementary bike maintenance that I don’t  
140 want to go ask them to do at the shop, because its like, I should know how to do this myself, I’ll go watch a YouTube  
141 video on that.” Similarly, most participants described a desire to use technology to find information on how to fix a  
142 bicycle and how to find information on bicycle related purchases. P4 stated that she’s “not like a super technical person”  
143 but has “had interest in working on my own bike... I feel like that’s such a huge part of cycling, in a way, is like having  
144 an understanding of your bike, how it works.”  
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149 **Safety.** Participants in this study, regardless of experience level with cycling, expressed significant concerns for their  
150 safety. A common safety concern for participants is the danger posed by cars. P1 explained that “I do like road riding,  
151 but I just don’t like road riding on the roads right now... Sharing the road with drivers, that’s like something that’s  
152 scaring me... I just don’t want to go out that way.” For P3, the least experienced cyclist in the group, she “would love to  
153 be able to regularly bike places and not be daunted by getting hit by a car,” and “I’m still scared to ride on the road  
154 sometimes, with the traffic here.” While P2 is a little more experienced than P3, she is “still just not very comfortable  
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157 with riding next to cars. Just cause, I haven't done it for very long." However, P3 identified technology as a key tool for  
158 her safety, that she wants to know "what bike gadgets I actually need, like what's gonna keep me safe."

159 Some participants also had concerns about getting lost impacting their safety. One of P3's concerns about riding with  
160 a particular group is that "they won't hesitate to leave you behind, and I get lost very easily." Similarly, P2 stated that  
161 getting lost while mountain biking was a concern for her, but purchasing her bike computer with mapping features,  
162 allowed P2 to feel "more comfortable on the trails alone (and) is why I can ride more regularly now."  
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#### 165 4 DISCUSSION

166 The findings from these interviews with women who did successfully overcome the barriers to becoming a cyclist point  
167 us toward important areas of potential work for CyclingHCI. Online communities are clearly an important resource  
168 for women cyclists, crowdsourcing helpful information including where to ride, how to dress for the conditions, and  
169 a variety of other benefits. Previous research has demonstrated that social support on social media can be highly  
170 motivating for women as they engage in more physical activity [7]. Beyond social media social support, technology  
171 may offer support in the form of collaborative technology, where individuals can exercise together, even if they're not  
172 in the same physical location [12]. Recent developments in artificial intelligence could lead to support for new cyclists  
173 [19], with particular attention paid to the unique challenges and hurdles that women face on their cycling journey.

174 As an extension of the theme of community described above, promoting a sense of belonging for women on the bike  
175 can help progress towards developing a cycling identity [1, 13]. However, contemporary cycling technologies have  
176 focused on disparate uses for experienced cyclists, from physical bike computers and smart training devices (e.g., smart  
177 trainers, power meters) to training apps (e.g., TrainerRoad, Zwift) and analytics platforms (e.g., Strava, TrainingPeaks).  
178 Each piece of technology focuses on one aspect of use for an experienced cyclist. Women who are approaching cycling  
179 without prior knowledge and experience must negotiate an overwhelming number of gadgets, apps, tools, and platforms.  
180 A more streamlined approach may be beneficial for individuals who are exploring cycling for the first time.

181 One of the most immediate concerns that the CyclingHCI community can help address is the need for safety. The  
182 adoption of inexpensive tools that integrate to smartphones already owned by individuals new to cycling may provide  
183 widespread benefit [9]. While significant political and cultural changes to our conception of road use, mobility, and  
184 transportation would be most beneficial to improving cycling safety, implementing more connected technologies such  
185 as the internet of things (IoT) may allow for communication with modern vehicles to warn drivers of other road users,  
186 including cyclists [3].  
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#### 194 5 CONCLUSION AND FUTURE WORK

195 This preliminary analysis has demonstrated that technology is an inexorable part of the modern cycling experience for  
196 many women who overcome the barriers and find their way onto bikes. However, there is an important role for the  
197 CyclingHCI community to play in investigating novel approaches to support women in community building, fostering  
198 a sense of belonging, and ensuring safety. The findings point to many open questions for future work. The CyclingHCI  
199 community needs to investigate the unique needs of women cyclists in terms of technology, and ensure that we include  
200 participants in all our studies in a gender-equitable way. The ways in which womens' and mens' cycling journeys differ  
201 is still an open question, as is the difference between women and men who use bikes only to commute (as the present  
202 study did not include women who primarily use the bike as a form of transportation). We hope that by expanding the  
203 CyclingHCI conversation to include a focus on gender equity, we can work toward more people of all genders reaping  
204 the benefits of riding bikes.  
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