

CYCLING SAFETY AS MOBILITY JUSTICE

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Abstract

Concerns about traffic safety are consistently identified as a barrier to cycling uptake. As such, improving cycling safety is a key priority in cycling planning, research, and advocacy. This chapter reviews the multidisciplinary literature on cycling safety, much of which focuses on traffic safety and considers either ‘objective’ or ‘perceived’ safety at the scale of the individual or the neighborhood. A mobility justice approach to cycling safety is then advanced. This approach considers how safety is shaped by intersecting power relations connected with and produced by, among other things: automobility, patriarchy, and racism. Cycling safety as mobility justice meaningfully expands cycling safety discourse to include other forms of danger such as sexual or police harassment.

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Safety Concerns: A Top Barrier to Cycling

The past two decades have witnessed an increased interest in cycle planning in many cities from a vast and diverse array of stakeholders with vested interests in urban transport. In some cases, the hard work of advocacy groups has been realized through the planning and building of cycling supportive facilities; the political will necessary to accomplish such things has also appeared in some cities, and the recent pandemic has, in some places, accelerated the installation of both temporary and more permanent cycling facilities. Concurrently, participation in urban cycling has grown considerably. The most dramatic increases have occurred in cities where cycling was not previously a regular means of daily travel, such as North American cities where cycling’s mode share has tripled or even quadrupled since 1990. Cycling is also re-emerging in some

Chinese cities, and is on the rise in South America, Europe, Australia, and even in some cities that have historically had high cycling rates such as Amsterdam and Copenhagen (Pucher and Buehler, 2021).

When it comes to encouraging city cycling, a key policy priority has been to foster a safe cycling city. Indeed, concerns about traffic safety are consistently identified as a barrier to uptake (Elvik, 2021). Improving cycling safety is also important for reducing cyclist injuries, a public health priority. Given this elevated status of “safety” in cycling discourse of all kinds, we explore cycling safety in multiple contexts in this chapter. We begin with a brief literature review, highlighting key research findings and debates in studies on cycling safety. Much of this work focuses on traffic safety and considers either ‘objective’ or ‘perceived’ safety at the scale of the individual or the neighborhood. Then, a different approach for thinking about cycling safety is introduced: reimagining cycling safety as mobility justice. This approach involves a more comprehensive and holistic view of safety that considers not just cyclists’ safety from cars, but from other forms of danger such as crime or sexual or police harassment. In so doing we explore the intersectional power relations that can shape one’s safety while on the move.

Approaches to Studying Cycling Safety

Diverse disciplines have contributed to cycling safety research, including geography, epidemiology, health sciences, planning and engineering. Much of this literature focuses on bicycle-motor vehicle interactions, and key topics include cyclist behavior (helmet usage, distracted riding), crash causation, evaluation of injury-prevention solutions, urban planning, and infrastructure design (Dozza, 2017). Most scholars working on cycling safety take up positivist or post-positivist onto-epistemological approaches, where knowledge about safety is produced through measurement, survey, hypothesis testing, application of the scientific method. This work

often focuses on measuring injuries, crashes, and conflicts, or ‘objective’ safety studies, or analyzing self-reported or subjective safety, or ‘perceived’ safety research, at the scale of the individual or the neighborhood (Table 1).

Table 1. Approaches to Study Cycling Safety

| | Objective | Perceived |
|--------------|--|---|
| Individual | <ul style="list-style-type: none"> - Helmet design, regulation, and use - Cyclist or driver behavior - Safety or health risk due to cycling - Variations across demographic groups | <ul style="list-style-type: none"> - Self-reported safety - Effects of ‘near-misses’ on cyclists’ - Variations across demographic groups |
| Neighborhood | <ul style="list-style-type: none"> - Urban planning - Infrastructure presence & design - Effect of built environment features on cyclist safety or health | <ul style="list-style-type: none"> - Self-reported ratings of safety, risk, or danger of infrastructure of street design |

Objective Safety

Work on ‘objective’ bicycling safety typically focuses on measuring and modelling injuries, crashes, or conflicts (Reynolds, 2009). Three sources of data are commonly used: police records, hospital (or other medical facility) admission records, and cyclist surveys where incidents are

self-reported. Official crash statistics notoriously under-represent cycling incidents, as many go unreported to the police and/or do not require formal medical care (Elvik, 2021).

Much of the literature on objective safety focuses on the individual-level protection of cyclists (Winters et al., 2012). Many of these studies examine the role of cyclist and driver behavior factors (e.g.: violations, substance use, training, etc.) on collisions. In the North American context in particular, cycling safety research has focused on helmets, for instance their design, regulation, and/or use (Reynolds, 2009). A key finding is that helmet-use can reduce the severity of injury (Attewell, 2001). However, previous work has found that mandatory helmet use can discourage cycling (Reynolds, 2009). Many studies have also found that injury rates decrease as cycling increases, a phenomenon referred to as the “safety in numbers hypothesis” (Prati, 2019). Some argue that helmet laws may work against safety in numbers by deterring cycling uptake.

A sub-set of studies on cycling safety specifically examine probabilistic risk. Much of this research identifies the probability of a safety or health-related metric (e.g., injury, collision, all-cause mortality, life-years gained, etc.) resulting from a measure of cycling exposure (e.g., number of days of cycling, total number of trips, time spent cycling). A recent literature review found that cycling is consistently associated with reduced risk of all-cause mortality (Zhao et al., 2021). Another main finding in this body of work is that cyclists experience greater risk of injury in places where cycling for transport is not the norm (Elvik, 2021). However, when studies compare the safety risks and benefits of cycling; many report that the health benefits of cycling far outweigh the health risks (Pucher et al., 2010).

Objective safety can also be examined at the scale of the neighborhood. Many papers explore intersection safety, or the impact of bicycle lane design on safety. Longitudinal studies have explored how safety changes before and after-infrastructure is built (Thomas, 2013). Overall, the

presence of bicycle infrastructure is consistently associated with greater safety and lower risk, including reduced collisions, decreased injuries, and less severe injury (Prati, 2019). Taken together, key topics in objective cycling safety research include the role of helmets, the safety in numbers hypothesis, the health and safety risks of cycling, and the protective effects of infrastructure. By focusing on injuries, crashes, and conflicts, this body of work does not necessarily reflect whether cyclists feel safe. Therefore, the following section reviews another approach commonly used in cycling research: studies examining perceived safety.

Perceived Safety

Research on cycling safety has also examined perceived safety, or self-reported or subjective safety. Perceived safety from traffic can be measured at the individual-level in travel surveys and has been found to impact individuals' decision to cycle, as well as their route choice (Winters, 2011). Low perceived traffic safety has also been identified as one of the most important barriers to cycling uptake by potential cyclists (Manaugh et al., 2017). More recently, perceived safety has been studied at the individual-level by examining the impact of 'near-misses', i.e., non-injury incidents between cyclists and other road users, which have been found to negatively impact cyclists' perceptions of safety (Sanders, 2015). Finally, research on individual-level perceived safety has also focused on concerns over personal safety from crime (Willis et al., 2015)

Many studies examine perceived safety with a focus on neighborhood features. For example, Delmelle and Delmelle (2012) found that bicycle infrastructure is associated with lower perceived concern over safety. Others have compared perceived safety across different types of streetscapes (Winters et al., 2012). For instance, Winters et al. (2012) found that major streets with shared lanes and no parked cars have the greatest perceived risk while multiuse paths have

the lowest. Overall, these studies indicate that cyclists perceive greater safety when cycling within infrastructure separated from traffic.

Though objective and perceived safety are measured differently, there is evidence that they are closely related. For example, Winters et al. (2012) compared the objective and perceived risk of different types of cycling infrastructures in Toronto and Vancouver and found that there was little discrepancy between perceived and objective measures. Further, regardless of how safety is measured, cycling infrastructure has consistently been associated with higher rates of cycling participation (Manaugh et al., 2017), which, in turn, can increase the effect of the “safety in numbers” trend discussed earlier. There is also evidence that both objective and perceived safety are not experienced evenly across the population, which will be explored in the next section.

Who is safe? Who feels safe?

Research on both objective and perceived safety has also examined how these factors vary across social and demographic factors. For instance, risk of fatal injury per kilometer cycled has been found to be higher for people aged 65 years or older (Elvik, 2021). Past experience cycling, measured as number of bike trips per week, number of years’ experience cycling, or distance cycled per week, is associated with reduced risk of injury as well (Hollingworth, 2015). The type of bicycle you ride may also influence safety. Notably, recent work has examined safety considerations for electric bike (or e-bike) riders, an increasingly popular emergent technology that may be associated with greater injury risk and severity than conventional bikes (Elvik, 2021)

The literature on cycling safety has focused considerable attention on “sex” and/or “gender”, largely depending on the disciplinary home of the scholar(s). When controlling for past experience and/or distance cycled, some studies have found that women experience lower injury

risk than men (Hollingworth, 2015). Much of the work on gender and safety has focused on perceived safety and many studies have found that women express greater concern over safety than men in places with low cycling rates (Ravensbergen, 2019). Indeed, women's great concern over safety has been put forth as an explanation for the gender-gap in cycling, the trend whereby women represent approximately one third of cyclists in low-cycling areas (Ravensbergen, 2019). In other work, we have taken issue with such normative, almost biological, explanations for this gender-gap that often rely on the gender binary and fail to capture social constructions of gender and how gender interacts with other axes of social difference (Ravensbergen, 2019). There is some evidence that safety concerns are larger barriers to other social groups as well, such as children (Clayton and Musselwhite, 2013). Research has also begun considering the relationship between race, ethnicity and/or income and cycling safety in recent years. Cycling and walking are often examined together here, and evidence indicates that income and ethnicity-based disparities exist in safe walkable and bikeable environments (Yu, 2014). Taken together, research considering equity and cycling safety has found that cycling experience, bicycle type, age, gender, race, and income, can influence one's risk of injury and perceptions of safety.

Cycling as Mobility Justice

Research on cycling safety has had important impacts on the ways in which we plan and design cycling infrastructure. Little of the work on cycling safety, however, has yet to engage fully with more critical approaches to mobilities, such as recent developments of mobility justice. Though there is no consensus on the definition of mobility justice, Sheller (2018) theorizes it as “an overarching concept for thinking about how power and inequality inform the governance and control of movement, shaping the patterns of unequal mobility and immobility in the circulation of people, resources and information” (p. 23). The remainder of this chapter advances a

conceptualization of cycling safety as mobility justice, whereby the ability to feel safe cycling is constructed as a product of intersectional and multi-scalar mobile power relations.

Centering Power in Cycling Safety

Viewing cycling safety as mobility justice requires thinking through intersecting power relations at multiple scales (e.g., among bodies, streets, cities, nations, and global systems). While cycling safety has been examined at both the scale of the individual and the neighborhood, much of the current cycling safety literature has yet to consider how power relations permeate one's ability to feel safe while cycling at these scales. For instance, the domination of motorized vehicles on public streets greatly impacts safety. Bicycle activism has a long history of questioning the logics of unequal road space allocation and governance, and some researchers have examined this dominance on road safety as well. For instance, some have argued that campaigns promoting helmet use place the responsibility for being safe on the cyclist (rather than the driver), all the while constructing the cyclist as the road user in need of protection (i.e., the unsafe road user). Cycling is not intrinsically a very dangerous activity (crashes that do not involve motor vehicles tend not to cause serious injury) instead, the danger is imposed on cyclists in dangerous environments (Jacobsen and Rutter, 2012).

The role of the cyclists in policing their own safety has been found empirically as well. In a qualitative study of commuter cyclists in the UK, interviewees discussed how they fought for space and respect on the streets and mentioned having strategies to keep safe from cars, the dominant form of travel. These cyclists also expressed frustration about the lack of emphasis on driver behavior in cycling promotion (McKenna, 2007). Similarly, Aldred (2013) has shown that some cyclists expressed how they got out of the way of traffic in order to perform as the 'good

cyclist', a practice that "indicate[s] the power of the discourse that it is cars that belong and take precedent on the roads" (p. 265).

Perhaps unsurprisingly, this work on cyclists' internalized responsibility for their safety tends to originate from places characterized by car-oriented design where the dominance of motorized vehicles is particularly strong. In these places, car-oriented design results in negative externalities at multiple scales. At the local scale, cities have undergone incredible restructuring to make room for the automobile (e.g., nearly one-half of Los Angeles is devoted to car-only environments). Furthermore, approximately one million people are killed each year, and many millions more are injured, in road accidents. Cars also produce emissions responsible for localized air pollution and global ozone destruction, and greenhouse gas emissions contributing to climate change (Urry, 2004). While the car's countermovement has grown in recent years, some have argued that it tends to place blame on the car itself, rather than challenge the source of the problem: our car dependence, or what Urry (2004) coined the "System" of Automobility

This System of Automobility is made up of numerous interdependent relationships between the automobile and social, political, cultural, geographical, historical, and technical systems. For instance, the system of automobility is deeply embedded with other industries such as road building, oil production, car repair and sales, and highway gas and rest stations. As such, dismantling automobility has social and economic effects beyond the automobile industry. The system of automobility is also social, for example the car comprises dominant discourses around what constitutes a 'good life'. This system produces and reproduces the domination that the car holds on many cities (Urry, 2004). In many contexts, cyclists (as well as pedestrians and transit riders) exist within this system of automobility where motorized vehicles are a powerful driver of complex and diverse processes. Cycling safety as mobility justice views cyclists as embedded in

automobility. Therefore, cyclist's safety is not solely a question of being safe from individual cars but being marginalized in a social system in which motorized vehicles are dominant. This system of automobility frequently places the responsibility for cyclist safety in the hands of the cyclist – the 'vulnerable road user' – resulting in victim-blaming when cyclists are injured. The solution lies in proving safe cycling environments, in other words in dismantling the very system where cars put cyclists at risk.

Considering intersectionality

When considering cycling safety as mobility justice, one must not solely consider how power relations due to the system of automobility influence cyclist safety, but also how these relations intersect with other axes of privilege, domination, and oppression. Doing so broadens discussions of safety to include other important safety considerations on city streets such as sexual and police harassment. Coined in 1989 by Kimberlé Crenshaw, intersectionality offers an analytical framework for understanding how one's identities combine to create different experiences of discrimination. This work originated from Crenshaw's critique that feminist and antiracist activism could omit the experiences of black women (Crenshaw, 1989). In the realm of transport, for instance, proposed policies meant to help women feel safe such as increased police presence can overlook the fact these policies can have the opposite effect on many women, particularly BIPOC (Black, Indigenous, and people of color) women.

The Untokening (untokening.org), a multiracial mobility justice collective, has argued that framing safety as Mobility Justice requires not solely focusing on protection from cars (and the people driving them), but to consider how safety is experienced differently by people embodying intersecting marginalized identities. Indeed, placing the responsibility for safety on the vulnerable road user does not solely exist for cyclists, as discussed above. Women and gender

minorities, BIPOC, and members of LGBTQ+ groups are also forced to take disproportionately more responsibility for their personal safety on city streets. For instance, women have been socialized to feel fear in public space, an experience compounded by experiences of sexual harassment (Valentine, 1989). Many women use coping strategies to deal with safety concerns, such as avoiding ‘dangerous places’, traveling with an escort, and avoiding confrontation (Dunckel Graglia, 2016). Black youth have also been found to employ strategies to navigate and avoid police contact (Fox Williams, 2019). These strategies exemplify the internalization of responsibility for personal safety. When vulnerable road users, be it cyclists, women, or BIPOC, take on responsibility for their own safety, not only does the responsibility for safety wrongly fall on the vulnerable road user, but the strategies employed by vulnerable road users to stay safe affect how people use public space and can constrain their mobility.

There is nothing inherent or biological about the internalization of safety— rather this is a result of unequal power relations, lived experience, and generational aspects of both. In her seminal work “The Geography of Women’s Fear”, Valentine (1989) calls women’s inhibited use and occupation of public space a “spatial expression of patriarchy” (p. 389). Similarly, the ability for BIPOC or members of the LGTBQ+ community to feel safe in public space is shaped by spatial and relational expressions of racism and/or homophobia. Quite simply, why wouldn’t it be the case that what we might often think of as spatially fixed experiences of racism and misogyny would translate into mobile settings? Indeed, a study of cyclist experiences in Portland, Oregon, found that racial profiling and gender-based violence can discourage bicycling amongst women and people of color (Lubitow et al., 2019). Mobility justice opens avenues to consider that cyclists’ ability to feel safe is a combined spatial expression of automobility, patriarchy, racism, classism, and other systems/forms of discrimination and oppression.

Figure 1 outlines these dynamics. Framing cycling safety as mobility justice, automobility can be posited as one of the many societal intersecting axes of power, domination, and oppression. The ability to feel safe while cycling is a product of where one sits in this complex intersection of mobility, gender, race, and other axes of power. The power relations included herein are not comprehensive – they merely present three of the power relations discussed in this chapter.

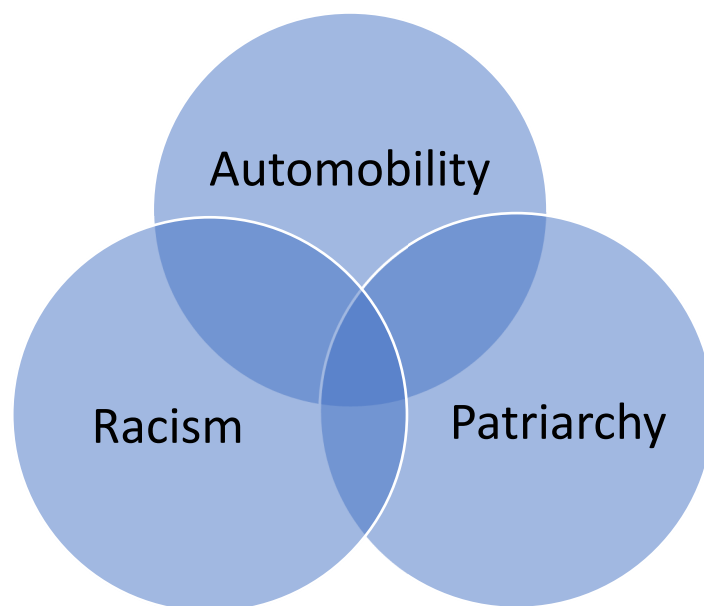


Figure 1. Cycling Safety as the Outcome of Intersectional Power Relations

Empirical evidence supports this framing as well. A study examining the impact of a bicycle course on women found that participants had to not only develop competencies to share the road with motor vehicles (automobility), but also to navigate sexual harassment and negotiate masculinized public bicycling space which requires assertiveness or tolerate aggressiveness (patriarchy) (Sersli et al., 2021). In another study focused on newcomer and refugee cyclists, safety concerns included negotiating road space, sexual harassment, and worries about

interactions with law enforcement – highlighting how safety was produced at the intersection of automobility, patriarchy, and racism (Ravensbergen et al., 2020a). These results are also supported by Charles Brown’s recent work on #Arrestedmobility which focuses on the constraint to Black people’s mobility, including over-policing. The death of Dijon Kizzee following an alleged cycling violation at the hands of Los Angeles police demonstrates the importance of considering policing in cycling safety (Olzer, September 29 2020, Ravensbergen et al., 2021).

Context matters greatly, as the experience of gender, race, and riding a bicycle is shaped by a place’s geography and history. For instance, depending on where you are, riding a bicycle in public can be perceived as a loss in status or as a trendy way to commute. These associations intersect with identity as well. In a study in Toronto, Canada, participants associated cycling with masculinity and as a means of travel for people from lower-income households (Ravensbergen, 2020). In another study, this time in London, UK, gendered, ethnic, and class identities shaped participants’ decision to cycle (Steinbach et al., 2011). Further, the dominance of the automobile varies greatly geographically. For example, cars are less dominant in cities famous for cycling such as Amsterdam and Copenhagen than more car-dominated cities including London and Toronto. Scale is important here too, as within these cities automobility is experienced unevenly. For example, parts of Copenhagen are car-centric while select districts of Toronto that have over a 30% cycling mode share (Ravensbergen et al., 2020b).

Cycling safety as mobility justice requires thinking through how automobility, patriarchy, racism, and other axes of power influence cycling safety, as well as how these dynamics are shaped by, and shape, place across these scales. For instance, take women’s concern over cycling safety. As discussed earlier, women consistently report greater concerns over traffic safety than men in places with low cycling rates, a trend which has been put forward to explain the gender-

gap in cycling. In places with high cycling rates, such as Amsterdam, the gender-gap appears to disappear (Ravensbergen, 2019). As Aldred et al. (2016) note, cycling in car-centric places can be perceived as a high-risk activity associated with bravery and confidence – characteristics that comply with hegemonic masculinity. Therefore, both automobility and patriarchy shape, and are shaped by, gendered concerns over safety. Using Toronto as an example again, similar rates of male and female cyclists can also be found within high cycling neighborhoods (Ravensbergen et al., 2020b). Within car-dominant Toronto, there are sections of the city that have begun to dismantle automobility. This does not mean, of course, that patriarchy has been dismantled in these communities. For example, many women may experience sexual harassment in these high-cycle areas. And within high-cycle areas, not all women have the same experiences of cycling. For instance, a recent study in Grenoble, France, found that racism and Islamophobia resulted in challenges creating bike programming that disproportionately targets Muslim women (Vietinghoff, 2021). Cycling safety as mobility justice requires thinking deeply about how, in this example, women’s experiences of safety lie at the intersection of safety from traffic, from harassment, and from exclusion and are the product of complex context-specific relationships between automobility, patriarchy, and racism.

Conclusion

Framing cycling safety as mobility justice presents opportunities for holistic and comprehensive studies of cycling safety that are historically and geographically rooted. This approach also dampens the tendency to essentialize cycling safety, i.e., to view differences between subjects as natural, or biological and to overlook power relations between these social categories. Just as different people do not have to experience mobility differently, there is no biological, natural reason for them do so, cycling is not innately dangerous – and cities are not inherently destined

to be car dependent. Indeed, recent shifts toward people-focused planning demonstrate that cities can take-back their streets from automobile dominance. By tackling the socially constructed and multi-scalar power relations shaping cyclists' safety, possibilities emerge not only for the cycling city, but for a truly safe and just cycling city which takes steps to dismantle systems of automobility, patriarchy, racism, and classism. We invite not really a departure from the ongoing and important work focused on other types of cycling safety – but rather we encourage greater reflection on the possibilities lying at the intersection of work on safety, mobility justice, anti-racist praxis and so on. This would involve broadening discussions of safety to include crime and sexual and police harassment, amongst other concerns, alongside safety from motor vehicles. Further, this holistic approach would require understanding the power struggles at the root of cycling safety, power struggles which currently result in the internalization of safety and victim blaming of vulnerable road users. Mobile bodies are also raced, and gendered bodies, and indeed experiences of cultural and other forms of violence perpetrated against immobile subjects may translate into the mobile realm - producing safety concerns that reach well beyond the physics of vehicular collision.

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