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Becoming Urban Cyclists

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Appropriating the Bicycle: Repair and Maintenance Skills and the Bicycle-Cyclist Relationship

All cyclists are sooner or later faced with a puncture or another mechanical issue, and becoming an urban cyclist requires to learn ways to deal with these issues. For cyclists, mastering repair and maintenance skills contributes to safer riding and to higher confidence on the road, especially for longer or unusual trips. These skills are also related to their identity as a cyclist (Aldred, 2013). They are not only useful when cyclists engage themselves in the repair and maintenance of their bicycle but also when they choose to outsource these operations to a professional bicycle mechanic, since it allows them to be confident and informed during the commercial transaction that it entails (Akerlof, 1978). The acquisition of repair and maintenance skills is thus a major step for individuals aiming to become urban cyclists, a step made more difficult by the fact that many people only become frequent cyclists as adults (Buhler, 2021). Despite this, the mechanisms at play when learning these skills have not yet been explored in scientific literature.

In order to understand how urban cyclists learn how to repair and maintain their bicycle, it is necessary to understand the relationship between cyclists and their bicycle. When repairing or maintaining a bicycle, individuals engage with the material object in an embodied practice (Dant, 2010) in which competences play a major role (Shove et al., 2007). This material interaction of repair and maintenance echoes the material interaction which occurs in the course of bicycle riding and the overall bicycle-cyclist interaction which is at the chore of cycling practices (Spinney, 2006). It is thus important to understand how the relationship between the cyclist and their bicycle is transformed by learning bicycle repair and maintenance, and reciprocally how bicycle repair and maintenance skills can be acquired through the bicycle-cyclist relationship.

In this chapter, I follow the appropriation theory by Daniel Miller as a framework and argue that the development of repair and maintenance skills can be seen as an appropriation of the bicycle. The relationship that cyclists maintain with their bicycle is different according to their repair and maintenance skills. As cyclists develop bicycle repair and maintenance skills, the instrumental relationship that they maintain with their bicycle is transformed. By acknowledging the central role that the bicycle-cyclist relationship plays in the acquisition of bicycle repair skills, we can reframe our perspective of what it means to become an urban cyclist.

For this aim, I dwell on data collected in the cities of Lyon and Melbourne: these two cities have a similar cycling mode share and similar goals regarding the development of cycling practices, but they belong to countries where different cycling cultures prevail, and where different infrastructure is available when it comes to bicycle repair and maintenance. Interviews were conducted with urban cyclists who are either very inexperienced or very experienced regarding repair and maintenance skills. This allows to better understand the skill learning processes and their mechanisms within cyclists' daily lives. This data allows to show the intertwining of repair and maintenance skills and the bicycle-cyclist relationship, and to identify the bicycle-cyclist relationship as a place where repair and maintenance skills are acquired, whether on or with the bicycle.

Theoretical Framework: the Bicycle-Cyclist Relationship and Appropriation

This chapter dwells on bicycle repair and maintenance as a form of appropriating the bicycle. In this section, I first argue that researching repair requires considering the materiality of bicycles and the nature of the bicycle-cyclist relationship. I then review the existing literature on the bicycle-cyclist relationship, and introduce Daniel Miller's theory of appropriation (1987) as a relevant framework for analyzing the development of bicycle repair and maintenance skills within the bicycle-cyclist relationship.

Repair Practices and the Materiality of Cycling

In European and Australian cities, urban cycling has been rising in the last two decades (Héran, 2015). This was followed by the development of bicycle shops catering to urban cyclists who are not able or willing to engage in repair and maintenance themselves. Despite this, it is still widely considered among cyclists that a good cyclist is able to repair and maintain its own bicycle, to the extent that cyclists with low repair and maintenance skills may not feel legitimate (Aldred, 2013). The boom of community workshops¹, places where it is possible to repair one's bicycle oneself with the help of available tools and a volunteer, show that repair and maintenance are still valued as essential skills for most cyclists. Therefore, a thorough understanding of how individuals become urban cyclists has to include the processes through which they acquire repair and maintenance skills.

An investigation of the acquisition of repair and maintenance skills requires looking at the bicycle differently. Indeed, transportation research, which is increasingly concerned with cycling and its adoption by urban dwellers (Dill, 2019), does not focus on the materiality of the bicycle as an object, or on the relationship between the cyclist and the bicycle. To some noticeable exceptions (Cook and Edensor 2017 ; Spinney 2006 ; Strömberg and Karlsson 2016), it overwhelmingly assumes that all cyclists ride a standard two-wheeled bicycle with similar average speed, and in good condition. However, when walking in urban areas, it is not uncommon to see a bicycle parked for months, lacking a wheel or a seat (Larsen and

¹ Website of l'Heureux Cyclage. 2020. « Les ateliers en France ». Accessed May 10, 2020. <https://www.heureux-cyclage.org/les-ateliers-en-france.html>

The number of community workshops registered by the French national network of community workshops grew from 6 in 2005 to over 350 in 2020

Christensen 2015). It is also usual to hear the rattling chain of a cyclist on the move, or to see that someone is riding a bicycle with deflated tires. These common observations act as reminders that bicycles are not only a way to get from A to B, but that they are also material objects with specific aesthetic or technical characteristics, with a specific history, carrying the name of a given manufacturer, and that they may be or not in good condition. Bicycles can break down, they age and decay. Considering repairs and maintenance processes means focusing on the material world and its underlying order (Graham and Thrift 2007). A focus on bicycle repair and maintenance may allow us to rethink our relationship with the material goods surrounding us.

The Bicycle-Cyclist Relationship

Understanding bicycle repair and maintenance practices and the acquisition of the related skills requires considering the materiality of the bicycle as well as the nature of the bicycle-cyclist relationship. Research in social psychology argued that the relationship between car drivers and their cars included three main dimensions: an instrumental one, an affective one and a symbolic one (Steg, 2005). The relevance of the affective (Coleman, 2015) and symbolic (Ashmore et al., 2018) components of this relationship is increasingly recognized, and these dimensions seem to be affected by the development of repair and maintenance skills (Abord de Chatillon, 2019). This chapter focuses on the instrumental dimension of the bicycle-cyclist hybrid, the most relevant when discussing repair and maintenance. That is, this paper only reflects on the relationship of the cyclist with the bicycle as a tool, and not as an object of affection, pride or a way to acquire social status.

One way of understanding the instrumental relationship between the cyclist and their bicycle is provided by Warnier's research on techniques and tools (1999). According to Warnier, when using a tool, an individual integrates it into their "corporal scheme." This is illustrated by the case of someone using a hammer; the hammer becomes an extension of this person's hand, they do not focus on the contact between their body and the hammer but on how the head of the hammer can hit the nail. This subject-object integration was also described in the field of mobilities research, with for instance the case of windsurfing (Dant 1998 ; Dant and Wheaton 2007) and of car driving (Dant 2004 ; Urry 2006). When it comes to cycling, the bicycle-cyclist hybrid is described by Spinney (2006). Following Ingold, he argues that "*The bike and body are thus produced as one: refined and maintained in conjunction with each other through and within movement.*" As an example of the way the hybrid expresses itself in action, Spinney adds: "*Gearing is felt by the rider – the machine asking the rider to maintain a circular movement, perhaps lower or raise the speed of the rider but maintaining movement of the legs and lungs at a manageable pace.*" (2006, 719). To some extent, within the bicycle-cyclist hybrid, the rider experiences mechanical issues of the bicycle as if it were its own.

While the cyclist is on the bicycle, the complex matter of the instrumental relationship they maintain with their bicycle is expressed through the bicycle-cyclist hybrid. However, the bicycle-cyclist relationship also exists in a wider context, for instance when the cyclist considers cycling for keeping fit or plans for getting their groceries by bicycle; the bicycle-cyclist relationship does not disappear when the cyclist dismounts. Bicycle repair and maintenance is likely to impact this relationship at both levels. For instance, if a gear cable of the bicycle is damaged, it means that while on the bicycle, the cyclist is unable to change gears and may struggle when riding uphill, but also that their choice of where to ride and what

activities to conduct with the bicycle will be different (the cyclist may choose to avoid some hilly areas, to carry a lower weight or to stop riding the bicycle at all).

As argued above, studying repair and maintenance practices requires considering the bicycle-cyclist relationship. However, the nature of the link between these two things is yet to be explored. The following section introduces the theory of appropriation, a framework that allows considering the acquisition of repair and maintenance skills together with the development of the bicycle-cyclist relationship, as part of one same process of consumption.

Appropriation and Seeing Cycling as a Form of Consumption

In *Material Culture and Mass Consumption*, Daniel Miller (1987) applies theories developed by Hegel, Marx and Simmel in order to describe the relationships that individuals in our society maintain with manufactured objects surrounding them². Miller argues that objects constitute society: they act as bricks of our social lives and frame social interactions. The industrial era gave rise to the mass production of everyday objects, from which we may feel alienated if we consider the conditions in which they were produced. However, this mass production goes together with mass consumption and we must regard the acquisition and use of manufactured objects as a true *work* of consumption, through which meaning can be transferred back into the objects while they are reintroduced into the social lives of the subjects.

Consumption as work translates the object [. . .] from being a symbol of estrangement and price value to being an artefact invested with particular inseparable connotations. [. . .]The object is transformed by its intimate association with a particular individual or social group, or with the relationship between these.

(Miller, 1987, 190)

This act of consumption as a process, that Miller successively calls “objectification” and “recontextualisation” will be termed “appropriation” here, in order to fit the argument of this paper. It allows considering the daily use of objects, their consumption, as belonging to a more general process through which individuals or social groups shape and appropriate material culture instead of considering it as “alien.” It also allows considering bicycle repair and cycling as practices that, despite their differences, are both constituted of an interaction between the cyclist and their bicycle, and therefore both contribute to the cyclist appropriating their bicycle.

This paper uses the theory of appropriation as a framework through which discussing the development of bicycle repair skills. It explores bicycle repair and maintenance as an appropriation of the bicycle as well as how this process unfolds within the instrumental aspect of the bicycle-cyclist relationship. I argue that when acquiring bicycle repair and maintenance skills, a cyclist sees the instrumental relationship they have with their bicycle transformed. The theory of appropriation allows integrating this interrelation between repair and maintenance skills and cycling practices into a new understanding of learning repair skills.

² I would like to thank Sophie Chevalier for pointing Miller’s work to me as relevant during the AnthroVilles annual congress in November 2019

Methodology

This chapter is based on data collected in the frame of an ongoing global research project in the cities of Lyon, France and Melbourne, Australia, two cities with a cycling mode share inferior to 4%. A mixed methods methodology was carried on, with the integration of qualitative and quantitative data. A survey was distributed to local cyclists of both cities, asking them about their repair skills and experiences, with more than 450 survey responses in each city. Furthermore, semi-structured interviews were conducted with 100 individuals involved with repair among which bicycle mechanics, bicycle shop owners, community workshop volunteers or employees and regular cyclists with diverse repair and maintenance experience and skills. This data was completed with regular participant observation in three community workshops (two in Melbourne, one in Lyon) and with the regular repair and maintenance of my own bicycle in both cities.

The main material used for this paper are interviews conducted with 35 regular cyclists who were recruited either for their very low or high experience regarding repair and maintenance according to their responses to the survey (among those who had consented to leave their contact details). An account of cyclists interviewed according to their city of residence and their experience regarding repair and maintenance can be found in table 1. The interview extracts present in this chapter were translated from French to English when necessary.

	Melbourne	Lyon	Total
Cyclists interviewed on Total their repair history	25	10	35
High experience in repair and maintenance	10	6	16
Low experience in repair and maintenance	15	4	19

Table 1. Interviews conducted in Lyon and Melbourne.

Although both cities have similar cycling mode shares and evolution, with a trend towards the development of electric bicycles, they differ when it comes to the type of bicycles used. Among others, Melbourne's cyclists are more numerous to ride on road bicycles than Lyon cyclists, who favour hybrid or city bicycles. This is due to a more widespread sports culture and the lower density of the urban area, which results in longer distances ridden on average. Furthermore, with an older cycling culture, Lyon has a larger second-hand market for bicycles, and Lyon cyclists are more likely to have purchased their bicycle second-hand rather than new (50% of them did so, in comparison with 29% of Melbourne cyclists surveyed). As a result, Lyon cyclists ride on bicycles that are on less good condition than Melbourne's cyclists do, as illustrated in figure 1.

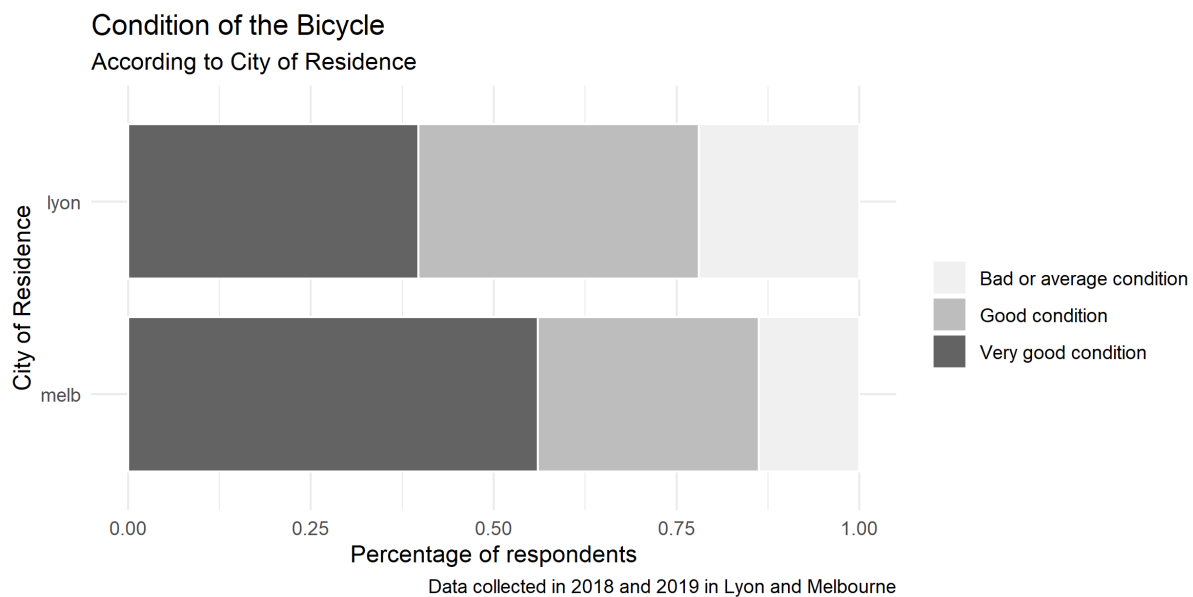


Figure 1. Self-assessment by Survey Respondents of the Condition of their Most Used Bicycle According to the City of Residence.

Another important difference between both cities is the resources available to residents of each of them when it comes to repairing. Indeed, the important rise of community workshops in France did not meet any equivalent in Australia: in Melbourne, there were only two workshops of this kind whereas there were eight of them in Lyon, a city with half as many inhabitants. Furthermore, French community workshops benefit from a strong local and national network supporting them, which was not the case of Australian workshops at the time of this study.

In this chapter, this international case study is not developed in a comparative aim since the arguments introduced here regard the general attitude of cyclists regarding cycling, repairing and maintaining their bicycle and the processes of learning occurring within these practices. However, the international setting in which this study was conducted helped to highlight a diversity of repair ecosystems and affordances, which may affect repair and maintenance practices. This allowed me to meet interviewees with more diverse backgrounds and attitudes related to repair for a more thorough understanding of the acquisition of repair skills. In the two following sections, I use the appropriation framework to describe different attitudes regarding repair and the bicycle-cyclist relationship. The first one is devoted to highlighting the difference between cyclists who have appropriated their bicycle and others who, on the other side of the spectrum, feel alienated from them. The second one focuses more precisely on the processes behind the appropriation of the bicycle.

The Different Stages of Appropriation

A first analysis of the survey results shows that self-assessed ease with repair operations and frequency of bicycle use are positively correlated among cyclists ($\chi^2 = 15.84$, $p = 0.003$). This result is illustrated in the graph below. This highlights a relationship between the ease with the bicycle and the ease with repair and maintenance operations, which together constitute what we call “appropriation.”

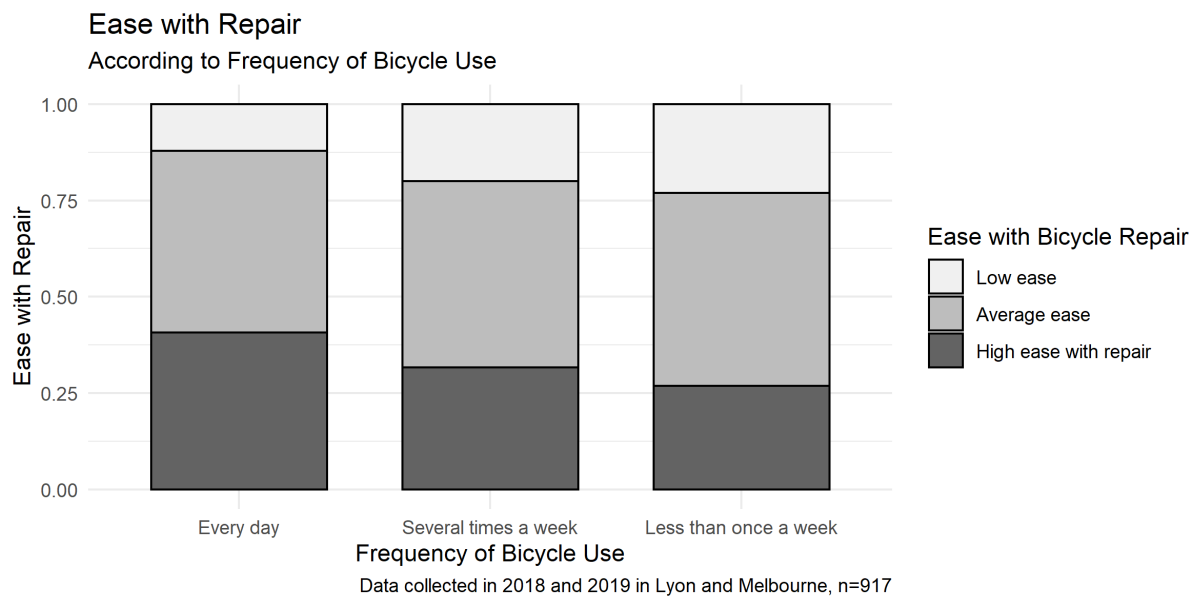


Figure 2. Self-assessment by Survey Respondents of how at Ease they are with Bicycle Repair According to their Frequency of Bicycle Use.

In this section, I draw extreme cases of alienation from, and appropriation of, the bicycle in order to emphasize the nature of this process and the way it unfolds both on the bicycle and with the bicycle. This allows a better understanding of how the bicycle-cyclist relationship and repair and maintenance skills are intertwined with each other.

The Bicycle as an Alien: Lack of Appropriation of the Bicycle

The cyclists who were the least experienced in bicycle repair and maintenance often had a lower instrumental relationship with their bicycle. Although some of them cycled very frequently, they did not know their bicycle either. They used it in ways that were less adapted to their practices and felt overall less comfortable while on their bicycle, which was to some extent considered as alien to them. This lack of repair and maintenance skills constitutes, together with a different relationship with their bicycle, a lack of appropriation of the bicycle. I describe below some aspects of this alienation through the example of Ellie, one cyclist who is very inexperienced regarding bicycle repair and maintenance. Ellie's situation is rather extreme and should not be considered as widespread among cyclists, but it illustrates some forms this lack of appropriation may take.

One aspect of Ellie's low experience with bicycle repair is her fear to engage with anything mechanical, and what she called a general, "phobia of tires."

I push myself to learn lots of other things but when it comes to the bike . . . anything mechanical is quite intimidating.

Ellie, Melbourne

Below, Ellie's example is used in order to identify four aspects of the alienation that a cyclist may experience from their bicycle. These aspects are the lack of anticipation, the shortage of vocabulary, the lower social integration as a cyclist and the dependency on others.

Lack of Anticipation

One thing that many cyclists who are inexperienced in bicycle repair and maintenance describe is a lack of anticipation of mechanical issues. Like many other cyclists in her situation, Ellie often experienced mechanical issues that she did not anticipate. For instance, she recalled of an accident which could have been avoided if she had understood warning signs:

For several years, my front handles would rock. [. . .] One day, my handles completely fell off! I was riding and they just flew off into the air [laughs], luckily I got off my bike, I didn't fall or anything.

She also mentioned a period of several months during which her tires kept deflating day after day, something that must have made her riding extremely uncomfortable and could have been solved easily if she had addressed this issue. These examples show how a lack of repair and maintenance skills can prevent a cyclist from detecting, understanding and treating warning signs that their bicycle is sending them. Being inexperienced in bicycle repair and maintenance does not only mean that an incident is less likely to be anticipated, but also that cyclists are more likely to ride an ill-adjusted and uncomfortable bicycle, because they are less aware of the condition of their bicycle.

Socializing to Bicycle Repair Through Vocabulary

One aspect of this lack of appropriation is the shortage of precise vocabulary to talk about her bicycle.

I say "left and right brake" instead of "front and back brake," that kind of thing.

So he actually fixed the tires, he gave me new brake cables, he gave me new . . . something else, and something else, at the same time.

Ellie has the feeling that she does not understand how a bicycle works and moreover does not know the right vocabulary. As discussed by several material culture scholars, procedural knowledge is very difficult to put into words (Watson, 2006) and in some manual professions, it is considered inappropriate to describe or explain a technical action (Delbos & Jorion, 1990). Despite this, the knowledge of a specific vocabulary and way of speaking is often key to the socialisation to a new practice, as illustrated by Agnès Jeanjean's work with construction workers (Jeanjean, 2009). This is also the case for cyclists who, as a community, find themselves united around a common vocabulary (Caimotto, 2021). In this context, Ellie's feeling of alienation is thus driven not only by a lesser knowledge of how things work, but also by a lower mastery of specific vocabulary.

Socialization and Social Integration

In a paper dedicated to women weaving carpets in the Sirwa region of Morocco, Naji shows that the women engaging with practices of weaving use this material interaction in order to redefine their feminine identity, give themselves self-worth and position themselves in society (Naji, 2009). Similarly, the practice of bicycle repair and maintenance contributes to feeling legitimate as a cyclist (Aldred, 2013). This is expressed by Ellie, who regularly mentions friends of hers who are more knowledgeable than she is at repair:

I have a friend who welds bikes together. By contrast, I would never touch the gears.

The same thing happens to her in her workplace:

As an avid cyclist, people talk to me about how bikes work but when they talk to me. . . I just smile. Because where I work is a depot, it's rather uncommon to cycle there so people talk to me about bikes all the time and I'm just like "oh yes, I understand."

Ellie thinks that it would be easier to bond with her colleagues if she was more knowledgeable about bicycles. She sometimes even pretends that she understands what they are talking about in order to fit in the conversation.

Dependency on Others

One aspect of the alienation from one's bicycle is the dependency on others that it creates. Ellie describes how, for a long time, her father used to maintain her bicycle.

Yes, and I wasn't riding it that much, and then my dad would come over and all he would do, now I do understand, he tightened with an Allen key.

As illustrated in this quote, Ellie used to depend on her father not only for the repair of her bicycle, but also for knowing what to do and when; she herself did not understand why he used an Allen key on her bicycle until her handlebars eventually fell off.

Ellie also mentions going to the bicycle shop and hearing that way more things are in need of repair than she first thought:

For the last two years, I've usually taken in when it's in like destruction mode, like in term of the tires, I take it in for the tires and they will be like "oh okay, you actually need new brake pads, you need this and this and this," and it is legitimate.

Many interviewees for this project expressed similar views, not all of whom feeling that the bill they were handed after a visit to the bicycle shop was "legitimate". The feeling of being swindled is common when doing a transaction with someone more skilled about the product being negotiated (Akerlof, 1978), a situation in which cyclists have no choice but trusting the shop employees.

Ellie's description is one of someone who has not appropriated her bicycle. Indeed, she feels very uncomfortable with the mechanical aspects of her bicycle. She does not know the names of bicycle parts well and is sometimes reluctant to touch or attempt to repair them. This is detrimental to her ability to ride comfortably and leads to unexpected breakdowns and costs. She also depends on other people more than she would otherwise. Ellie's extreme example shows the diverse ways repair and maintenance skills constitute a relationship with the bicycle as a material object embedded in social relations. In the next section, practices of cyclists who are experienced in bicycle repair and maintenance are discussed to shed more light into the process of appropriation of the bicycle.

An Appropriated Bicycle

At the opposite of the spectrum, some people have acquired bicycle repair and maintenance skills and have a very different instrumental relationship with their bicycle: they have appropriated their bicycle. This appropriation constitutes a different relationship between the cyclist and the bicycle, but also with the social environment of the cyclist.

Knowing one's Bicycle

By learning bicycle repair and maintenance skills, cyclists appropriate the bicycle and their relationship with this object changes. The knowledge of how a bicycle works informs the

cyclist's experience of the ride. This is most obvious when diagnosing a mechanical issue, as shown in the example of Chloé, a cyclist who considers herself autonomous with most operations she engages with.

One gear cable broke down inside the gear shifter [. . .]. But that had started becoming noticeable, it is true that I had previously noticed that it was harder to shift gears and I think that the cable had started loosening already, maybe some threads had started breaking.

Chloé, Lyon

Chloé is knowledgeable about the composition of brake cables (made of threads) and can apply this knowledge to understanding and anticipating mechanical issues that she faces. She also masters the adequate vocabulary (shifter, gear cable) and is able to describe precisely what she experienced. This echoes the argument brought up by Harper (1987) who shows how a very thorough understanding of the materials and of the purpose for which the machine will be used is central to conducting repair operations.

Feeling the Bicycle

In the previous example, Chloé felt that the gears were shifting less easily than usual and, thanks to her knowledge of how a bicycle works, was able to interpret where this feeling came from. Her sensorial experience of riding a bicycle is informed by her repair and maintenance skills. In this case, the diagnosis occurred within the bicycle-cyclist hybrid. The mechanical specificities and the condition of the bicycle affect this hybrid, defined above as "the bicycle and the rider being produced as one." Like Chloé, cyclists experienced in repair and maintenance often diagnose mechanical issues while on the bicycle and can anticipate a mechanical issue before it occurs. This diagnosis is based on sensorial appreciations, as illustrated by Samuel:

Usually the first thing is hearing the chain, you can hear the chain squeak, yeah, and then you check the bike over again. And [. . .] when I'm riding I'll listen to it, so you can usually hear when a spoke is loose, it goes "queek, queek" so then I'll just flick the spokes just to listen to that, to adjust . . . keep the spokes tight..

Samuel, Melbourne

Samuel uses the sounds that he hears while riding (squeaky chain or loose spokes) to know what bicycle part needs to be repaired or maintained.

Appropriating the Bicycle and the Environment

Learning bicycle repair and maintenance is not only a relationship between the cyclist and the bicycle, but also with the surrounding environment. An example of this are two older road cyclists who were inflating their bicycles at a public bicycle pump in a park. Asked about why they thought inflating their tires was necessary, they answered that they were gone on a ride but suddenly realized that one of them was "unusually slow." "I usually beat him!" said the second cyclist, laughing. This reply shows the way the bicycle-cyclist hybrid works, through habit. The cyclists described here are experienced enough to know their respective rhythms as allowed by the physical efforts they invest, and thus know that any variation in those rhythms can only be caused by a mechanical issue such as deflated tires. This example reveals how developing repair and maintenance skills does not only mean appropriating the bicycle, but also the direct environment in which the repair and riding occur.

With the Bicycle

Appropriation does not only happen within the restricted frame of the bicycle-cyclist hybrid or at the scale of a bicycle trip only. Another aspect of it is the integration of the object into one's cycling practices. This is what Miller terms "recontextualisation." One example of such a thing is the following extract of a conversation with Aline, a woman who often carries groceries and her daughter on her Dutch bicycle.

I have a small hand pump, it works but it has more limited capacity and takes longer to inflate. And you know, you cannot see the air pressure displayed so you cannot be truly sure of where you're at. Even if, I do not need something that[. . .] I just need it to ride, to brake and when I ride my bike I usually plan my trip based on the lowest speed. I never worry about the time or think, "oh I have to be fast," and even if the tire isn't inflated perfectly at 3 bars as it should, well it's not so bad, it will just be harder for me but there isn't much at stake.

Aline, Lyon

Aline says that she does not mind her bicycle pump not being of high capacity since she does not cycle with the aim to perform. Her habit of inflating her tires as well as the resources she regularly uses are thus not ideal but adapted to what she considers her riding practices should be. Aline's confidence that she exactly knows what uses she has of her bicycle allow her to feel comfortable with her repair and maintenance practices such as they are. In this way, she has appropriated her bicycle since her repair and maintenance practices fit her idea of herself and of whom she is in society. Aline's situation is similar to that of people engaging in DIY attempts to renovate their kitchen described by Shove et al. (2007); indeed, the researchers show that DIY home renovation practices aim to align the material conditions of dwelling with desired life and social practices such as having dinner together as a family.

The examples cited above show how cyclists with experience in repair and maintenance relate differently, not only with their bicycle but also with their surrounding environment. Taken together, examples of cyclists with extremely different experiences of bicycle repair and maintenance serves to understand the process of appropriation of the bicycle. They demonstrate that bicycle repair and maintenance is not a skill that is carried by the cyclist, but that is shared between the cyclist, the bicycle and the social environment in which they find themselves. Learning bicycle repair and maintenance is thus a form of socialization, both to one's bicycle and to the surrounding environment.

Appropriation in Action

If, as argued above, repair and maintenance skills cannot be separated from the relationship that cyclists maintain with their bicycle and the environment, we must consider riding practices and experiences as central to the acquisition of repair and maintenance skills. In other words, bicycle repair and maintenance are not only learned in a classroom but also on the bicycle itself. The constant interaction occurring between the bicycle and the cyclist in the frame of the bicycle-cyclist hybrid and in the course of riding practices in general is also one of learning, it is part of the work which constitutes the appropriation of the bicycle by the cyclist. Reciprocally, acquiring repair and maintenance skills transforms the relationship between the cyclist and their bicycle which occurs in the course of riding practices but also inside the bicycle-cyclist hybrid.

In this final section, I show diverse ways in which appropriation occurs, and the diverse ways in which cyclists become familiar with bicycles in general, and more specifically with their own bicycle, in time.

Development of Repair Skills Through the Bicycle-Cyclist Relationship

The theory of appropriation allows considering the learning of repair and maintenance skills and the bicycle-cyclist relationship as intertwined. Consequently, the bicycle-cyclist relationship is one place where the acquisition of repair and maintenance skills occurs. In this subsection, I explore the learning of bicycle repair and maintenance as it happens within cycling practices, whether it is on the bicycle or with the bicycle.

Learning on the Bicycle: Within the Bicycle-Cyclist Hybrid

The first example of the acquisition of skills through riding is one mentioned above. Ellie's bad experience with bicycle handlebars falling off was one that she did not forget. It had her reconsider things she had not previously cared about and understand them differently. Acts of repair and maintenance, such as her father regularly maintaining her bike, were understood differently after the incident.

More generally, it is common for cyclists to discover something about how their bicycle works after a sudden breakdown of their bicycle. An example of this is Daniel, a cyclist who recounts a bicycle trip across New Zealand twenty-five years ago: this tour was an important life experience, but also a time where he learned a lot about how bicycles work, as shown in the following extract:

Thinking about that, when I did the trip, I learned a lot as I went. So I actually got a new chain when I came over to Australia, I had brought the bike with me, but I didn't realize that the shop that did it hadn't put on a new cassette. So I found out the hard way as I was going up in Kangaroo Valley, New South Wales, and it just kept slipping. Because it's a new chain and an old cassette, [. . .] it was slippery, it would come and go. I have learned since then that you've gotta pay for the whole thing. And I don't know why the shop didn't just do it.

Daniel, Melbourne

When his bicycle started changing gears without reason, Daniel identified this situation as not right. It is only afterwards that he understood where the issue came from and learned that changing a bicycle chain must be done in complementarity with the condition of the cassette. After this event, he had updated his bicycle repair and maintenance knowledge. Daniel recounted another frightening experience that occurred during this same trip. He had attempted to fit a new pair of brake pads on his bicycle and thought he did right. However, it did not work and as he was cycling downhill, the brake pads got loose and shredded the rubber of his tire.

Both examples given here are very dramatic, but they demonstrate how the appropriation of the bicycle proceeds from a back-and-forth between the application of mechanical principles regarding how the bicycle, as a machine, operates, and the sensorial experiences of riding that occur within the bicycle-cyclist hybrid. In both cases, what Daniel initially thought was right turned out to be wrong once he was actually riding, and the bicycle-cyclist hybrid was the place for a lesson of bicycle repair and maintenance. This phenomenon is what Freud termed "afterwardsness" (*nachträglichkeit*), and it highlights the way learning is not a linear experience but one where each new event recontextualises the previous ones (Delbos & Jorion, 1990).

Learning with the Bicycle: Outside of the Bicycle-Cyclist Hybrid

The bicycle-cyclist hybrid is not the only moment of bicycle riding practices in which repair and maintenance skills are learned. Indeed, similarly to the way people eventually decide to purchase an electric bicycle, the acquisition of repair skills can also be triggered by diverse events related to the general cycling life and projects of individuals (Marincek, 2021; Muggenburg et al., 2015). We can sort these events into three categories, each of which can be an opportunity for learning about repair: the intensification of riding practices, the transformation of riding practices and the continuation of riding practices.

A first category of key events is when cyclists *intensify their riding practices*. This can take the form of a house move, which extends the length of a commute, or of an upcoming trip. For instance, Caitlyn attended the basic bicycle maintenance workshop as a way to prepare for touring New Zealand by bicycle. *"I didn't know how to change a tire and I thought it would be important to learn before I went,"* she explained.

A second category of key events in the riding life of a cyclist is those related to a *transformation of their riding practices*. One example is the case of Florent, a man who, when his grandfather died and left him his old bicycle, decided to turn it into a fixed-gear bicycle as a new project. In the course of doing so, he ended up visiting numerous bicycle shops and asking them for advice about the mechanical aspects of fixed gear bicycles, and learning enough repair and maintenance skills to then decide to become a bicycle mechanic.

Another example of learning repair skills through the transformation of riding practices is the purchase of a new bicycle. For instance, Aline was once given money to purchase a good quality bicycle. She then searched for one that would have a similar braking system as the bicycle she used to ride as a child, pedal brakes. She recounted how this search made her aware of some technical aspects of the bicycle that she did not use to know:

It happened when I was looking for a pedal brake bicycle. The thing is, we often confuse pedal brakes with fixed gear or freewheel but it is not the same. That's it, this is how I have been confronted to, how I learned the difference between both and what I wanted and all. [. . .] I don't know how I could have learned otherwise.

Aline, Lyon

A third category of key events in cycling practices which lead to the acquisition of repair and maintenance skills is in the course of the *continuation of riding practices*. One example of this is Karen, a middle-aged e-bicycle rider who regularly goes to the bicycle shop for a service. Karin progressively established a relationship with the mechanics working there, who often give her advice on how to maintain her bicycle. For instance, as she recalls, they advised her to change gears more often, despite her not feeling the need to do so on her electric bicycle: *"When the bike chain had to be changed, the guys tried to explain to me how to use it better so that it would not happen that often, and I think I got better at it now."*

Another case of such an interaction is when she got advice from them on how to better inflate her tires: *"So again I went back and then they said, 'you got a lot of wear on your tires because you are not pumping them up enough' and blah blah blah. I said, 'no I've pressed them and they're fine!' but no, it was not as pumped up as supposedly it needs to be."* According to Karen, frequent visits to her local bicycle shop contributed to good relationship with the staff who then started giving her mechanical advice. Her regular riding habits and her social integration with the bicycle shop staff are two factors that contributed to her acquiring bicycle repair and maintenance skills,

among which the ability to guess whether the tension of her tires is sufficient by squeezing them.

These examples demonstrate how the acquisition of repair and maintenance skills may happen not only through formal learning in a classroom or a workshop, but also through the bicycle-cyclist relationship. It can occur on the bicycle, within the bicycle-cyclist hybrid, like when the bicycle breaks down unexpectedly, revealing a problem that existed before and could have been detected. It can also occur with the bicycle, when cyclists decide to intensify their practices, to transform them or while continuing them. One important point highlighted in this is the role that bicycle shops can play in the appropriation of bicycles by their owners. Indeed, even if this is not their primary aim, they can be an environment in which people learn about repair and acquire new cycling habits.

Development of the Bicycle-Cyclist Relationship Through the Acquisition of Repair and Maintenance Skills

The bicycle-cyclist relationship is central to repair and maintenance skills and practices. Reciprocally, developing repair and maintenance skills as well as repairing and maintaining one's bicycle contribute to appropriating the bicycle since it transforms the relationship that the cyclist maintains with it. This appropriation occurs both at the level of the bicycle-cyclist hybrid and generally, in strengthening the relationship that the cyclist maintains with the bicycle.

On the Bicycle: Development of the Bicycle-Cyclist Hybrid

Acquiring repair and maintenance skills transforms the bicycle-cyclist relationship, included at the very time of riding the bicycle, when the cyclist and the bicycle assemble into the bicycle-cyclist hybrid. An example of this is the testimony of Caitlyn, the cyclist who attended a bicycle maintenance workshop in anticipation to her New Zealand trip. According to her, her riding behaviour changed since she attended that workshop:

I probably inflate my tires more regularly now. I didn't realize that I needed to do it so often. I was riding around with probably close to flat tires, let's be honest. I had to change my brake pads myself as well [. . .] And that was good like, I felt confident to do that, to adjust the brake pads. That was fun. And now. . . I had a crash recently and now my brake pads need replacing again, on the front end, and I feel confident to do that, to just tinker.

Caitlyn, Melbourne

Caitlyn's testimony shows that developing repair skills impacted much more than her ability to intervene when her bicycle breaks down; indeed, the way she considers her bicycle was also transformed. She feels more confident when engaging with repair but also with experimenting. The workshop contributed to transforming Caitlyn's attitude regarding her bicycle and to her appropriation of it. Furthermore, the workshop led her to reconsider what is to her adequate air pressure in her tires: she now feels less comfortable riding with deflated tires than she used to. This illustrates a transformation of the experience of a cyclist within the bicycle-cyclist hybrid. Once again, acquiring repair skills contributed to the appropriation of the bicycle, as expressed in the bicycle-cyclist hybrid.

With the Bicycle: Development of Cycling Practices

Through learning repair and maintenance skills, cyclists see the instrumental relationship that they have with their bicycle transform, not only while riding but also in general. One example

of this is Barbara, a cyclist who decided to get some training on bicycle repair and maintenance, with the aim to become a professional bicycle mechanic. When asked about what changed in her cycling practices since then, she replied the following:

One of the main things is to not be too quick to throw away my bike. Now I know how to maintain my bikes, so it's okay. Particularly in bike shops, they're always quick to go 'get rid of that bike,' but actually I'm finding that I don't want an upgrade. I'm quite connected to my old vintage bike and I just want to maintain it to a point where it rides fine, it gets me from A to B. It's been a big shift, just knowing that you don't always have to upgrade. And also, I guess I'm more confident riding around, and I always carry around a tool set and stuff so if something happens I'll be able to do the repairs on the road.

Barbara, Melbourne

Barbara's case shows that the relationship with the bicycle is transformed by the acquisition of bicycle repair and maintenance skills. Indeed, acquiring knowledge affected the confidence with which she rides, and therefore where she rides to. Besides, learning these skills affected how long she keeps a bicycle instead of throwing it away, and allowed her to use her bicycle the way she wants instead of having to submit to what bicycle mechanics think is best for her. These skills therefore brought some autonomy into her riding practices.

The process of appropriation goes both ways; the acquisition of bicycle repair and maintenance skills transforms the instrumental relationship that a cyclist has with their bicycle, and the development of the instrumental relationship between a cyclist and their bicycle contributes to them acquiring new repair and maintenance skills. This happens at the level of the bicycle ride and of the bicycle-cyclist hybrid, but also at the general level of the cycling practices in which the cyclist engages.

Conclusion

In this chapter, the acquisition of bicycle repair and maintenance skills was discussed. Learning how to repair one's bicycle is still a major step for anyone wishing to become an urban cyclist (Aldred, 2013) but no previous research work has yet dwelled on this learning process. I argued that bicycle repair and maintenance practices must be understood together with the relationship between the cyclist, their bicycle and their environment. Indeed, cyclists who are experienced in bicycle repair and maintenance show a different relationship to their bicycle and their environment than inexperienced ones. Cyclists who are less skilled at repair and maintenance may feel alienated from their bicycle, as they depend on others to keep it in good condition. They are more often subject to unexpected breakdowns and costs. On the opposite, cyclists who are experienced in repair and maintenance are able to diagnose a mechanical issue while riding and to anticipate mechanical issues. As a cyclist acquires new repair and maintenance skills, they see their instrumental relationship with their bicycle transform and reciprocally, cyclists learn about bicycle repair and maintenance in the course of their cycling practices. This double movement constitutes a process of appropriation (Miller, 1987). Furthermore, the acquisition of repair and maintenance skills transforms the social relations in which cyclists are involved.

Highlighting this intertwining of cycling practices and repair skills allows a better understanding of what it means to learn how to repair a bicycle and of how this process occurs both on, and out of, the bicycle. The acquisition of repair and maintenance skills can occur on

the bicycle or at the level of usual or changing cycling practices, for instance when planning a bicycle trip abroad, or when purchasing a new bicycle. On the other hand, learning repair and maintenance skills transforms the sensorial experience of a bicycle ride and changes the opportunities and choices made in the course of general cycling practices.

This chapter shows the relevance of the theory of appropriation for reintegrating the materiality of the bicycle into the consideration of cycling practices, something that is often overlooked in scientific discussions of cycling. It also allows a focus on the embodied nature of cycling and the sensorial aspects of such a practice. This study has wide implications for policymakers aiming to develop cycling modal share, since it locates this mode of transportation as the interconnection between cyclists, bicycles as material objects, and their environment. Riding and repairing a bicycle are two skills that complete and strengthen each other in a process of appropriation of a bicycle. This chapter therefore highlights the importance of including bicycle repair and maintenance into the scope of cycling policies, and makes a point for designing bicycle repair and maintenance courses that take the cycling practices and lived experiences of their attendants into account. It shows that several aspects of cycling practices that are not usually seen as educational, such as riding one's bicycle or even falling off it, can actually contribute to the acquisition of repair and maintenance skills. As France and the UK recently released national bicycle repair vouchers³ in the context of the covid-19 pandemic, it is relevant to note that such visits also contribute to cyclists appropriating their bicycle.

In this chapter, I used the theory of appropriation in order to describe a general process that transforms the relationship between a cyclist, their bicycle and the environment. By doing so, I did not dwell further into the differences that diverse social groups and minorities may encounter in this process and the way it unfolds. Women's ease in engaging with, and learning about, bicycle repair and maintenance is inhibited by various mechanisms of exclusion (Abord de Chatillon, 2021). In a similar way, it is likely that the frequent obstacles faced by members of ethnic and class minorities when engaging with cycling (Steinbach et al. 2011 ; Lubitow 2017) contribute to deterring them from acquiring bicycle repair and maintenance skills and appropriating their bicycle. Scope remains for scientific research in the field of mobility to keep exploring the diverse meanings invested by cyclists in bicycle repair and maintenance practices.

³ See <https://www.coupdepoucevelo.fr/auth/home> and <https://fixyourbikevoucherscheme.est.org.uk/> for details about each national scheme

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