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Bike Kitchens and the sociomateriality of practice change: exploring cycling-repair relations

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ABSTRACT

Maintenance and repair of bikes – material interventions – are essential to sustain cycling practices. In this paper we explore the role of (bi)cycle self-repair workshops (Bike Kitchens) and the practices they enable to maintain cycling practices. We connect a sociomaterial understanding of assisted self-repair to Bike Kitchens' role in transformational mobility change. Empirically, we utilize our own experiences in organizing and running a small Bicycle Kitchen in Sweden in conjunctions with observations and interviews, drawing on theories of social practice, the sociology of materiality and repair studies. We develop the position that through deliberate engagement with the cycle as an entity, assisted self-repair practices provide flexible means of representing the transformative potential of cycling materialities. This has implications for the meanings attached to the cycle, cycling, repair and other associated practices. We argue that Bike Kitchens may engender epistemic practices useful to develop human-centered visions for re-imagining mobility and sociomaterial relations.

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Introduction

Progress in advancing people-oriented mobility is incremental while at the same time dominance of motorized individual transport continues to grow (European Environment Agency, 2023). Cycling as practices and cycles as technologies are assigned the role of potentially transforming urban mobility away from the automobile (Cox, 2022; Te Brömmelstroet et al., 2022, Spinney, 2016; Spinney, 2022). Yet, how cycling is conceived and governed follows entrenched rationalities of efficiency, speed and utility, strengthening adverse notions of ingrained mobility systems (Cox & Koglin, 2020).

Mobilities scholarship urges a move beyond solutionist approaches of technological substitution (Banister, 2011) and mobility fixes (Spinney, 2020, 2022). Mobilities scholars recognize that new points of intervention are needed to challenge, rather than to reproduce, existing ways of acting on urban systems, mobility (Ryghaug et al. 2022; Te Brömmelstroet et al., 2022) and cycling as a part of it (Cox,

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2022). In line with critical and imaginary mobilities, vélomobility scholarship developed as an antithesis to automobility (e.g., Cox, 2019; Koglin, 2013; Furness, 2007). Vélomobility advocates for fundamental change in the rationalities and assumptions underlining mobility, through substantiating people-oriented mobility imaginaries (Cox, 2022). Narrative approaches are argued to hold deep-reaching transformative potential, where mobility might be rethought as play, social interaction, commons and unnecessities (Te Brömmelstroet et al., 2022). In this article we investigate Bike Kitchens as representing an embodied approach to transformative societal change. Bike Kitchens link cycling to material care through convivial characteristics, by enabling mutuality, co-learning and self-sufficiency (Batterbury & Dant, 2019; Batterbury & Manga, 2022; Bradley, 2018; Schmid, 2019; José Zapata Campos et al. 2020).

'Bike Kitchens', 'community bike workshops' or 'DIY bike repair spaces' come in different organizational forms, but are frequently volunteer-run initiatives to support (bi)cycle self-repair and maintenance by providing a space to access tools, spare parts and repair assistance (Batterbury & Dant, 2019; Batterbury & Manga, 2022; Bradley, 2018). In doing so, they offer spaces for social as well as material relations (Batterbury & Vandermeersch, 2016). As part of social movements, Bike Kitchens are conceptualized as 'urban commons' in order to imagine and enact alternative urban futures that resist commodification (Bradley, 2018; Lange & Bürkner, 2018). Instead of economic productivity and efficiency; Bike Kitchens foreground the value of relational goods and volunteering as a 'productive' activity (Fitzpatrick et al., 2022), 'local-regional arenas of "collaborative governance"' (Herrle, 2015: 196 ff. as cited in Lange, 2017: 53) or (forms of 'self-governance', 2020). Some authors argue that in Bikes Kitchens visitors can become change agents in cycling advocacy (Batterbury & Manga, 2022; Rigal, 2023; Furness, 2007).

Previous research on Bike Kitchen and other community initiatives has explored their (potential) roles in (urban) socio-material transformations (Bradley, 2018; Marletto & Sillig, 2019; Seyfang & Haxeltine, 2012). Yet limited research has unpacked *how* Bike Kitchens might engender cycling-centered transformation through the practices enacted within them (for exceptions see e.g. de Chattilon, 2021; Rigal, 2023). Our study departs from Bike Kitchens' practice-material relationship in order to reveal elements to support transformative change. Eco-modern narratives of 'smart cycling' emphasize innovative materiality (e.g. e- or shared cycles), yet the materiality of 'mundane', everyday cycles in cycling practices is rarely addressed (Larsen & Christensen, 2015; Shove, 2012). Many everyday (bi) cycles are in bad shape, with barely functioning brakes, worn out chains and buckled wheels (Larsen, 2017b). While this state of disrepair makes them unobtrusive and less prone to theft, it certainly affects riding quality and at worst can be outright dangerous or a hindrance to cycling. Our study contributes to rethinking the 'ordinary' technologies, such as the cycle, in urban cycling futures. In doing so, we respond to the call that the relation between practices in transport and mobility deserve more consideration, particularly the limited understanding of 'meaning' in social practice (Kent, 2022).

The present study explores how Bike Kitchens engender diverse cycling representations and propagate transformational understandings of mobility and materiality. To

achieve this aim, we explore the relationship between (assisted) self-repair in a Bike Kitchen setting, cycling, and other practices mediated by cycles. Theoretically we draw on Social Practice Theory and empirically ground our study in our own experiences in organizing and operating a local Bike Kitchen in Uppsala (Sweden), supported by observations and interviews. We suggest that Bike Kitchens are agents in and for urban mobility transformation, as they engender benign practices and transpose their constituting elements to other practices. Two questions guide our study:

- How can we conceive of the cycling-repair relationship as a social practice relation?
- How might a practice perspective on cycling and repair in Bike Kitchens contribute to transformational urban change?

Our contribution with this paper is threefold. Firstly, we add weight to existing literature on social (community) initiatives as important change agents in urban transformations. Bike Kitchens form a disparate cluster of change-oriented initiatives with various change ambitions, in different community contexts. We acknowledge the particularity of the case and contribute with research on a specific Bike Kitchen arrangement in a Swedish University context that explicates the flexibility of assisted cycle self-repair arrangements that nevertheless might find resonance with, and prompt inspiration in, other contexts. Secondly, we develop a conceptual notion of the cycling-repair relationship to identify practically relevant leverage points to support cycling and other convivial, benign practices. Thirdly, we outline how this relationship is relevant for practical means to allow actor groups to diversify perspectives on urban mobility.

We first outlining how practice theories inform an understanding of repair in relation to cycling. We then present a conceptual model of the cycling-repair-relationship. Thereafter, we elaborate on the methods, the analytical procedure and material that guided the empirical part of our study. We continue by applying our conceptual model to a Bike Kitchen case in Uppsala. Our concluding discussion then revisits the research questions and suggests future research avenues.

Cycle repair as a social practice

Practice Theory allows the examination of the role of material entities and how they connect with, or are a part of, practices (Nicolini, 2012; Shove, 2016; Schatzki, 2001, 2019). Compared to other social theories, practice theories re-center the analytical focus, moving from the acting individual as 'agent' to the individual as a 'carrier' of practices. As a consequence, practice theories represent activities, such as cycling and cycle repair, in ways that allow for novel forms of interventions to spread and consolidate practices. For the Sociologist Elizabeth Shove and her colleagues (2012) the material world is an inherent part of practices, where for example, repair and cycling practices share the bike as a material element (Hargreaves, 2011; Hui, 2016). Shove et al. (2012) developed a pragmatic approach to better understand everyday practices and how they change. We adopt their understanding of practices for its emphasis on the emergence, change and material focus on practices. In doing so, we follow previous practice-oriented studies on cycling (e.g. Cass & Faulconbridge, 2016; Larsen, 2017b; Spotswood et al., 2015). Shove et al. (2012) suggest four leverage points to intervene in practices: (1) the constituting

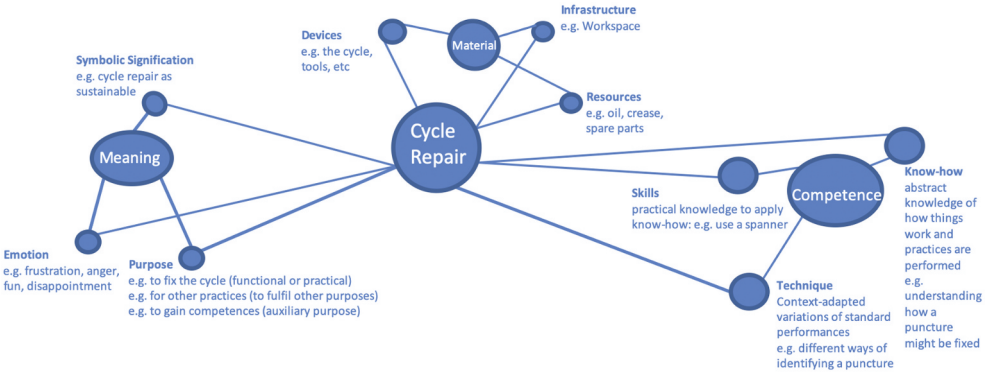

Figure 1. The cycle repair intra-practice relation exemplified by cycle self-repair.

elements that make up practices, (2) the ways in which practice relate to one-another, (3) people as practice carriers and (4) the social networks reproducing practices.

Following Shove et al. (2012) we can conceive of practices as aggregations of three elements: competence, material, and meaning. In contrast to Shove and colleagues (2012), we break each element down further into what we call 'dimensions' of practice elements in order to better distinguish between different modes of practice connections and interventions. Figure 1. presents the practice of cycle repair broken down into elements and dimensions. The cycle repair node at the center connects its three comprising elements (competence, material, and meaning); it acts as a 'hub' joining practice elements. Each element is in turn made up of dimensions, which we recognize as nodes within and between practices. Within a practice, each node is essential for establishing the connection between the central 'hub' and the three elements. More connections between dimension and elements, means more connections between elements and the practice 'hub', resulting in a more stable practice arrangement. Each dimension can furthermore act as a 'connecting link' to other practices outside repair, such as cycling. We return to this notion of inter-practice relations under the section *material relations in cycling and repair practices*. Next, we introduce intra-practice relations as connections between elements and dimensions.

We dissect competences into *know-how* (Löwenstein, 2017; Fuller, 2013), *skills (*Bäckström & Gustafsson, 2017; Dreyfus & Dreyfus, 1980; Ogbuanya & Chukwuedo, 2017), and *techniques* essential to practices (cf. Becker, 1978; Shove et al., 2012; Van Tuinen, 2017). Novice repair practitioners might not know how to perform repair, including identifying the cause of failure, knowing which tools are required and how to use them. Competence also requires knowledge of how a bike, or parts of it function. With *know-how* we capture the general understanding of a practice (cf. Schatzki, 2002; Löwenstein, 2017; Fuller, 2013). We see *skills* as the application of said know-how, such as being able to use a spanner, or adjust brakes with a barrel adjuster (Bäckström & Gustafsson, 2017; Ogbuanya & Chukwuedo, 2017). *Technique* in our understanding relates to different ways of conducting repair, under different conditions, using different materials and skills, such as patching a punctured inner tube with a repair patch, compared to a self-made patch from an old inner tube, compared to replacing the whole inner-tube

(Van Tuinen, 2017;. Know-how, skills and techniques do not develop linearly, but in an iterative process that is closely related to the meaning dimensions of affect (emotions and moods) as part of practice performances (cf. Fuller, 2013). Fuller, (2013) develops the argument that know-how represents a tacit form of knowledge that cannot be transmitted through (explicit) verbal or visual inscriptions (e.g. 'how-to' texts or videos), but depends on the experience of material engagement. Fuller posits that the *conditions* for know-how can be conveyed for the practitioner to unpack through the embodied experience of craft and repair work. Our conceptual understanding of knowledge in practices aligns with Fuller's (2013), but differs terminologically in that we adopt 'know-how' more literally as the explicit knowledge of knowing 'how-to', while *skills* capture the applied, embodied dimensions of developing tacit knowledge. By gaining experience through continued embodied material work, the practitioner can develop a level of virtuosity we capture through the competence dimension *technique* (Becker, 1978; Van Tuinen, 2017).

Materials are the physical elements of practices, where Shove (2016) describes three basic material-practice relations: 1) resources that are consumed, 2) devices that are interacted with, and 3) infrastructures that build a material background to enable practices but are seldomly consciously interacted with. In the case of Bike Kitchens, these can be e.g. oil (1), tools (2), and the workshop space (3).

The third practice element, *meaning*, broadly conceived denotes 'the social and symbolic significance of participation at any one moment' (Shove et al., 2012, p. 24), or 'symbolic meaning, ideas and aspirations' (Reckwitz, 2002 see Shove et al., 2012, p. 28). Yet, there is no clear consensus among practice theorist on how to conceptualize 'meaning' in practices (Shove et al., 2012). To guide our analysis of meaning, we draw on Schatzki (1996, 2019) and conceive of meaning as a three-split practice entity to: give purpose to practices, account for an emotional and affective frame of and for practices, and assign significance to practices outside their immediate purpose.

S*ymbolic signification*, helps to orient a practice in arrangements of practices that make up social life and share a similar meaning. For instance, cycle self-repair might carry the symbolic significance of sustainability or thrift (Bradley, 2018) and can connect to other practices with a shared meaning (Hui, 2016; Reckwitz, 2016). Cycling could equally carry meanings of sustainability and economic viability (Fishman et al., 2015).

Practices carry *purpose* (Nicolini, 2012). There are conscious or subconscious reasons for practices. When a person enters a Bike Kitchen with a non-functioning bike, it is probably to repair the bike. Yet a practice can have multiple purposes; in addition to fixing one's own bike, a visit to the Bike Kitchen may be to develop repair know-how and skills. Practices can be broken down into smaller, individual sequences of actions that connect through their purpose (to meet an end). Practices often involve a combination of subordinated and hierarchically organized steps (Schatzki, 2019). The practice of repairing a flat tire, requires the removal of the wheel, which in turn involves loosening bolts, unhooking brake levers, etc. Schatzki (2002) terms the relations between such actions part of a 'teleoaffective structure'. Bike self-repair can equally be part of different hierarchies, such as gaining repair competences (learning), or socialisation (cf. Rigal, 2023).

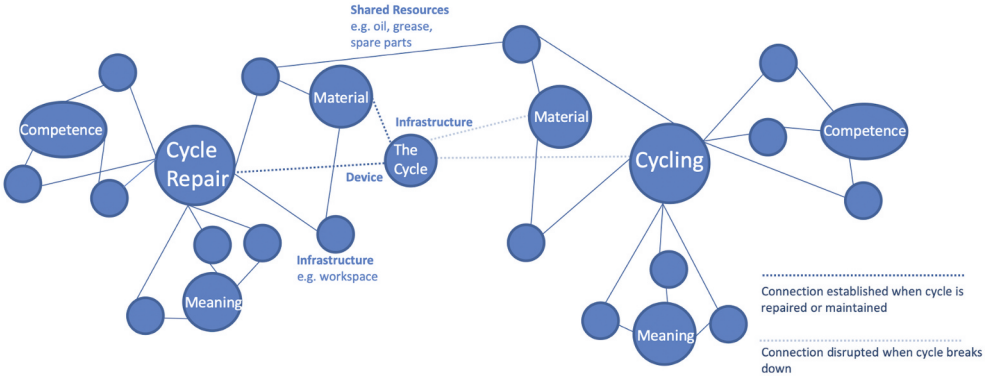

Figure 2. Inter-practice relations between cycle repair and cycling.

Emotions and moods are the last dimension of the 'meaning' element (cf. Schatzki, 2001). Meanings are delicate, change quickly and are coupled with emotions (Shove et al., 2012, p. 49; Fuller, 2013). Timid first-time Bike Kitchen visitors might feel empowered after a successful repair session, which may affect how they perceive the meaning of future bike self-repair (Shove et al., 2012). Through successful enactment, repair can be decoded from something a person is uncomfortable with and recoded as an enjoyable alternative to repair services. Conversely, unsuccessful repair may lead to frustration and reduce the appeal of future repair engagements.

Figure 1 visualizes a dendogram of repair, highlighting the multiple opportunities, or points of intervention each branch offers to strengthen or weaken other practices (cf. Shove et al., 2012). New practices can be created by developing new connections to already existing practice elements as visualised by the dendogram branches. Cycling, could be added to the dendogram as a further connection to 'Cycle Repair' as both convey 'sustainability' in practices; they are connected through their 'symbolic signification' (see Figure 2). In the following section, we further explore the repair-cycling-relationship and how it can be severed through processes of breakage and deterioration.

Material relations in cycling and repair practices

Even though cycling is a complex practice including pedaling, steering, balancing, navigating etc., the cyclist rarely consciously relates to the bicycle while cycling (Scheurenbrand et al., 2018). The cycle becomes an 'unproblematic means to an end, rather than an independent thing to which I [the person cycling] stand[s] in relation' (Cetina, 2001:178). As part of a habitualised performance, the cycle can slip out of awareness as cyclist and cycle merge in the practice (cf. Larsen, 2017a; Spotswood et al., 2015). Winner (2014) describes the subconscious material-practice-relation as similar to sleepwalking (see also Rosen, 2004). In these instances, the bike becomes 'infrastructure', which Shove (2019) describes as being necessary for a practice, but largely forms a material backdrop. In moments of malfunction or breakdown, the cycle slips back into awareness as an entity separate from practice and body (Cetina, 2001).

Relating to the bike as infrastructure implies little engagement with, or care for, the bike except when it is broken, or malfunctions.

We share the position that material semiotics are commensurate with theories of practice (Evans, 2020). Similar to practices, objects or devices are argued to have a function – a built-in purpose – which enables practices (Miettinen & Virkkunen, 2016). Breakdown or failure of the device (the bike) signifies a severed relation between purpose and practice, which can occur in different ways (Martinez and Laviolette, 2019). The malfunction of a cycle can be seen as a spectrum from slow and creeping deterioration to direct and abrupt breakage (de Chatillon M 2022b). Deterioration might not initially inhibit the function of an object, yet may eventually lead to its breakdown (de Chatillon M, 2022b; Godfrey et al. 2022; Graham and Thrift, 2007). Often an initial change in a bike's material capacity goes unnoticed by the cyclist, who automatically adapts to the deterioration. Over time brake pads wear down, to which the cyclist adapts by successively braking earlier in anticipation of a stop or change of direction (cf. Godfrey et al. 2022). The severity of degradation on cycling quality is often first perceived in direct comparison. Anyone who has experienced changing from a run-down bike to a new one has probably felt this difference in performance. Having other people ride your bike can also be used as an indicator to reveal unnoticed maintenance and repair issues (cf. Rea & Jacques, 1987).

Generally, processes that reinstate a certain quality of functioning, or impede degradation, fall under the umbrella of maintenance measures (Godfrey et al., 2022), such as straightening a slightly buckled wheel, lubricating the chain, pumping tires, etc. Over time, lack of maintenance materialises in a poorly functioning, unsafe bike (de Chatillon M, 2022b). Repair is a special craft-based practices, because it is reductive (Martin, 2016). Compared to creating a custom-designed cycle from scratch, repair re-creates a bike with fewer mechanical problems.

The bicycle as a technology is assigned symbolic meaning, such as sustainability (Batterbury & Dant, 2019). There appears to be something special about the bicycle that sets it apart from many other technologies. Ivan Illich (1972) described the bicycle as a convivial technology, meaning a technology that engenders autonomy in use, without creating further demand (see also Bradley, 2018). Whereas the car depends on the system of automobility, including roads, parking spaces, fuel stations, repair services (Urry, 2004), the cycle poses little of these demands. Bradley maintains that conviviality is also inherent in the bike as its workings are intelligible and can readily be changed and repaired (2018:1677f). Compared to other technologies with 'blackboxed' inner workings (cf. Latour, 1999; Fuller, 2013), many cycle functions can be observed and comprehended by close visual inspection.

For novice practitioners, the cycle's characteristics make it conducive to repair and maintenance (Batterbury & Dant, 2019); the threshold to understand how parts of the cycle function, or to gain know-how, is lower compared to other technologies. Nevertheless, we see repair and maintenance (especially when not routinised and habitually performed) to require a conscious and attentive form of engagement with technology in line with an understanding of epistemic practices. Following Karina Knorr Cetina (2001;1997), we conceive of repair and maintenance as 'non-standard forms of engagement' with the bicycle that provide opportunities to change how we understand the bicycle (its meaning) in conjunction with practices. We illustrate the relationship

between cycling, the cycle, repair and maintenance in Figure 2. One of the permanent linkages between repair and cycling, or cycling and maintenance, is created through shared resources. Resources such as oil, grease, or spare parts are essential for both repair and maintenance. They *can* also be part of cycling's material components, provided the bike and the practice of cycling carry a certain meaning, such as that of a sustainable, or flexible mode of mobility (not indicated in Figure 2.).

When the cycle breaks down, the cyclist becomes aware that the bike does not function as intended. An example might be a puncture discovered while departing to visit a friend. The cycle is no longer part of the practice arrangement; the connection is severed until the tire and/or tube are fixed. As part of the material elements, the cycle changes its infrastructural role and becomes the essential device for cycle repair. Without a broken bike no cycle repair; without a functioning bike, no cycling. Bringing cycling in relation to repair emphasises care in material relations and broadens conceptions of the bike as more than a utility vehicle (cf. Horton, 2006).

Case context

This study is based on material gathered from the Ultuna Cykelköket (Bike Kitchen Ultuna) located approximately 5 km from Uppsala's city center on the campus of the Swedish University of Agricultural Sciences (SLU). About two-thirds of Uppsala municipality's 240.000 inhabitants live in the inner-city area, where most services, employers, shops and the city's two Universities are located within a five-kilometre radius around the city centre (Statistic Sweden, 2023). 460 km of the 557 km of municipal cycleways are within the urban area, the majority of which physically separates motorised from non-motorised traffic (Uppsala Municipality, 2023). About a third of all inner-city trips are conducted by cycle. The high cycle mode share is often accredited to the high student population, moderately flat topography and compact urban layout. The municipality describes Uppsala as 'a cycling-friendly municipality' (Uppsala Municipality, 2013a, p. 3) with a 'well-developed cycling path network, especially in the urban area' (2013b, p. 3) and a 'deep-rooted cycling culture' (Uppsala Municipality, 2016, p. 8). The municipality, a local cycling organisation (Uppsala Cykelförening) and the local branch of Sweden's largest cycling advocacy Cykelfrämjandet offer cycling-supporting interventions and projects. To our knowledge, Ultuna Bike Kitchen is currently the only weekly open cycle repair workshop.

The idea to establish the Bike Kitchen emerged from the first author observing many bicycles in Uppsala in need of maintenance prompted by previous experience in Bike Kitchen volunteering. Established in 2019, the Bike Kitchen might be an unusual case in that the first author is the only permanent volunteer, Bike Kitchen founder and organiser of weekly open repair workshops. While volunteer engagement is practiced, encouraged and highly appreciated, it is not expected or planned for in the Bike Kitchen's regular operation. The operational and organisational model emerged over time as the least time consuming and most resilient in the particular context. The ambition for the Bike Kitchen was (and is not) to scale in size, or to offer a wider range of services, but to enable assisted repair and maintenance opportunities on a local scale. The Bike Kitchen

received seed funding from SLU for purchasing repair equipment, while the locale is provided by the state-owned property company Akademiska Hus for a nominal rent that is in turn covered by the Department of Urban and Rural Development at SLU. The Bike Kitchen receives bicycle donations from local housing companies and the campus facility management as well as material donations from Bike Kitchen visitors.

Material and methods

A combination of approaches is recommended to analyse practices (Hitchings, 2012, Nicolini, 2012). Hence, we assembled our empirical material through different methods; observations, interactions and interviews around the Ultuna Cykelköket. The first authors active participation, Bike Kitchen organisation and operation provide an (auto)ethnographic context to observe and be part of the workshop practice under investigation in this article (Hargreaves, 2011). Additional material was gathered through interviews. Together with a volunteer, the main author invited people through a local sustainability network to participate in repair crash courses with the aim of developing repair skills to become prospective Bike Kitchen volunteers. We hosted two workshops, each lasting 4–5 hours. We documented the workshop practices through photographs and interviews with workshop participants and conducted semi-structured interviews with nine respondents each lasting 30 to 90 min. All interviewees expressed interest, or attended, at least one of the crash courses. All interview respondents furthermore expressed interest in contributing to bike repair initiatives by volunteering and improving their repair skills. While some have extensive experience in organizing, running, or volunteering in bike repair spaces, others have visited Bike Kitchens before, but not previously assisted in bike repair. Photographs were taken during one of the crash courses and used as prompts during interviews (Törrönen, 2002). The photographs provided cues to speak about depicted practice performances, or to uncover meaning as part of practices (Törrönen, 2002). All except one interview were conducted in person, audio-recorded and later transcribed in full.

We oriented the interviews towards elements of practices (material, competences and meaning) of bike self-repair in Bike Kitchens. We sought to capture competences (know-how, skills and techniques) by asking participants to describe how they would perform a certain repair procedure, noting the general level of nuance they expressed when talking about repair practices. We also observed engagement during workshop participation. Paying attention to sequencing of actions allowed us to distinguish between different activities that make up a practice, such as the distinction between identifying/diagnosing a problem and the actual process of repair. We further sought to tease out meaning as an overarching element between material and practice, by questioning individuals' reasons (purpose) for their interest in Bike Kitchen activities, beyond the utility function of fixing one's own bike. Expressions of motions and affections when talking about practices further provided cues for auxiliary meaning categories. We also posed questions relating to the material elements of Bike Kitchens and the bicycle, where interviewees' comments revealed further material semiotic characteristics.

While the results are based on workshops and interviews, our own experience in establishing, organizing and running the campus Bike Kitchen inevitably affected the

analysis. As Nicolini (2012) notes, deep immergence is advantageous and provides a tacit background for first-hand experience. Our own experience in bike repair informed our methodological approach and facilitated the interpretation of observations and interview material. We use direct to interview participants' quotes and references to distinguish their voices from our overarching 'ethnographic' experience and other researchers' contributions.

We analysed interviews through a qualitative content analysis following an abductive approach (Bryman, 2016; Patton, 2002). Thematic abduction implied using practice elements as thematic guides to interpret the interview material, while at the same time allowing for new themes to emerge inductively (Kent, 2022). While our questions are oriented at the general level of practice relations, we cannot generalise to other Bike Kitchen contexts. Instead we strive for exemplifying practice-connections in its contextual subtleties (cf. Flyvberg, 2001).

In the following section, we discuss the empirical material in light of our conceptual understanding of practice relations and relevant literature.

Bike Kitchens and cycle repair

Bike kitchens as material containers

Interview participants recognized the advantage of centrally located Kitchens, with easy access by other transport. Acute repair presents a non-standard practice for most people, which makes ease of access to Bike Kitchens important to slot bike repair between sequences of other activities that make up everyday life (Shove et al., 2012). Urban centers are typically referenced as desired locations. Respondents also recognised the benefits of locating Bike Kitchens on, or around, university campuses, or close to student areas in the city. Referring to the Ultuna Bike Kitchen, interviewees identified that despite being located on a university campus, being removed from the city center is a barrier. While Bike Kitchens on campus could attract employees and students, ideally a Bike Kitchen close to the city center could draw in a more diverse group of people.

While accessibility and proximity are important, the actual physical space and material layout appears to be of less importance. A few respondents commented on the details of the material space, such as ease of access into the Bike Kitchen with a bike, sufficient room, adequate temperature, good lighting conditions, a concrete floor, and clear signage from outside (interviewee #7 and #5). Apart from basic design attributes, it appears most important to *have* a locale for bike repair. In this view, the Bike Kitchen becomes an infrastructural element that serves as a background for repair practices (cf. Shove, 2016).

Devices (tools) and resources (e.g. oil, grease and spare parts) are brought to the fore in the interviews, deemed more important than the Bike Kitchen setup. Gieryn (2002:38) notes, reflecting on Giddens (1994), that: 'At the extreme, the physical side of built places becomes almost irrelevant for social practices'. Applied to the Bike Kitchen the material shell is less important than the material it contains to support practices. This is certainly the case for the Ultuna Bike Kitchen, which has changed locations in response to the availability of locales. Participants had few expectations beyond the basic material components housed in a locale as outlined above. This provides flexibility regarding

the physical environments in which Bike Kitchen practices can take place. In fact, the tools and workshop devices are not tied to a building, but can be moved around as exemplified at Ultuna. When the weather conditions are suitable, the repair practices tend to flow out of the workshop as people set up their workstations outside. It is hence the material (devices and resources) more than the physical space (infrastructure) that constitute the Bike Kitchen.

A material aspect considered central when setting up the Ultuna Bike Kitchen, but that appears less important to interview participants are spare parts. While second hand material can work in certain cases, or be used for 'quick fixes', new materials tend to fix problems more sustainably (Hielscher & Jaeger-Erben, 2021). In our experience, the most common repair queries require resources that are being 'consumed' (puncture patching kits, inner tubes, brake pads, chains, etc.). Similarly, maintenance queries rarely require spare parts. The absence of interviewees mentioning the availability of spare parts, whether salvaged from old cycles, or new, is in our experience not reflected in the regular operation of a Bike Kitchen. Wheels, derailleurs, hubs and headtubes in different material conditions can be important for reference, or comparison, throughout repair and maintenance (Rigal, 2023; cf.; Shove et al., 2012). Dissecting an old wheel hub to reveal cup and cone bearings, alone or as part of transmitting explicit knowledge by other Bike Kitchen visitors, can help in gaining the competence to know-how the system works, how it can be manipulated, and how manipulation affects cycling.

Bike kitchens as social spaces of meaning

In practice theory, the body can be considered part of the material world (e.g. Schatzki, 2019). As with all social practices, being in the company of others is an essential 'material' prerequisite for Bike Kitchens (Batterbury & Manga, 2022; Batterbury & Vandermeersch, 2016; Bradley, 2018). A person can physically engage in someone else's repair, give advice, hand tools, etc., convey explicit repair knowledge (know-how) that conditions the development of skills (cf. Fuller, 2013) and technique (Becker, 1978; Van Tuinen, 2017). Interaction through practices implies connecting different meanings and competences. The interviewees described how the Bike Kitchen co-constitutes practitioners in different roles (Watson & Shove, 2022, p. 12; Alkemeyer & Buschmann, 2016). Learning throughout practices enables practitioners, and leads to diverse subject positions (Alkemeyer & Buschmann, 2016). Individuals assume different roles that express various meanings associated with practices. These roles in turn affect the meaning of a Bike Kitchen (Watson & Shove, 2022). For example, people become mechanics, but they also become teachers and apprentices.

An emotional dimension is closely connected to Bike Kitchen practices. Predominantly, events occurring in the Bike Kitchen are associated with positive emotions such as 'fun':

> '. . .probably one of the more important ones [aspects] that it's actually fun to actually be there [. . .] it's a friendly atmosphere to actually hang out. [. . .] otherwise why do it, you know?'. (Interviewee #4)

The term 'Bike Kitchen' alone serves as a semiotic vehicle to convey the social aspects inherent in the concept as one interview participant remarked:

> 'The kitchen part of it, the Bike Kitchen, I think, was . . . to reflect this idea of building a community together. It's what brings you together. There's food that you can have, tea and coffee and biscuits there as well. And also, people can have [. . .] like a space to chat and get to know each other. So, it's supposed to be a community space as well as a skills workplace'. (interviewee #6)

The quote above underscores how the presence of materials and people affects the meaning of Bike Kitchen practices. Bike Kitchen participation for some becomes important outside the utility purpose of repair (symbolic signification). A clear example for meaning linked to bike self-repair practices is volunteering. Significations such as sociality and the exchange of competences give meaning to voluntary involvement.

Bike kitchens and competences

Rereading excerpt of interviewee #6 above primes us for elements of competence co-inhabiting Bike Kitchens addressed in this section. In addition to a material barrier to repair, there is a knowledge barrier that Bike Kitchens can help to overcome (Interviewee #9). One of the respondents exemplifies this as follows:

> 'And like the way that I understood it is that there's the materials and there's some people who know something and they try to transfer that knowledge to people who don't know that something, kind of'. (Interviewee #3)

Knowledge-transfer is a fundamental purpose of interactions in Bike Kitchens; some people are unsure of how to fix their own bike, but want to learn it, while others are willing to share their competence, or figure things out together. Hence, the existence of social initiatives depends on the reciprocity between practice carriers (Shove, 2012). For example, volunteer engagement is dependent on the 'willingness to exchanging very useful skills between you, and to people who . . . , to anyone who wants to learn them, for free'. (Interviewee #6). What interviewee #6 describes as 'willingness', we interpret as the symbolic signification of Bike Kitchen practices beyond the utility purpose of fixing one's own cycle. The Bike Kitchen and the practices it enables signify what one respondent refers to as a 'circular' or more 'sustainable' way of living with less material resources (#2). Furthermore, cycle self-repair reflects the general meaning of self-repair as practices that increase autonomy in material relations. Circularity, sustainability and autonomy are examples of meanings beyond the immediate repair purpose that came through in the interviews. Others meanings are of course possible (de Chatillon M, 2022a). Reasons for frequenting Bike Kitchens beyond immediate repair do not have to be singular, but can connect to different meanings and be part of different practices (Hui, 2016; Mock, 2023). An interviewee with extensive volunteer experience describes the desire to convey knowledge as a driver for her engagement:

Figure 3. Volunteer (middle) explaining how to break and reconnect a bicycle chain with a chain breaker tool.

> ' . . . I want to show them. I want to transfer that knowledge, because I had to work to get it, you know, like maybe I can lessen the work for someone else because It's always helpful to be able to do these small things [adjusting chain tension] on your own'. (#3)

Learning and teaching are entwined in Bike Kitchen interactions. A person might be explaining how to remove a bicycle chain, and in the next instance learns how to remove a bottom bracket herself. Figure 3 shows the interaction between a workshop participant (middle) explaining to two other participants how to take a bicycle chain apart and reconnect chain links using a chain breaker tool. When shown the picture during the interview, the person explaining (middle) reflected that it captured her preferred way of teaching and exemplifies a combination of verbal and visual elaborations while providing continuous feedback on performances (cf. Fuller, 2013):

> Interviewer: "You said that you really liked this picture".
>
> Interviewee #5: "Yes. And it was heartwarming because it's two people learning the same skill together from someone who is not just doing it for them, but letting them do it while explaining what they have to do. I [. . .] really like the idea, like when you sit down and two people would need to learn how to do punctures. [. . .]. And that creates a bond between them as well. So they can go, you just go to each other for help [. . .]. I think it's nice because it means it's not just me acting, there are some of us who interact with each other".

Teaching someone is not only seen as purposeful in light of repair, but is seen as desirable and bringing about positive emotions. One participant for instance describes the process of teaching others as "gratifying":

> 'I also think that I learn more by teaching other people than just doing it, because when I just do it, then I kind of forget. But if [. . .] I can actually teach somebody else how to do it, then I know that I actually can do it. And so I think it's very gratifying [. . .] to teach others and to

> show them that they can do it on their own. And then when they can, you know, the next time they show up and then, just do it and it's great' (#9).

The quote furthermore underlines the abstraction of teaching and learning; discussing cycle repair becomes a reflection on the generalized practice of teaching. Furthermore, *cycle* repair competences can become linked to repair practices in *general*; in addition to the cycle, other devices can become considered repairable (cf. Shove et al., 2012).

Bike Kitchen visitors are in a constant process of receiving, translating and mediating skills, know-how and technique; a process that dislodges the practice-specific competences of cycle repair and links them to other practices. The coding of knowledge is not only important for the mobility and circulation of cycle-repair elements, but for many competences (Fuller, 2013; Shove et al., 2012, p. 43). Participants compared joint learning (in the Bike Kitchen) to online self-education, or video tutorials on YouTube and Reddit (#2, #4 and #9). Tutorials can be helpful to know how to conduct repair by making competences mobile (Shove et al., 2012, p. 96; cf. Fuller, 2013). However, it can be difficult to apply competences and evaluate whether certain steps are performed in the 'right' way. In the Bike Kitchen other people can monitor the performance of a practice (cf. Shove et al., 2012, p. 75). Other workshop visitors are essential to decode knowledge and apply it to the practice at hand; they can help to unpack know-how, but also assist novices in skill development, or present different techniques for different scenarios. For example, to know how it feels when a bolt is 'tight enough' (skill), or that in absence of a bucket of water, you can find punctures in your inner tube by carefully listening to where air escapes, or feeling the air stream on your skin (technique). Where tutorials unilaterally provide the competence to 'know what you are doing' (Interviewee #9), a benefit to Bike Kitchens lies in the interaction between people to solve repair queries together and mediate from knowing what to do, to knowing how to do it and how it looks, feels and sounds when you are doing something right (cf. Fuller, 2013).

For example, learning can lead to the competence of knowing how to repair individual parts of a bike, through prolonged interactions the process of learning extends to developing repair skills and different techniques for repairing other parts of a bike.

Cycles' properties in relation to repair practices

Repair represents a different way of relating to the cycle potentially reframing its meaning and that of surrounding practices, such as cycling, or repair in general. In repair, the cycle becomes the focus of a practice – an 'object of enquiry'– through which new ways of acting can be observed (Miettinen and Virkkunen, 2016:438). Participant #7 explained that the bike is 'more than the sum of its parts'. In repair practices, the 'closed box' of the cycle is opened, when it becomes a system of levers, bearings, cables, bolts and screws (cf. Knorr Cetina, 2001:181; Latour, 1999).

> "And I guess when you learn that they [cycles] work and I think that, it's really cool to find out how something works by just logically thinking about it and seeing, 'okay, well this connects to this, so that means that actually something must be wrong with that, because of that' [. . .]. But just then you can, you know, look at any problem and not feel completely stuck, but at least give more of a diagnosis when it's broken". (#9)

Beyond the cycle, interviewee #9 describes how repair becomes about understanding the mechanical logic of how things work in general. The interviewee outlines the competence to 'know how things work' and relates it to understanding why things do not work; why they need repairing. An assessment of what is wrong prefigures practices of active manipulation and positions diagnosing in the sequence of repair. The centrality of finding out what is wrong has previously been described as the ' . . . kernel of a bike mechanics craft [. . .]' (Martin 2016, p. 73). Diagnosis can be applied to 'any problem' as the interviewee points out and highlights what has been described as the 'practice-generating' character of epistemic objects (Knorr Cetina, 2001: 183).

The reflections in this section highlight DIY cycle repair as a rewarding set of practices that depend on the cycle's characteristics as a thing that 'just makes sense' (#9) and is 'easy to fix' (#3). Minimal competence is required to start bike repair, the learning curve is steep and results can be achieved quickly (Bradley 2018). The cycle's comprehensible mechanical function makes it a rewarding repair entity as the following quote illustrates:

> 'The first time I brought my project back. It was very old. Mm-Hmm. [. . .]And I feel, I did feel like, hopeless. It was very bad. And. But you told me it maybe needed just air. And I pumped the tires. Yes, it works. And some other small stuff just brake adjustments and gears, and all was not so hard as I expected. Yes. And this made me so happy. So I could ride the bike'. (#2)

Despite the relative 'ease of repair' interviewees generally report a difference in the level of care different bikes receive. More specialised cycles are often entities of great affection in contrast to the 'everyday bike', which as long as it performs, tends to go unmaintained apart from measures that are very quick and have an immediate effect on performance, such as pumping tires and lubricating chains (cf. de Chatillon M, 2022a). Everyday urban cycles generally tend to be older and often second-hand, as to be unobtrusive and less prone to theft (cf. Larsen, 2017b; Scheurenbrand et al., 2018). The overall tendency of limited bike maintenance underlines its status as a mundane object that performs in the background even for our interviewees interested in bike self-repair (Knorr Cetina, 2001; Shove & Trentmann, 2019). Cycle repair can change the meaning of the cycle. For some people, this makes for continued and diversified engagement, for others, once the purpose of repairing is achieved, it becomes almost invisible until new problems occur (Rigal, 2023).

Concluding discussion

In this section we return to our initial research questions in an attempt to translate our findings into implications for deliberate change-oriented interventions.

How can we conceive of the cycling-repair relationship as a social practice relation?

Relations between practices provide leverage to induce changes in practices (Hui, 2016; Shove et al., 2012). This section details the complexity of practice relations in the Bike Kitchen and suggests *how* Bike Kitchens enable assisted cycle self-repair and maintenance that in turn contribute to other meaningful practices. Bike Kitchens can draw

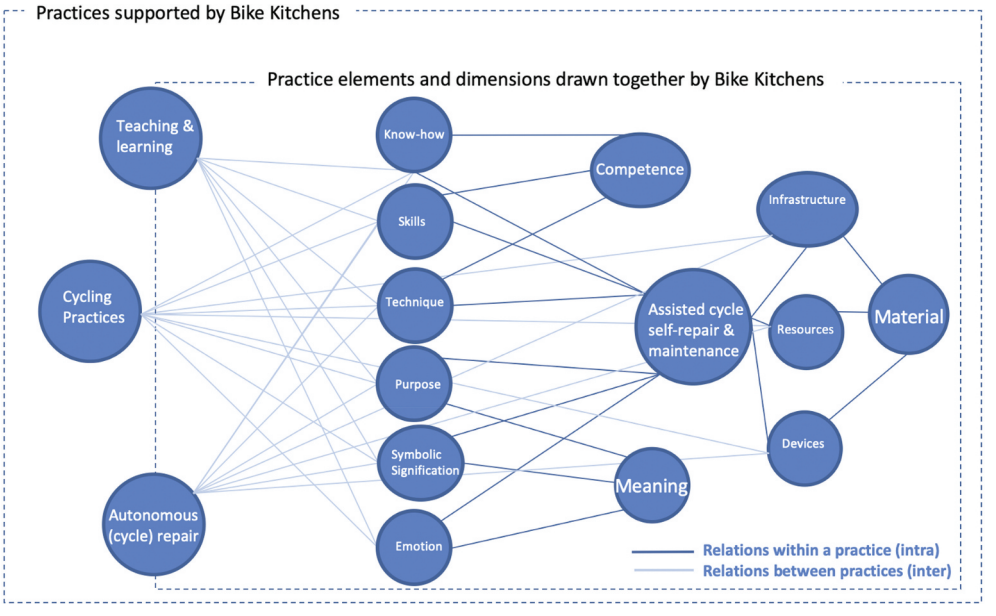

Figure 4. Practice relations exemplified by assisted self-repair practice in Bike Kitchens. Inter-practice connections are depicted in light blue, intra-practice relations in dark blue.

together disparate practices, such as cycle repair, socialization, teaching and learning. They do so through inter-relations between multiple dimensions which underlie practice elements. Our study reveals the dominant interrelations between the meaning dimensions and competences of assisted cycle self-repair, maintenance and other practice. Figure 4 illustrates the interlacing of assisted cycle self-repair and maintenance with other practices. Repair and maintenance stabilise cycling practices. Variations in practice elements are introduced through assisted self-repair as a visceral, bodily, socially and materially interactive experience. Connections occur dominantly through meaning and competence dimensions. Meaning and competence networks are further strengthened by the Bike Kitchen's and cycles' semiotic, or symbolic signification. Cycles' material characteristics as a comprehensible technology and the Bike Kitchen as social space of and for competences strengthen the meaning-competence-nexus further. While material elements are essential to Bike Kitchen practices (e.g. people, tools and spare parts) they form fewer connections. Material prerequisites brought together in a Bike Kitchen support several other practices. Importantly, the supported practices transcend workshop spaces and temporally bound instances of assisted self-repair performances. Conceiving the nuance of practices allows for a different understanding of how Bike Kitchens stabilise the practice of cycling while enabling changes in other meaningful practices.

How can a practice perspective on cycling and repair in bike kitchens contribute to transformational urban change?

Bike Kitchens and the practices they engender are semiotically close enough to cycling to maintain a meaningful connection to transport and mobility. Yet, Kitchen practices are

also meaningful in light of other practices that are purposeful, symbolic and emotional. We argue that particularly the meaning dimensions can act as spawning points for reconceiving urban life as more convivial, sufficiency-oriented and sociable, while not foreclosing other urban imaginaries. Bike Kitchens' multiple significations make them valuable additions to urban systems. Representing cycling as socio-material care, sociality and learning as well as the cycle as an epistemic object makes both amendable to various policies, plans and strategies beyond mobility. Previous research established that Bike Kitchens are spaces for experimentation with culture and education, production and consumption, resource governance, science and technology and alternative conceptions of work (e.g. Fitzpatrick et al., 2022). Bike Kitchens build on sufficiency in material relations and lifestyles in general. Instead of generating excessive waste, materials can be recycled and repurposed. Instead of relying on purchased repair services, people learn to re-engage with technologies' inner workings. Tools, spaces and competences become commons. Work in terms of volunteering is not a service or labor, but is exchanged for free as a redistributive and reproductive activity. These characteristics, make Bike Kitchens flexible instruments that can be integrated into a range of policies and grassroots initiatives outside the realm of transport and mobility. Adding to their transformative character, Bike Kitchens don't directly critique the automotive system and thereby do not inadvertently reinforce dominant mobility discourses, but showcase the benefits of alternatives (Caimotto & Caimotto, 2020).

Based on our research we can add that Bike Kitchens might be even more sufficient in their requirements than previously outlined. Bike Kitchens do not have to rely on expensive locales, but might be organized as pop-up events, where for example volunteers collectively provide tools. Kitchens' organisation and operation *can* exclusively rely on volunteer support, or cooperate with various other actor groups. For example, can public, often municipal, actors contribute with providing locales. Housing associations can contribute by providing abandoned bicycles. These kinds of collaborations can stabilise social initiatives, but they can also lead to dependencies and undermine the multiple co-benefits of Bike Kitchens, for example, when they come under pressure to professionalise (Henriksson & Scalzotto, 2023).

Flexibility and multiple policy-relevant benefits make Bike Kitchens desirable candidates for collaborations with, or support through, public or private actor groups. Bike Kitchens might risk becoming tokenized to portray cycle-support and urban placemaking as part of the 'standard' array of policy instruments (Sheller, 2020). Instead of challenging the urban system, Bike Kitchen may end up feeding into it. Bike Kitchens are not shielded from assimilation into mainstream policy practices. Reciprocity and mutuality in assisted bike self-repair fit the prevailing rational of individual responsibilities in neoliberal governmentality (cf. Spinney, 2020, 2022). We content that the Janus-faced character of Bike Kitchens is an inherent advantage that positions them as useful 'narrative' vehicles. Because they can be adapted to various socio-political contexts and supported in various ways, Bike Kitchens are open for collaborations with other actors and enable open-ended, non-prescriptive, inclusive and pluriversal urban imaginaries.

Despite our praise, we must emphasise that Bike Kitchens are no panacea for vélomobility. They might spawn new ways of thinking about, and enacting, socio-material relations, but are unlikely to spread these new meanings on their own. Even if

more people embraced cycle maintenance and repair practices, their role in transforming mobility might be questioned. New ways of seeing and thinking need nurturing to become viable alternatives as to eventually find reflection in policy rationalities (Te Brömmelstroet et al., 2022).

Leyendecker and Cox (2022) remind us that"[c]hange does not happen evenly or consistently, and individual people, with their own histories and involvements, continue to be important as both motors for, and brakes upon change" (Leyendecker & Cox, 2022, p. 7). The Bike Kitchen is an example of a social setting where active individuals might instigate such change.

Bike Kitchen are in a position perhaps not to challenge, but to question, socio-material relations. Our Bike Kitchen experiences point towards the embodied dimensions of benign practices, such as reciprocity, conviviality, sufficiency and care. What Leyendecker and Cox (2022, p. 7) observe in cycling activism, we observe in Bike Kitchens as (advocacy) interventions: they are heterogenous and reveal 'ontological concerns: the kind of people we desire to be and the kinds of realities we inhabit. [. . .]. So, an important part of that discussion concerns the social relations and relationships that we wish to foster'. Assisted self-repair and maintenance in Bike Kitchens as well as other cycling advocacy and activist initiatives convey notions of self-efficacy, autonomy and resilience as part of alternative forms of governing practices (Bradley, 2018; Lange & Bürkner, 2018; Quick and Feldman (2014). They offer insights into alternative mobility and urban narratives that deserve more scholarly attention, the Bike Kitchen suggests entry points to reconceive and rethink mobility, with implications on how we act not only *on* mobility, but *for* fundamental mobility changes. Bike Kitchens might transcend growth paradigms and adverse mobility notions to provide 'deep leverage points' for system change (cf. Te Brömmelstroet et al., 2022).

The present case is but one example of in-depth investigations of a Bike Kitchen arrangement in a Swedish context (e.g. Bradley, 2018; José Zapata et al., 2020). Previous research in Swedish contexts has already investigated Bike Kitchens as part of the urban sharing infrastructure (Hult & Bradley, 2017), citizen-driven waste-prevention initiatives (José Zapata Campos & Zapata, 2017), prosumption, consumption governance (Lehner, 2019), circular economies (Bradley & Persson, 2022), and more specifically bike-sharing initiatives in circular futures (Henriksson & Scalzotto, 2023). Like the present article, most have done so with reference to single cases. In light of the growing body of 'Bike Kitchen research' future studies might utilise comparative approaches to interrogate commonalities and differences between Bike Kitchens on national scales and beyond. Conceptually, future research might explore the intersections between cycling and other practices through shared elements (e.g. Mock, 2023) to better understand in which ways desired practices may be supported and while others reduced. We further encourage research to engage with the embodied and experiential characteristics of cycling in conjunction with nurturing alternative cycling narratives. Where the position developed here supplements narratives of sociomaterial care, future research might explore community street interventions in light of a commoning mobility narrative (Nikolaeva et al., 2019). In relation to mobility as unnecessity (Te Brömmelstroet et al., 2022), research might also position personal mobility as a privilege. For instance, through research together with people

challenged to experience cycling on their own (Andrews et al., 2018; Clayton et al., 2017), or by exploring social cycling initiatives that assist in experiencing cycling mobility (Cotnam, 2020; Gray & Gow, 2020; McNiel & Westphal, 2020).

Disclosure statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Authors' contributions

Daniel Valentini developed the research design, collected the material, conducted the analysis and wrote the paper. Andrew Butler commented on and suggested revisions to the manuscript.

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