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E-biking within a transitioning transport system: the quest for flexible mobility

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ABSTRACT

Over the last few years, electrically assisted cycling, e-biking, has increased substantially worldwide. Replacing car driving for individual journeys, especially commuting, is highlighted as important to mitigate climate change, improve public health, and reduce congestion and other unwanted consequences connected to the car. Car driving, however, is still the overwhelmingly dominant mode of personal transport globally and the 'system of automobility' permeates the whole of society. Flexibility and autonomy are considered the main reasons for the car's dominance (Urry 2004). By analysing interviews and diaries kept by e-bikers, collected in semi-urban and urban settings in Sweden, this article aims to contribute to knowledge about emerging micromobility practices such as e-biking in relation to a transport system where flexibility is the norm. The results show that e-biking encompasses elements that give the practice potential to both recruit and retain practitioners. By successfully combining elements of conventional cycling and car driving, it offers reliability, convenience, and flexibility. E-biking facilitates transforming a dull commute into leisure as the rider can enjoy the sensuous and reflective aspects of the journey. At the same time, through that squeezing of time, it does not challenge prevailing structures but rather maintains the time-space of automobility.

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Introduction

Since its introduction to the masses in the 1950s, car driving has become so dominant that it permeates the whole of society and shapes infrastructure, industry, economics, and everyday life. Sociologist John Urry (2004) calls it the system of automobility and claims that flexibility and autonomy are the main reasons for the car's historical dominance. At the same time, car driving has many unwanted consequences. Replacing the car for individual journeys, especially commuting, is therefore highlighted in policy and public debates as well as in research as an important way to mitigate climate change, improve public health, and reduce congestion in urban areas (Zhang 2022). Alternatives that enable the same 'connectivity, speed and "convenience"' as the car (Cass and Shove 2018, 8. See also Urry 2004) are needed in order to reduce car usage.

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Micromobilities, that is light weighed, slow-moving vehicles, with or without small electric assisting engines (Bahrami and Rigal 2022; Cook et al. 2022; Jones and Chatterjee 2023; McQueen et al. 2021) with ‘capacity to mediate between different spaces and speeds’ (Bahrami and Rigal 2022, 14). The driver can move between roads and pavements, walk with their vehicle, or bring it into other transportation modes. Despite this high degree of agility, independence and flexibility, it has historically proved difficult to replace the car with micromobility alternatives.

In this article, the practice of e-biking, electrically assisted cycling, is discussed within this context. Over the last few years, e-biking has increased substantially worldwide (Næss, Heidenreich, and Solbu 2023). The external assistance created by the electric motor place the e-bike somewhere in between a conventional cycle and a car/motorcycle (which also are the transport modes that e-biking tend to replace). As discussed in previous research and further discussed below, the external assistance facilitates longer trips in hilly and windy conditions and makes the transport mode more accessible for people with physical limitations (Cherry and Fishman 2021; Edberg 2023; Fishman and Cherry 2016; Fyhri et al. 2017; Fyhri and Fearnley 2015; Marincek and Rérat 2021; Plazier, Weitkamp, and van den Berg 2017; Popovich et al. 2014).

The aim with this article is to contribute with knowledge about emerging micromobility practices such as e-biking in relation to a transport system where flexibility is the norm. By deriving from the perspective of already committed e-bikers, why and how e-biking recruits and retains practitioners and, similarly, why it is considered a preferred mode of mobility by practitioners themselves, is examined. The analysis lays the foundation for a discussion on the potential role of e-biking within a future more sustainable mobility system.

The informants, from urban and semi-urban parts of southern Sweden, were asked to write travel diaries and then develop their answers in interviews, which were partly conducted in a mobile format. The material was analysed through a practice-theory lens which offers the opportunity to analyse everyday routines as part of social transformation (Shove, Pantzar, and Watson 2012).

The results show that the key to understanding the popularity of e-biking as an alternative to car driving, conventional cycling, and public transport is the flexibility and predictability offered by the practice. It is argued that this is created in certain environments and by a combination of different elements, which also enable the practice to play along with the rules of automobility. E-biking thus facilitates maintaining the current autocentric lifestyle, including norms of cleanliness, distance between work and home, and pro-growth ideals, which give a certain meaning to the practice.

Automobility, flexibility, and the integration of practices

‘The system of automobility’ (Sheller and Urry 2000; Urry 2004) describes the stable social structure in which the car is such a dominant feature that it permeates the whole of society and shapes our infrastructure, industry, economy, and the way we live our lives. The introduction and domination of the car does not simply imply higher speeds but also creates a system that stimulates and takes over the notion of convenience (Dennis and Urry 2009), controls the landscape, and is a key commodity in production and consumption (Dant 2004). Dennis and Urry note that other modes of mobility have to struggle to fit into the car-centric landscape because the car ‘has redefined movement, pleasure, and emotion in the contemporary world’ (2009, 132). This also implies that other modes of mobility and vulnerable social groups are left behind due to the unequal power relations that automobility contains (Cresswell 2006; Powells et al. 2014; Sheller 2011, 2018; Spinney 2020). Cycling and other micromobility solutions can constitute more equal alternatives – e-biking can for instance empower women in low-cycling countries (Wild,

Woodward, and Shaw 2021), but the risk is that inequal structures instead are reproduced (Cox 2022).

Urry (2004) claims that, when it was introduced, automobility was something new – travel by car did not replace public transport or other vehicles, but rather gave birth to new travel routines and additional journeys. The main reason for this was the flexibility it offered, with drivers being able to get wherever they wanted, whenever they wanted. Compared to the timetables of public transport, automotive temporalities are more subjective and individualistic. However, this also includes coercion because ‘it forces people to juggle fragments of time so as to deal with the temporal and spatial constraints that it itself generates’ (Urry 2004, 28). The power of automobility to remake time-space, and to expand, thus stems from ‘its peculiar combination of flexibility and coercion’ (Urry 2004, 27).

Any given practice, such as car driving or cycling, is not inherently flexible in itself. The flexibility is rather situated and varies depending on how the practice is positioned in relation to other practices. Cass and Shove (2018, 9) define flexibility as ‘the converse of closely-coupled sequencing and/or rigid synchronization’. Practices are more flexible when they are ‘relatively detached (they are not tied to specific times or places); de-coupled (not requiring the co-presence of other things or people), or capable of being interrupted, restarted and broken into smaller parts’ (Cass and Shove 2018, 9). Flexibility can therefore be conceptualised as an outcome of how practices are sequenced and synchronised (Blue, Shove, and Forman 2020).

Practices are here understood as routinised types of collective behaviour. That does not mean that individual differences do not exist. To demonstrate the (inter-)connectedness of individuals and structures, it is relevant to distinguish between practice as performance and practice as entity, where the former consists of the integration of different elements carried out by individuals. Practice as entity is then the shared understandings of that practice that exist beyond particular individuals, socially constructed ideas that have a history and can change over time (Shove, Pantzar, and Watson 2012; Spurling et al. 2013). A practice is thus a pattern that can be executed in many different and unique ways (Watson 2012). At the same time, the existence of any one practice depends upon the people performing it, not only on the elements of which it comprises. Practitioners need to be recruited, but also to remain attracted so that they continue to engage in the practice. Recruitment is affected by existing inequalities, and risks reproducing them. How practices persist can be explained, at least to some degree, by whether or not they provide any internal rewards, have a symbolic or normative anchoring, or are connected to other practices (Shove, Pantzar, and Watson 2012, 75).

According to Shove, Pantzar, and Watson (2012), practices consist of three interrelated constitutive elements that are brought together each time a practice is performed. *Materials* are different objects, technologies, and infrastructure, such as roads, vehicles, and clothes. The battery and the motor are the material entities most clearly characterising e-biking (Behrendt 2018). *Competences* include knowledge, physical ability, and shared understandings of how to best perform a practice. Examples include the ability to drive, functional dressing, and finding appropriate routes and parking places. *Meanings* are cultural conventions, expectations, and socially shared understandings. The car, for instance, has historically been seen as a status symbol, and over time cycling has changed from being a leisure activity for the rich, to a dominant community mode of transport for the working class, to a more marginalised mode of transport, which is now increasing again (Cox 2019; Spinney 2020). The three elements are interconnected and often difficult to separate from each other. For instance, in cycling, locks are not only material objects but also a competence. As Aldred and Jungnickel (2013, 614) describe it: ‘while competence in car locking would often reside largely in the vehicle itself (via integrated locking systems), the distribution of competence is different with bicycle locks. Cyclists need to know what counts as a “good lock”’.

Practices often involve ‘coupling constraints’ (Hagerstrand 1970); that is, they require that other people or things are present at set times. In related terms: different practices connect to

each other in the daily schedule and lead to sequences of actions. This sequencing relates to 'necessary' materials, the preparation of those materials, social conventions, and institutional ordering (Cass and Shove 2018, 7–8). For instance, preparing to commute to work by cycle includes packing a bag, which in turn requires that the clothes to be packed are clean and dry if it is deemed necessary to change them – and also the existence of a shower at work. To be flexible and effective, the commuter must also be able to perform the sequence of practices (before and after) in a smooth way.

E-biking is thus analysed as an integrated, sequenced – not isolated – activity, a practice that is entangled in other practices and infrastructures in time and space (Cox 2019; Shove, Watson, and Spurling 2015). Similarly, Urry claims that the dominant automotive system does not depend upon the car in itself, but rather upon the specific interconnections between different features that characterise it: 'autonomous humans combined with machines with capacity for autonomous movement along the paths, lanes, streets and routeways of one society after another' (Urry 2004, 26). That is, we need to include what happens before and after the trip, such as the reasons for it, what materials need to be brought along, and in what condition the commuter 'needs' to arrive at work (fresh or sweaty), which then includes norms of cleanliness and comfort (Shove 2003a).

As the system of automobility has created individualised mobility, including 'instantaneous time, fragmentation and coerced flexibility' (Urry 2004, 36), a return to a transport system dominated by collective forms of travel, such as public transport, is deemed unlikely (Pooley, Turnbull, and Adams 2006; Urry 2004). People possessing the most beneficial prerequisites (in terms of gender, economic means, infrastructure, etc.) for having a choice have always, long before the existence of the car, preferred 'a means of transport that minimised contact with other people and which gave them maximum control over their journey and their personal space' (Pooley, Turnbull, and Adams 2006, 256); that is, individual and flexible modes of mobility. The reduction of car usage thus requires other modes of travel that offer the same type of flexibility. As discussed in more detail below, it could be argued that the temporalities, movement, and space of the cyclist are even more personalised and thus, in certain respects, more flexible than those of the car driver due to the hybrid nature of cycling, and that the addition of the electric motor has the prerequisites to make e-biking even more flexible because it enables adjustable assistance.

Cycling and other micromobility modes potentially has qualities, such as slowness, sensory richness, the ability to socialise, environmental consciousness, and enhancing diversity and well-being, that challenge the economic growth narrative symbolised by the car (Furness 2005; Hall 2003; Næss, Heidenreich, and Solbu 2023; Spinney 2020). According to Spinney (2020), however, it is speed and other qualities that reproduce and sustain pro-growth agendas and enable commuting for a minor, privileged, group that are currently enhanced. Thus, 'what we seem to be producing is a cycling system that attempts to mimic the car system, just slightly slower (or indeed, in the context of current high levels of congestion, slightly faster)' (Spinney 2020, 11; see also Sheller and Urry 2006, Sheller 2011). Bahrami and Rigal (2022, 2), on the other hand, claim that micromobilities, of which e-biking is arguably part, have the potential to 'flip urban mobility into a new system, beyond car dominance and its spatial patterns of segregation and fragmentation'. One reason why micromobility not yet has been able to seriously challenge the current system is the lack of largescale interventions beyond the individual scale (Bahrami and Rigal 2022, Næss, Heidenreich, and Solbu 2023; Zhang 2022). The 'underlying culture of autonomous mobility, the spatial and social relations that go along with automobility, and the landscape of cultural discourses that equate personal mobility with freedom' (Sheller 2011, 292) need to be challenged.

In the following sections, after discussing methodological issues, the empirical material is considered through this lens.

Definitions, methods and materials

In this article, the term *e-bike* is used to describe the artefact that is used when cycling assisted by an electric motor. To distinguish e-biking from other related practices, Behrendt (2018) introduced the term *e-velomobility*, which implies practices, systems, and technologies of e-biking and ‘focuses on the complex interactions between bodies, bikes, electric motor and battery, urban environment and other road users’ (2018, 72). Behrendt emphasises that, as pedalling is a key feature of velomobility, *e-velomobility* does not include moped-style electric two-wheelers, even though they are related. In this article as well, the scope is limited to this type of e-bikes, also called *pedelecs* (short form of pedal electric bicycle), which have an electric motor that can be switched on for assistance. The motor can be a maximum of 250 watts and only give assistance up to 25 km/hr to be classified as an e-bike in Sweden and the EU (European Parliament 2002; Swedish Ministry of the Environment 2017, §2).

In Sweden, where this study was conducted, the government is aiming for zero net greenhouse gas emissions by 2045 and has established an interim target of a 70% reduction in the transport sector by 2030 (Swedish Government 2018a). At least 25% of personal journeys should be undertaken by public transport, cycling, or walking by 2025 (Swedish National Board of Housing, Building and Planning 2019; Swedish Government 2018b). As one way of stimulating this transition, the Swedish government introduced an electric vehicle grant in 2017. The grant was regulated in a governmental act (2017:1317), and had the intention to ‘increase the possibilities for transporting yourself in a climate-friendly way’ (Swedish Ministry of the Environment 2017, §1 authors’ translation). Before being revoked already in 2019, the grant was heavily criticised. The main argument being that the grant principally would gain already well-situated city dwellers. The at-the-time right-wing opposition regarded the grant as symbolic without leading to climate benefits. Other criticisms included mismanagement of tax money and that investments in cycling infrastructure and increased conventional cycling would be preferable for the environment as well as for public health (Swedish Environmental Protection Agency 2019, 15). Anderson and Hong (2022, 4) argue that the grant was an expensive way to reduce externalities from driving, even though it led to fewer commuting trips made by car. According to statistics gathered by The Swedish Environmental Protection Agency (2019), it was both men and women with a higher mean age than the population in general, living in urban areas in the southern part of the country, with a higher level of education and a higher mean income, who were typical recipients of the grant. The recipients also estimated their health as better than the population in general. This is in accordance with how previous studies have characterised the typical e-biker (Cherry and Fishman 2021) and was significant for the participants in this study. However, it is noticeable that several participants had physical disabilities that hindered them from conventional cycling, and that several people lived in the countryside.

This paper draws mainly on diaries written by e-bikers, along with qualitative active interviews.

Focussing on already devoted practitioners might be considered a drawback as it excludes the non-users, those that never would consider altering their comfortable autocentric lifestyle as well as the ones lacking the opportunity to alter their mobility patterns, together forming the majority of the population. It is equally important to remember that this study takes place within a western, high-cycling context and that the conditions for e-biking and other active modes of transport differ around the world (Wild, Woodward, and Shaw 2021). However, analysing the ones successfully conducting an (individual) transition but being aware of the structures supporting their favourable situation, offer the opportunity to understand the practices at play in further depth which in turn hopefully can gain the transition to more sustainable and just mobility not only in Sweden.

Twenty-seven diaries were collected, and twelve interviews conducted. 21 of the participants were recruited from among the recipients of the Swedish electric vehicle grant while the rest of

the informants were recruited from a Swedish Facebook group devoted to e-biking and through invitation letters placed on e-bikes.

The informants were aged between 30 and 72 years, with a slight predominance of women. The main use for the e-bike was as a means of transport for everyday journeys, such as commuting. Most informants had a commuting trip of up to 10 kilometres but occasionally travelled up to 30 kilometres by e-bike. The informants all lived in the southern part of Sweden, with a concentration on Gotland (which had the most disbursements from the electric vehicle grant) and Stockholm (which had a low number of disbursements). This selection ensures a rich and varied empirical material including that both urban and more rural areas were studied.

The diaries were designed as open-ended travel diaries in which participants were asked to describe and reflect upon their travels for at least one week. The procedure was repeated three or four times during different seasons. Questions regarding the purpose of the trip, how long it was, and what the weather was like were added to guide participants. In addition, they were encouraged to add photos and documents to illustrate their stories. The instruction was to describe all their journeys, not only the ones conducted by e-bike. It was evident, however, that the focus was primarily on the e-biking, and other trips were only briefly mentioned. To overcome this drawback, to enable us to ask follow-up questions, and to extend the reflection, semi-structured interviews were conducted with a selection of the diarists.

The interviews were partly conducted in a mobile format (Büscher and Urry 2009; Cox 2019) to enhance our understanding and further engage in the practice. The interview either started or ended with a joint cycle tour along a route the participant often took, such as their standard commute. The interviews were recorded, but as the mobile part proved difficult to record, extensive notes were taken directly after the session. Informed written consent to take part in the research have been obtained from all participants, and the names used in the article are pseudonyms.

The combination of diaries and active interviews proved successful in offering participants complementary ways of expressing themselves (Elliott 1997; Kenten 2010). This 'diary-interview' method combined the linearity over time of diaries, which can reveal temporal shifts (Kaun 2010), with the opportunity for enhanced reflection provided by interviews. This was particularly useful for covering a mundane activity like everyday mobility, which can be difficult to describe after the event (Kenten 2010; Zimmerman and Weider 1977).

The interviews and diaries were supplemented by discussions on online forums devoted to e-biking. Data collection was done in Swedish throughout, which means that all quotes appearing in the article are translated into English. The material was coded using NVivo software. Theories of social practices, as described above, informed the analysis throughout.

Squeezing time? The quest for a convenient and predictable mode of travel

In the material, the most stated reason for purchasing an e-bike, and the most common way of using it, is to commute back and forth to work. Commuting can be regarded as a single coherent practice because it implies 'the activity of travelling regularly between work and home' (Cambridge Dictionary 2022). The commute is a routinised practice (O'Dell 2020) and, to be comfortable, it should be predictable and as pleasant as possible, but still go quickly. Commuting is probably the most common form of everyday mobility for adults (Pooley, Turnbull, and Adams 2006), and among the informants in this study, the e-bike was considered the most convenient, flexible, and predictable way to accomplish it.

An attributed meaning that unites cycling and car driving in opposition to public transport is that they are individual and independent modes of mobility, where the traveller can keep distance from others and decide upon the route and timetable. The e-bike, in comparison to conventional cycles, however, also assures the traveller of a steadier speed, less affected by

headwinds or hills. A combination of flexible route choices and the ability to avoid being caught in traffic jams or delayed public transport, leads it to be regarded as a predictable commuting tool.

I know that in certain situations, first of all, I sometimes have to show up [at work] within an hour's notice and then I know I can't rely on the metro. And usually when the metro breaks down then there is congestion [on the roads]. In winter traffic and stuff like that, it always tends to go hand in hand. And with this sort of on-call rescheduling thing, I felt like this is sort of the only way I can make sure that I actually show up where I'm supposed to be. Plus it's an incredible freedom to be able to ride. [...] So when I add up walking to the subway, jumping on and going and then walking the last bit. I think it's 35 minutes maybe, 30. Here [with the e-bike] I'm there in about 18–20 minutes. So somehow I'm gaining every day. I gain by getting home on time and faster to my kids every day. (Sandra, diary)


Sandra states that she is dependent upon a reliable method of commuting that can get her rapidly and conveniently to work at exactly the right minute, in the right condition – sometimes at short notice. She found such elements in e-biking. E-biking can thus be a good tool to handle everyday time-space restrictions, such as inflexible working hours, the inability to work from home, and picking up/leaving children at school and activities. Using an e-bike, as in Sandra's case quoted above, can thus be a rational choice to get from one place to another as quickly as possible without being hindered by anyone or anything else. Convenience is thus not only calculated in minutes (Dennis and Urry 2009). It can also involve fewer moments than alternative travel modes. It is common for the e-bike to be parked close to the residential house, that the route includes few stops and no risk of traffic jams, and ends with parking the e-bike at work, in comparison with walking to the metro station, waiting for the train, maybe experiencing delays, walking from the metro station to work, and so on. E-biking can thus help organise and connect dispersed practices (Southerton 2003). In this sense, the level of accessibility is high, as long as the infrastructural settings, not the least for parking, are in place (Edberg 2023). But the practice also generates less rational feelings, such as a sense of freedom, as expressed by Sandra above.

In comparison with conventional cycles, the electric motor makes it easier to use cargo e-bikes or ride with chariots behind the e-bike and with more load. Thus, it makes it possible to 'squeeze time' (referring to practices condensed into limited blocks of time (Southerton 2003)) in connection with shopping or picking up children. However, there are still examples of situations where a car is used as a complement:

Went shopping for flowers and bags of soil etc. for the garden. Nothing that works to load on the cycle. (Sandra, diary)

Urry claims that one of the components that (together with other components) generates the character of the dominant system of automobility is that it 'reorganizes how people negotiate the opportunities for, and constraints upon, work, family life, childhood, leisure and pleasure' (2004, 26), and creates a norm for how certain things should be accomplished. Examples include being able to combine errands, transport goods, or be geographically mobile, which can be exemplified by the quote below:

Getting rid of the car as a means of transport won't work for us because we have our summer cottage, hunting interests, social life outside Stockholm, and the need for transport capacity that far exceeds collective solutions by bus, train, or other means of transport. (Michael, diary)

Letting go of the car is not regarded as an option by Michael and many others because they perceive that too many of their interests and engagements require a car. They do, however, prefer to use the e-bike when it is convenient. It is thus the practice – getting from A to B in the most flexible, comfortable, enjoyable, and reliable way possible – that is important, rather than the vehicle. The analysis thus shows that the e-bike, conventional cycles, and the car are often seen as complements rather than combatants by e-bikers. They fulfil different purposes at an individual level. The vehicle is chosen in terms of the performance that is required. 

complementary approach, however, requires access to a multitude of different vehicles, which is not achievable for everyone.

However, by changing habits and acquiring competences or appropriate materials, new routines are created. One example is procuring a cargo bike or chariot or, as in Anna's case, a long tail (a e-bike with a modified, extra-long and stable rear package carrier), which enables her to take two children along, which are possible ways to overcome transport limitations and increase the flexibility of e-biking:

Went with the car to the house we just bought to meet a craftsman. Brought both kids, which made it hard to ride a cycle. Although not when we get the new cycle we're going to buy, then both can ride! Did some shopping on the way home because I had the car anyway. (Anna, diary)

As described above, buying an e-bike with extra carrying capacity will reduce the demand for a car. As communicated in an interview conducted after Anna bought the long tail, the family now makes a lot of journeys with it that would otherwise have been done by car, and the family has reduced the number of cars they own from two to one.

The experience of convenience and what is the 'normal' way of performing a practice can thus change, and is related to the infrastructural arrangements within which it takes place. As Stina notes in relation to recycling:

Cycled to the recycling to throw some stuff away. So convenient and it went so fast. I was the only cyclist! (Stina, diary)

In some circumstances, the meanings of the e-bike are largely the same as those of the car. The ability to undertake practices such as shopping trips or garbage management by cycle however demands other, more adequate, infrastructures that promote other modes of mobility than cars. As Shove, Watson, and Spurling (2015, 9) argue, infrastructures 'serve to connect practices in space and time'. As infrastructures and practices intersect and shape each other, the planning of infrastructural arrangements is closely involved in whether or not certain practices depend on cars and can thus affect what is deemed 'normal'.

Electrical assistance: Materials, competences, and meanings

As described above, the assistance offered by the electric motor is not only optional but also available at different levels. The analysis shows that e-bikers continuously negotiate how much assistance one should use (see also Behrendt [2018, 72]). These negotiations are mainly based on motivation and energy, if the rider is prepared to work up a sweat or not, and the infrastructures used. It also differs between different practitioners. A large variety of different meanings of e-biking practice are thus generated because the level of assistance is optional and negotiable. These meanings are connected to the expectations and perceptions of one's own performance of the practice. While some prefer to do the travel as active as possible, others use the assistance more. When defending the fact that she often cycles with full assistance, Anna contends: 'if I didn't like having assistance, I wouldn't have bought an e-bike'. For Anna, the meaning of the e-bike is to avoid what she experiences as the drawbacks of conventional cycling – above all, being sweaty. But at the same time, she enjoys movement, being outdoors, travelling in an environmentally friendly way, and not being stuck in traffic jams or dependent on timetables, as is the case with cars and public transport respectively. Anna often chooses a scenic route, even if it takes longer.

The negotiable assistance requires different types of micro-decisions and competences than is the case with other mobility options. In some ways, these are less complex and demanding just because the e-bike can also be operated without the motor, and thus the driver does not have to worry about being stranded if the battery becomes drained of energy, as is the case with a car, an electric scooter, or a one-wheeler.

In other ways, the decisions are more complex. To be able to benefit from the assistance, the e-biker needs to manage competences related to charging and maintaining the battery. In social media and e-bike journals (Åslund 2020), as well as among my informants, the best ways to manage batteries and the optimal way of charging and storing them in order to prolong the life-span and the capacity are discussed.

My first e-bike battery was crappy, because I accidentally left it on the charger when I went on vacation, and that's just how you kill a battery. (Thomas, interview)

Batteries are also connected to competences such as range calculation. Because the battery uses more power when cycling in harsh weather conditions – more assistance is used against the wind, and cold temperatures decrease the battery's capacity – the practitioner needs to be able to determine whether the battery is sufficiently charged based on weather forecasts. As Gunnel notes:

In good weather, the battery lasts the round trip to work, but as soon as it gets cold, I have to charge it at work. I have to lug the charger back and forth. This has meant that I always charge the battery when I get to work, whether I need to or not. (Gunnel, diary)

As Gunnel needs to remember to carry the charger back and forth between home and work, she has considered buying another battery, which she reasons would also be good 'in case the charging didn't work for some reason'. Even though the e-bike can be operated without the assistance, it is no longer 'e-biking' if pedalling is the only option (Edberg 2023). An uncharged battery thus has effects for the entire practice.

I find the cycle very sluggish when the battery runs out. That's the worst thing about my bike. It should have better gearing when the battery runs out and you're forced to ride without electricity. (Yvonne, diary)

An uncharged battery also has other consequences, such as if the driver is dressed for the less physically demanding e-biking practice, and then works up a sweat when the practice shifts into conventional cycling. Another linked consequence for e-bikes with integrated lights is that the lights do not work if the battery is uncharged.

Forgot to charge the battery for the cycle, so not much energy left in it. Enough to ride up the hill later, but no more than that. It's stupid that the cycle lights don't work if the battery is empty. (Sofia, diary)

If these sequenced practices are not correctly performed, the e-biker risks standing there with a flat battery. For some, this is not a problem – the cycle can still be used – while others, such as Yvonne quoted above, consider it tiresome.

In summary: The battery itself, including locking, removing, carrying it around when not cycling, and charging is sometimes a hassle requiring competence and routines. On the other hand, being able to cycle without the battery is also an increment of flexibility and demonstrates the hybrid nature of e-biking – between motorised vehicle and cycle. Meanings connected to e-biking can be referred back to the *materiality* of the e-bike, including surrounding infrastructure, but also to *competences* to manage the cycle and accessories and to plan before a trip, all of which are discussed in more detail below.

Turning a commute into leisure

The flexible travel includes getting from point A to point B at a previously estimated time and in a smooth and predictable manner. This does not, however, necessarily imply finding the fastest route if a slower route provides other sub-benefits.

It [the journey] becomes more of an experience when you cycle. Both that you feel if it's cold or hot, and the scents and, but also what kind of wind you get. Is it biting cold or is it actually nice? So you experience the seasons a lot more. [...] You get a greater experience of that [when you're] cycling than sitting in a car. (Yvonne, interview)

Using the commute as an opportunity to be outdoors, experiencing the surroundings with the senses, whether it be scenic views or scents, or choosing the route with fewest bumps, hills, and stops, maximises what the commuter can get out of the journey and distinguishes it from car-centric logic. It could also be understood, however, as a very rational choice because time is used in the most efficient manner (Southerton 2003).

In either case, for the informants, taking a scenic, or in other ways pleasant, route is a way to experience the ride and transform the commute into a leisure activity. Commuting can thus become a time for reflection. As Gunnel and Sandra write:

Really happy that I cycled today even though it was evening. Could just rush home with my cycle. Being used to longer commutes, I can sometimes miss the time. Cycling gives me the opportunity to reflect on the day's work. (Gunnel, diary)

To work, taking long deep breaths. Crazy busy at work. Trying to enjoy the moments when I can't work anyway, looking out over the water at the Traneberg Bridge. (Sandra, diary)

Enjoying the ride makes the journey a goal in itself and not just a necessary evil. As Sandra continues:

It's nice to break up a full day's work at home with a cycle ride. (Sandra, diary)

For Sandra, as for so many others during the Covid-19 pandemic, the amount of working from home has increased. Taking a ride on the e-bike can then be regarded as a nice break in the working day, even when the reason for the trip is something as mundane as picking up the kids from preschool. In comparison, driving a car is framed by the informants as stressful and as a 'transport distance', lacking the benefits of being outdoors.

The ability to design and alter the route, depending on circumstances, needs, and priorities, during a single journey or to fit what one deems the ultimate meaning of the journey to be – as fast as possible, relaxing, beautiful, without stops, or depending on the weather, company, or something else, is one often-mentioned advantage of e-biking. As Anna and Christer explain:

Are there good cycle paths? Is the surface good? Preferably not in heavy traffic, not too close to cars. Mainly because I find them annoying, they make noise, and they stink. (Anna, interview)

I try to visit my father at weekends, so the e-bike is great for this because you can choose other routes home depending on the weather. (Christer, diary)

The optional assistance decreases the cyclist's responsibility and the need for related competences in terms of knowing about the topography of the route (see also Aldred and Jungnickel 2013). In the quote below, Anna describes how the assistance facilitates choosing the pleasanter, but more physically demanding, route:

Incredibly nice cycling day. Nice to have an electric bike so I can choose the nice route along the water, despite the fact that there are a lot of hills along the way, and still not sweat. (Anna, diary)

In addition, just as with a conventional cycle, the e-bike can be wheeled, or even carried, in areas where cycling is prohibited or impractical, which facilitates shortcuts that are impossible by car. To find the ultimate route for regular trips such as the commute, it is often necessary to take shortcuts and shift between cycle tracks, pedestrian paths, roads, gravel, or even off-track. It is also common for cyclists, if they dare, to move between streets, cycle lanes, and – even though it is prohibited – pavements (Ihlström, Henriksson, and Kircher 2021) to follow the most convenient route. With a cycle, one can 'get off the bike and wheel it where there's a pedestrian path or something like that, and I can't do that with a motorcycle. I can take it [the e-bike] into the park and then I continue to cycle in the other direction, so it's much more agile and flexible' (Anna, interview). Being able to make such switches is highlighted as an advantage of cycling in general, and of e-biking in particular, because the motor facilitates maintaining and resuming speed, as well as overcoming steep uphill stretches. In addition, the electrical assistance makes it possible to have cushioning, which otherwise makes the cycle heavy to pedal. This facilitates

cycling on gravel and other uneven surfaces. The number of possible routes increases (see also Koucky et al. 2017), and thus also the flexibility of the journey. The e-bike thus involve both temporal and spatial flexibility, even though the motor and battery make the cycle heavier and the parking situation more complicated.

Finding the right route requires the right competences and access to materials such as GPS.

Cycling by Google GPS and made a bad route choice. Cycled along Hornstull beach and there turned out to be a lot of people out walking. Had to cycle quite slowly, but arrived just in time. (Peter, diary)

In comparison with public transport, where you are locked to a timetable and predesignated stops, and where you are 'passive' as soon as you are in the train or bus, the e-biker must acquire the competences of navigating and scheduling the trip, or alternatively the competences of using journey planning tools, such as road-finding apps. The e-biker thus operates in the same personal, 'instantaneous' time as the car driver (Urry 2004, 29) and must sequence different points in the schedule (Southerton 2003). The hunt for the perfect route, or seeking the exact timing of the trip, can be fun and an act of independence, but also stressful. In addition, despite the benefits of flexible route choices, being forced to take detours also reflects the domination of the car, the fact that infrastructure for cycling is underdeveloped, and that the need to facilitate motorised mobility still dominates urban planning (Cox and Koglin 2021; Hall 2003).

In summary: Flexibility in how the commute is carried out creates time for leisure, because the trip in itself becomes recreation and an experience. The commuting time is re-evaluated and is no longer considered a waste of time (Plazier, Weitkamp, and van den Berg 2017, 30). In many ways, this is similar to how automobility was described in its infancy, before it became a means of commuting: 'To tour, to stop, to drive slowly, to take the longer route, to emphasise process rather than destination, all became part of the spatial practice of performed art of motor touring' (Macnaghten and Urry 1998, 209 referring to Adler 1989). Additionally, the design of the vehicle makes space outside the road network accessible. But, as argued above, the rationality of maximising one's usage of time and space also fits well into the currently dominant pro-growth, time-squeezing logic.

Optional physical activity and norms of cleanliness

Another dimension of flexibility is level of physical activity. Based on the diary material, the actual bodily movement of cycling is an important aspect of the reasons for using an e-bike, even though e-bikers sometimes feel judged and 'stigmatised' in relation to conventional cycling as they get comments from people using non-assisted cycles and from members of the general public who consider e-biking to be cheating (see also Behrendt 2018; Plazier, Weitkamp, and van den Berg 2017; Popovich et al. 2014). The e-bikers themselves often feel obliged to give excuses or explain why they use electrical assistance:

I love my e-bike and using it to and from work. It gives me a little exercise. A conventional cycle would have given me more exercise for sure, but I would probably not have cycled to work as often then. (Fredrika, diary)

By being able to regulate the assistance, the e-biker can influence the condition they are in when the goal is reached. To live up to current norms of cleanliness, many do not want to arrive at work sweaty – at least not if they have an office job (Shove 2003a, 2003b). This understanding of personal hygiene may function as a barrier to using conventional cycles as a commuting tool. As Fredrika expresses it: 'The hill up to work makes me sweaty on a regular cycle. With an electric bike I don't have to shower when I get to work, I just get warm but not too sweaty.' Thus, when e-biking, the cycling practice no longer has to be sequenced with showering and changing clothes. The possibility of avoiding working up a sweat thus influences the choice of clothes. Even where the informants adjust their clothing to be comfortable for cycling and in accordance

with the weather, it is primarily ordinary clothes that are worn during the commute, no specific training/cycling clothes are required. The cyclist is thus prepared for other activities than cycling, which increases the flexibility of combining the journey with other practices. In addition, the hassle of taking extra clothes and showering accessories can be avoided, which facilitates the daily logistics.

The logistics of it is also a thing [...]. Otherwise I have to think in the morning: 'okay, can I shower now at home, and dry my hair at home, or do I have to take my shower things and change of clothes with me to work?' so I can change there. Then, I have long hair, so it takes quite a long time to dry, so I have to decide whether to go to a meeting with wet hair or not, or I need an extra 20 minutes to fix it. But in the other case, I have those 20 minutes while I eat breakfast. (Anna, interview)

This is another example of time usage maximisation; by being able to dry her hair at home while eating breakfast, instead of allocating time to do so at work, Anna perceives that the e-biking saves her time, something that is greatly appreciated in these times of complex and time-compressed commuting practices (Southerton 2003).

By having the flexibility to regulate or even remove the external assistance, the e-biker can choose to take more exercise when it is socially acceptable to work up a sweat, or when showers and fresh clothes are available, such as on the way home or at the gym.

But the choice of the e-bike specifically was because of the bridge I sometimes call 'the wall', the Traneberg Bridge. Sometimes there's such a headwind that you're all sweaty by the time you get to work. And I need to get to work in different conditions. Sometimes I can arrive at work and be sweaty and then I always have a change of clothes. At other times I need to arrive and be fit for the fight straight away and jump in if there's a rush. So I want to be able to use both options. (Sandra, interview)

'Being clean' and getting exercise are thus two meanings of e-biking – separate but still combinable due to materials such as the motor and competences related to managing the assistance and planning sequenced practices. The combination of elements thus makes it possible to choose between an e-biking practice that is close to cycling and one that is close to car driving.

Conclusion: the flexibility to support or change the system?

Urry (2004, 29) claims that the car journey is the ultimate, most seamless way to travel, and that it makes other modes of travel inflexible and fragmented. As has been argued above, e-biking offers considerable flexibility, convenience, and reliability in some circumstances. It facilitates being flexible within an inflexible daily life, including commuting to a workplace, and being in the right place at the right time for meetings, activities, or picking up children. This is especially evident when the infrastructure built up by the system of automobility fails, such as when roads are congested during certain periods of the day, or when there are no car parking spaces, and requires eligible cycle infrastructure.

The e-bikers contributing to this study claim that e-biking enables them to cycle further, more often, along a greater variety of routes, and on different occasions than conventional cycles. This flexibility makes it 'happen'. In many respects, however, the individual performances of the e-biking practice differ. As described above, for some, it is a means of transport, for others a tool to be outdoors, get exercise, or be independent. At the same time, the individual performances form a coherent practice-as-entity (Shove, Pantzar, and Watson 2012) of flexibility, accepting that assistance is used in situations where alternatives are perceived as causing too much effort, and when the e-bike is considered to add sub-benefits – like enabling one to take a scenic route or by being faster and more convenient. As this article has shown, e-biking brings informal rewards, not least in the form of convenient commuting, exercise, being outdoors, and having the ability to plan one's journey. The practice has a symbolic and normative anchoring because it is promoted in policy and associated with notions of environmental friendliness and a healthy life. It is connected to other everyday practices, such as working,

transporting children, and purchasing goods. Together, this suggests that e-biking is a practice that is not only able to recruit practitioners, but also to maintain them (Shove, Pantzar, and Watson 2012, 75). However, to attract more practitioners the infrastructural settings to be able to sequence e-biking with other practices has to be accessible for a larger share of the population and adopted in policy.

The requirement to pedal but with the option of different levels of assistance offered by the electric motor involves certain materials, competences, and meanings which distinguish e-biking from many other modes of mobility. A car cannot be operated without its engine, and even though the driver can choose different gears, the level of assistance is not negotiable. The opposite is true of conventional cycling, where the cyclist can choose different gears but still always relies on their own physical strength. The main argument of this article is thus that e-biking becomes a viable and preferred choice of mobility mode, especially for commuting, when it successfully combines elements of conventional cycling with the flexibility of the car, and thus can 'blend in' with the current system of automobility. That successful combination creates flexibility, reliability, and accessibility. However, it is to a large degree limited to already privileged groups in certain geographical areas. It is important to remember that the participants in this study represent a minority, a group of already devoted e-bikers with the right conditions to conduct individual transitions of their mobility practices. The opportunity for some to enjoy flexible travel is often enabled by decreased opportunities for convenient mobility by other, less privileged, groups (Cox 2022, Hall 2003; Powells et al. 2014; Sheller 2011, 2018). It is thus important that alternatives to the car do not reproduce the unjust opportunities for travelling flexibly, predictably, and conveniently, neither locally or globally. Injustices in mobility and flexibility distribution thus require more awareness in future research and has to be taken into consideration when policy interventions are designed.

For the e-bikers represented in this material, the e-bike facilitates 'the good life' by decreasing their car usage. This was not necessarily for ideological or environmental reasons, but rather due to other benefits offered by e-biking. Getting from point A to point B as quickly and conveniently as possible is one important benefit. The timescale of the journey is not, however, unlike for car commuters, the single most important issue for e-bikers, who enjoy the sensuous and reflective aspects of the journey. At the same time, by combining their commute with leisure, and using the daily commute to be outdoors, experience nature, and get exercise, e-biking makes it possible to schedule practices within designated timeframes and to 'squeeze time' (Southerton 2003). E-bikers are thus still coerced into the intense flexibility that automobility has created because the practice makes it possible for its users to continue living 'spatially stretched and time-compressed' lives (Urry 2004, 28). Hence, it does not challenge the system of automobility, but rather perpetuates existing structures precisely because e-biking is a flexible mode of mobility capable of replacing the car in many instances. In other words, it maintains the socio-temporal patterns of people's everyday lives (Blue, Shove, and Forman 2020, 939). However, even though the boundaries created by the automobility system restrict e-biking because the design of the road system has been dominated by autocentric planning (Hall 2003; Koglin and Rye 2014; Sheller and Urry 2000), the e-biker is less constricted by the rigid system of where to drive, rules to follow, or the difficulty of interacting with other users of public spaces. E-bikers can access places that are impossible by car, motorcycle, or public transport. The e-bike can be wheeled by the handlebar in places where cycling is impossible and thus is not as bound to the 'rhythm of the road', as Urry (2004, 29) frames it. The practice is thus not only supporting the current system and providing an efficient commuting tool for privileged urban people, it also opens up alternative ways of experiencing mobility, such as sensuously experiencing nature and slow journeys offering time for reflection. As this pinpoint some of the underlying problems with the dominating car culture, this should get more attention in policy in order to reach transformative change.

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