



Beyond infrastructure: The multiple barriers to cycling in middle and older age

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ABSTRACT

Active mobility is at the core of cities' efforts to promote inclusion, health and liveability. However, the role of cycling remains marginal in many cities and its promotion is usually approached from separate health or transport angles. In addition, its sustainability and suitability for people of all ages is questionable, following the persistently low cycling use among older age groups. While urban populations are ageing and cycling offers important benefits for positive ageing, cycling's promotion strategies typically centre on the modal shift of younger age groups and rarely engage with the long-term experiences that define mobility behaviour. In response, this article offers insight into later life urban cycling by illuminating how diverse cycling lifecourses shape ageing, wellbeing, and mobility itself. By using a mix of qualitative methods, it explores the cycling trajectories and experiences of middle-to-older aged adults in a distinctly low-cycling city in the United Kingdom, where it identifies heterogeneous trajectories and sets of barriers and negotiations that shape present and future cycling practices. Furthermore, this piece reveals how cycling's mobility and wellbeing benefits entangle over the lifecourse, as positive healthy ageing resources. Finally, it identifies what it takes, beyond infrastructural transformations, to support low-cycling cities to make cyc a feasible and normalised part of the mobile practices of people of all ages.

1. Introduction

Walking and cycling, as principal active forms of mobility, are among the most environmentally friendly and energy efficient forms of human movement. They form part of zero-emission mobility, but also build physical outdoor activity and associated health effects into everyday activities (Creutzig et al., 2018; Fernández-Heredia et al., 2014). Longitudinal research indicates a further reciprocal effect between active travel and mental health (Kroesen and De Vos, 2020; Martin et al., 2014). Walking and cycling are very rarely harmful to others, are affordable, and active travel networks are a fundamental component of equitable and accessible urban spaces (Chong et al., 2010; Pereira et al., 2017). Despite the convincing evidence base created in recent years, not least in this journal, cycling's health and social equity benefits are however not equally available (Brand et al., 2021; Braun et al., 2021). In its current state, cycling can be exclusive, for instance based on its "high degree of corporeality, dependency on technical skills, risk negotiation, physical capacities, and health situation" (Jordi-Sánchez, 2016: 143, author's transl). The vast differences in cycling uptake between cities and population groups are reflected by a lower representation of women, children and older adults, groups which, in turn, have

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the highest need for protected and well-connected infrastructure (Aldred et al., 2016, 2017).

The resulting reality is that cycling has a low modal share in many cities and that, even when promoting cycling, unequal uptake patterns are being reproduced, with profound effects. Recent work in USA-cities has found that economic and racial inequities persist in new cycling services, which may leave communities most affected by health and safety concerns unattended (Crossa et al., 2021). More generally, active travel promotion may help the shift away from car use, but without improving the mobility opportunities of those who currently do not cycle or those less involved in urban policymaking (Arsenio et al., 2016; Golub et al., 2016). Whereas higher cycling cities tend to have a more balanced gender and age distribution (Harms et al., 2014), low-cycling contexts grapple with a substantial underrepresentation of children, whose independent cycling ability creates skill, responsibility, and autonomy, and of older adults, for whom cycling improves cognitive functions and boosts prevention and other physical activity benefits (Aldred and Dales, 2017; Garrard et al., 2021; Leyland et al., 2019; Schwanen et al., 2012). At the same time, physical activity benefits of cycling are distinctively significant for both younger and older age groups (Götschi et al., 2016). Arguably, this echoes the early findings of Sallis et al. (2004) that active travel conditions have barely improved despite shared interest in doing so in health and transport disciplines. Hickman et al. (2013) and Rau et al. (2016), in addition, maintain that this disciplinary gap also exists at a policy level between spatial planning and sustainable mobility policies.

As a consequence, this paper turns to scholarship on cycling and ageing, two sets of urban realities that reconfigure materialities and individual conditions to access urban spaces and services. Crucially, cycling interventions are found to support personal health and meaningful activity at older age (Oja et al., 2011; Spencer et al., 2019), for instance derived from cycling's convenience or satisfaction, the aesthetics of the urban landscape, and from the collective socialisation in outdoor spaces (Stefansdottir, 2014; te Brömmelstroet et al., 2017; Zander et al., 2013). In a comprehensive review on older age cycling, Van Cauwenberg, de Geus, and Deforche (2018) observe an untapped potential in the social, mental, and physical health benefits of cycling for transportation. Due to the complex interplay between individual and external determinants that impede more widespread cycling uptake for older adults, they call for more research on the determinants that are of particular importance in later life. In a North American context, environmental barriers (weather, distance, terrain), safety barriers (drivers, crime, theft), and personal/logistical barriers (traveling with others, comfort, physical ability, carrying goods) are identified, however for a generic adult population (Fowler et al., 2017).

Cycling studies have created a wealth of knowledge about the role of infrastructure, urban environmental features, and affective elements. Road infrastructure should have safe and physically separate cycle lanes, offer integrated networks, and cycling should be promoted as part of commutes, (traffic) education, and cultural norms (Fernández-Heredia et al., 2014; Heinen et al., 2010; Muñoz et al., 2016; Pooley et al., 2013). From a socio-psychological angle, cyclists are found to prefer streets with fewer lanes, lower motorised traffic volumes, lower overall speeds, and no car parking. Fear of traffic creates further tension, protective measures, and eventually exclusion (Chataway et al., 2014) while, in turn, cycling may reduce psychological distress and increase life satisfaction (Ma and Ye, 2022).

However important, the underlying social and environmental factors including safety perceptions, health conditions, and travel patterns may not be generalisable to older adults and others less likely to cycle (Dill et al., 2014; Ma and Ye, 2022). In addition, the mobility trajectories of those who (are foreseen to) cycle deserve attention. Such trajectories are formed by key events and turning points, such as adolescence, family formation or retirement, which are identified as key moments within one's mobility biography (Chatterjee et al., 2013; Hörschelmann, 2011), and by biological, psychological, and social processes that shape a person over time (Jones et al., 2014; Klimczuk, 2015). In addition, cycling practices are shaped by social norms and identities that impede or facilitate its uptake as form of everyday mobility (Spotswood et al., 2015). Thus, the mobility biography is an accumulation of events, choices, norms, identities, and experiences that drives present and future mobility, both through its sequential life phases and by disruptions, delays and returns that occur more abruptly (Berg et al., 2014; Rau and Sattlegger, 2018).

Following this more relational-biographical approach to cycling uptake, this paper argues that any sort of re-negotiation of travel choices and mobility patterns builds on the dynamic space-time constraints of the lifecourse (Jensen et al., 2015). The substrate on which (sustainable) mobility innovations and active travel promotions land is thus imbued by mobility skills, capacities, and experiences that have accumulated over time. In the case of older age groups, this is exceptionally acknowledged by Winters et al. (2015) who draw links between, firstly, older adults' acquired cycling practices at young age and, secondly, and conceptually, between age-friendliness and cycle-friendliness. Similarly, Jones et al. (2016) distinguish the trajectories of existing or potential cyclists of middle-to-older age as either resilient, re-engaged or reluctant, variously able to deal with changing conditions and capabilities based on their cycling antecedents. Arguably, for older adults to (continue to) cycle, both physical infrastructure features and personal qualities (social situation, skill and confidence, later life shifts such as retirement) play a role in prolonging the cycling practice (Ryan et al., 2016; Van Cauwenberg et al., 2018a,b).

Bringing these considerations to the low-cycling case study of Newcastle-upon-Tyne (United Kingdom), this paper aims to understand how cycling trajectories and experiences shape opportunities for ageing, wellbeing, and mobility. It will clarify the role of past mobility behaviours and biographies in the relation to their geographical territory and intends to contribute to the understanding of what hinders and facilitates everyday cycling behaviour. It seeks to pair actual and latent cycling behaviours with age-related capacities, arguing for a more productive way to improve cycling facilities that reduces cycling's emphasis on executive functions and takes account of the sensory capacities that affect how cycling infrastructure is used. It thus complements the works on increasing cycling levels in low-uptake contexts that postulate a growth trajectory that also leads to a more (age-)inclusive uptake (Félix et al., 2019; Den Hoed, 2024).

After all, the age-friendly and health-supporting role of cities has gained importance following a changing composition of their population structure. By 2050, 70% of all people will live in cities worldwide, with people over 60 as the fastest-growing cohort in their populations (Plouffe and Kalache, 2010). Following Murray (2015), transport and mobility research requires to adopt a

transdisciplinary and relational approach towards age-friendliness and urban ageing (also in [Musselwhite et al., 2015](#)), with active agency for older citizens themselves ([Buffel, 2018](#)). By taking a form of active travel in which the middle-to-older age group is underrepresented, the secondary aim of this article is to address the challenge of transforming mobility systems so that they accommodate for ageing in place in cities. To this end, Section 2 sketches the application of mobile and biographical methods in a low-cycling city context, generating in-depth qualitative accounts which are analysed in the light of the literature on active mobility, wellbeing, and age-friendliness in Section 3. Section 4 summarises the key contributions of this paper and their implications for active mobility planning and age-equality.

2. Materials and methods

2.1. Study context

The data collection presented here was part of the project *Mobility and Place for the Age-friendly City Environment*, which advanced the potential of Newcastle upon Tyne (UK) as an Age-Friendly City ([WHO, 2007](#)). Newcastle is the regional centre of Northeast England and the core city of the Tyneside urban area. The city itself has nearly 300,000 inhabitants, whereas Tyneside is home to nearly 900,000. Newcastle's persistently low cycling uptake (<2% of daily trips) and limited age and gender diversity of those cycling resemble the situation of many UK cities ([Department for Transport, 2021](#)). For comparison, cycling uptake in mature cycling contexts reaches up to a 20% trip rate for people aged 65–74 and 13% for people over 75 ([Harms et al., 2014](#)). Regarding vehicle use in Newcastle, 64% of households does not own a bicycle while 39% does not have car access ([Dissanayake, 2017](#)). Although the city is fairly compact and flat, it is worth noting that it is situated along the River Tyne, which lies between 40 and 80 m lower than most parts of the city. Importantly, the study targeted residential neighbourhoods which are mostly located in the flatter, less-central areas of the city.

Despite decades-long ambitions of the city leadership to promote urban cycling, Newcastle features a persistently low uptake ([City of Newcastle, 1991](#); [Newcastle City Council, 2016](#)). As part of a wider trend informed by national transport policy, modernist perceptions of societal progress through automobility ([Urry, 2004](#)), unrestrained resource and space allocation to automobility has occurred since the 1950s. Cycle planning has remained marginalised, although individual cities report recent increases in cycling uptake ([Aldred and Dales, 2017](#)). At the time of study, Newcastle's separated cycling infrastructure was restricted to National Cycle Network (NCN) routes on both banks of the River Tyne and scattered and unconnected cycle lanes throughout. The pink lines represent NCN-routes, the green ones are paths free of motorised traffic, whereas the blue lines are on-road cycle routes ([Fig. 1](#); see [Pepper et al., 2015](#) for more context).

2.2. Study design and data collection

The study took a qualitative approach to capture the long-term mobility experience of people over the age of 55. To understand the effects of cycling on ageing, wellbeing, and mobility opportunities, it enquired both current mobile behaviour and the past lifecourse, and targeted experienced, novice, as well non-cyclists. The methodology is inspired by rich empirical studies that exposed the social and experiential qualities of cycling, based on the mobile methodologies introduced [Büscher et al. \(2010\)](#), such as [McIlvenny \(2015\)](#), [Plazier et al. \(2017\)](#) and [Spinney \(2011\)](#) and [Van Duppen and Spierings \(2013\)](#). These studies provided an important impetus to experiment with mobile methods to get hold of, synchronise with, or intervene in processes of movement in real-time relational dimensions. However, their common focus on specific cycling types, such as mountain biking, messengering, e-biking, or commute cycling, makes mobile methods less prevalent in studies cycling experiences in everyday mobility, including that of older adults. Exceptions are from higher-cycling contexts, such as from Flanders and the Netherlands where studies used a combination of bike-along and sedentary interviews ([Den Hoed and Jarvis, 2022](#); [Van Cauwenberg et al., 2018a,b](#)).

In response, this study developed an integrated research design of biographical and mobile methods. Through a sequence of four research interactions – biographical interviews, video-recorded ride-alongs, geo-tracking, and reflexive interviews –, it documented



Fig. 1. Land use and road network in Newcastle-upon-Tyne.

Source: [Newcastle City Council \(2016\)](#)

people's mobility biographies and current mobility experiences. In addition, it brought together often individually used methods to collect information about mobile biographies, thus mitigating the limitations of separately adopting sedentary or mobile methods (Jensen et al., 2015; Merriman, 2014). First, the interviews covered historical accounts of mobility experiences, (dis)continuities of travel mode uses over time, benefits and challenges, and wider events such as relocations, household changes, work and social relationships, as well as health situations. Second, the ride-along method invited participants who cycled to show a habitual ride to the researcher, who went equipped with a bicycle-mounted video camera with audio capability. Third, the geospatial data were part of mobile diaries collected using a smartphone application that tracked outdoor movements averaging 10 days per participant. A pilot study showed the possibility for easy in-app reconstruction of routes, and minimal intrusion through a legible interface and low battery consumption, while maintaining private data behind password protection (Case et al., 2015). The resulting geospatial information was used to create snapshots of current urban mobility patterns and used as visual input for the concluding interview. In this interview, lastly, participants commented on the gathered research materials, reflecting on route experiences, cycling potential, habits and motivations, and on relations to their reported biographical trajectory. This enabled for a degree of co-production in the data analysis, providing a platform for reflexivity and voicing of participants' local knowledge (Buffel, 2018).

The analysis on which this paper reports is based on in-depth engagement with 17 research participants, following a recruitment strategy based on work with community groups, civic organisations, and a group of novice cyclists on social health prescriptions. Subsequent chain-referral sampling diversified the sample in terms of demographic characteristics, residential locations, life stages, and 'types' of cyclists, allowing to access both actual and latent cycling potential (Dill and McNeil, 2016). Based on informed consent and pseudonymised participation, the final sample of participants is listed in Table 1 and represents a mix of travel mode uses, employment and household types, and cycling trajectories, identified by Jones et al. (2016) as resilient, re-engaged or reluctant. Their ages ranged between 55 and 87, and 71% of participants were female, partly reflecting the higher proportion among the older population. Overall, the analysis reports from 29 interviews with a total duration of 24 h, twelve useable GPS tracks, and ride-along recordings of a total duration of 4.5 h.

The thematic analysis started with closed coding on the interview and ride-along transcripts and excerpts of the video data using NVivo software. The coding structure was driven by the wider research questions of the project, and included health and ageing-related comments, cycling activities (historical trajectories, current practices, choices and experiences), and use of other transport modes. Through iteratively testing, rewriting and merging, these broad codes were divided into (sub-)codes and memos were used to describe this process and the content under each sub-code. Those memos formed the basis for thematic groupings, for instance everything that made cycling 'difficult, impossible, or unpleasant', from which the researcher identified the barriers to cycling uptake developed in Section 3. Other primary themes relevant for this paper are 'expressions of cycling normalisation', 'effects of lifecourse and transitional periods', and 'cycling and ageing' (e.g. difficulties and opportunities around health and wellbeing in later life). The next section presents the analytical themes, specifically the ranges of barriers and qualities of cycling in later life and how these are negotiated in

Table 1
Description of participants.

Pseudonym	Age	Household ¹	Employment	Trajectory ²	Life stage(s)	Cycling context(s) ³	Main mode ⁴
Kelly (f)	55	C	Volunteer/carers	Re-engaged	childhood, recent	NEE	C
Daisy (f)	66	S	Retired (secretary)	Re-engaged	childhood, recent	NEE	B, C
Elaine (f)	68	C	Retired (teacher)	Reluctant	childhood	–	C
Sophia (f)	62	C	Retired (HR)	Re-engaged	childhood, recent	NEE	B, C
Becky (f)	56	C	Business owner	Reluctant	childhood, 20s	Yorkshire, Oxford	W, PT
Anne (f)	87	C	Retired (teacher)	Resilient	always	Cambridge, NEE	B
Thierry (m)	66	C	Retired (teacher)	Reluctant	never	–	W, PT
Richard (m)	56	C, 2ch	Manager	Re-engaged	childhood, recent	NEE	C
Madeleine (f)	68	C	Retired (librarian)	Reluctant	childhood	–	W, PT
Danielle (f)	58	C	Volunteer	Resilient	always	abroad, NEE	B
Stuart (m)	55	S	Unemployed	Resilient	always	East Anglia, abroad, NEE	C, B
Tess (f)	55	C, 2 ch	Higher education	Resilient	always	Edinburgh, London, M'chester, NEE	B
Tracy (f)	57	C	Cashier	Re-engaged	childhood, recent	NEE	PT
Mark (m)	60	S	Cycling instructor	Resilient	always, less in 30s	abroad, NEE	B
Mary (f)	66	S	Retired (teacher)	Re-engaged	childhood, recent	NEE	C
Chris (m)	57	C	Healthcare	Resilient	childhood, student, 50s	Cambridge, London, NEE	C, PT
Olivia (f)	64	C	Retired (higher education)	Resilient	always	abroad, NEE	B

Notes: ¹ C = adult Couple; S = Single; ch = children; ² Classifications follow Jones et al. (2016: 13), 're-engaged' here means 'restarted cycling after a multi-year hiatus at any time in adult life'; ³ NEE = Northeast England; ⁴ W = walking, B = bicycle; C = private car; PT = public transport.

individual cycling experiences and mobility biographies.

3. Findings

3.1. Why do older adults cycle? Age-friendliness in older age cycling

I tried to cycle in Newcastle but didn't enjoy it at all. I just found it too frightening to be honest. I stopped. (...) It'd be nice just to go to the shops on my bike, just because you can carry more. That's what I used to do when I was riding, but not now.

(Becky, mid-50s)

Becky could be classed as a reluctant cyclist since moving to Newcastle in the 1990s. She cycled frequently during her twenties in Oxford, in a time and place she recalls as "everyone cycled and it was easy". While not having cycled for decades, she retains a positive image of cycling, illustrating how the biographical approach taken in this study leads participants to explain past cycling trajectories, current trade-offs, but also ingrained or imagined practices that could make someone cycle at later age.

The striking alignment between the individual wellbeing benefits of cycling and intended age-friendly policy outcomes (Götschi et al., 2016; WHO, 2007) leads this analysis to explore the sensory experience of cycling, as well as its benefits to the mobile lives of middle-to-older adults. It distils three so-called age-friendly 'qualities' of cycling, even if they exist within the limitations described later on in Section 3.2. First of all, social qualities are integral to participants' cycling. For many, cycling both creates social interaction *en route* and is an important feeder to social activities. The limitations of cycling in a complex urban environment even bring people who cycle together. Participants express how their methods of wayfinding and dealing with traffic situations have been shared learning processes, creating mutual support networks for overcoming the difficult cycling environment and personal disruptions with people 'like them'. Sophia, in her early 60s and part of a learner group, recalls the confidence and mutual support during one of her first group rides:

Oh, I was so nervous. I just thought 'why am I doing this?', because nobody wants to see me, a middle-aged woman in Lycra [laughs], I just thought. But I knew it was all ladies, and the lady who trained us said we're all shapes and sizes. They gave me this bike [and I said] 'what the hell are these gears, I've never seen all these left gears!'

The collectivity of negotiating travel atmospheres and socialisation (Zander et al., 2013) highlights the importance of social capital at the neighbourhood level. For many participants, their post-retirement activities take place more locally than before. This opens the opportunity to encounter neighbours, speak to them while riding, off the bike or momentarily riding together. These relational qualities require a practice of low physical effort and attentiveness, and also allow participants to appreciate the spatial and social variety of the city (te Brömmelstroet et al., 2017). As Danielle (resilient cyclist, late 50s) appreciates:

There was one time when I was cycling in really bad weather, and an older lady approached me and gave me a few sweets because I was so brave [laughs]. I think she'd seen me before and said, 'yeah I saw you before, so good that you cycle!'

That's what I like about cycling and walking. When I cycle to [school], I pass through really different neighbourhoods. There's one of them where everyone at 11am walks outside in their pyjamas [or] sits together on a couch that's been left outside for months. At first, I kind of felt like 'oh ...', but now I just wave to everyone and at some point they get to know you.

Second, a reciprocal relationship between cycling mobility and enhanced health (Kroesen and De Vos, 2020) can be observed in the individual mobility patterns of this study. Although health is rarely participants' primary reason to cycle, it generates a series of resources that are specifically associated with positive ageing (Black and Street, 2014). Importantly, most participants previously normalised cycling as form of transport, not seeing it as particularly healthy or distinctive. Their usually low-to-moderate physical effort accommodates durable health qualities within their everyday mobility patterns, derived from visiting places, feeling energised, or prolonging active lives. Doing so, the qualities of current cycling create aspirations for future cycling; continuing cycling may be a later life goal in itself. For instance, Richard (mid-50s) looks ahead to his retirement, pursuing creativity and physical and mental activity:

So when I'm 65 I'd do voluntary stuff, or campaigning stuff, something. I'll keep myself busy. And then I'd still need a mode of transport to do that [i.e. cycling]. I'd couldn't see myself spend my time gardening [laughs], yeah I'd be doing stuff. Doing stuff to keep your brain active as well.

Third, wellbeing qualities such as senses of belonging, achievement, and self-challenge are identified, as well as continuing access to care facilities and social connections, which are particularly relevant in later life. Newer cyclists may derive meaning from their novel, collective learning effort, whereas more experienced ones find that some rides can 'make your day'. Rather than consciously pursuing cognitive or functional benefits, most participants' cycling aspirations are grafted on extending their opportunities for wellbeing and mobility. For instance, participants who have recently re-engaged with cycling speak about overcoming sedentary lifestyles, anxiety, and a lack of social connections or meaningful interactions. This goes beyond the cycling practice itself, as they befriend people in their local area, organise rides by themselves, and inspire others to change their behaviour too. Furthermore, feelings of discovery, relaxation, distraction, and reconnection with the outdoors arguably improve their personal wellbeing. Daisy, in her mid-60s, summarises how different wellbeing qualities come together since she started cycling in the past year.

It is fun for the grandchildren, you've gotta try and think, you want them to keep fit, be active, so you try coach them into doing something a little bit different. (...) It sounds stupid, but it sort of takes you back to being a child again, having fun on a bike.

In the summer my boyfriend got a bike, well I bought him the bike for his birthday, because he's never ever been on a bike in his whole life. He might be, you know, a really good cyclist.

In the context of a low-cycling city, re-engaged cyclists often come to appreciate these opportunities from a recreational angle, whereby cycling does not always grow into a realistic option to integrate into *everyday* mobility. Others downscale their cycling over time, successfully finding a kind of cycling that suits their everyday activities and physical skills. An absence of this room to 'manoeuvre' the spatial and social norms of the urban environment would likely lead to cycling to disappear from their (imagined and latent) mobilities and, in the process, reduce health and accessibility opportunities in later life.

3.2. Barriers to age-friendly cycling

Participants' cycling patterns are often "partial" (Jones et al., 2016: 44), adapted to (avoiding) motor traffic rhythms and less suitable times of day (darkness and rush hours), or reduced in terms of uptake on non-recreational journeys. Over time, uptake varies widely, including participants with stable trajectories, temporary episodes, disrupted cycling biographies, or not cycling at all. This analysis groups the elements that hinder uptake, create negative feelings or experiences while riding, demand physical efforts, or otherwise make cycling unlikely (to continue) in later life. These elements are summarised in Fig. 2 and explained below as six barriers to age-friendly cycling in low-cycling cities.

First, in line with widely documented infrastructural deficiencies, spatial barriers confine the range of activities cycled to, change its experience, and generally deter participants from cycling. While the most habitual cyclists applaud its convenience and speed, they still describe their cycling commute as "something to get over with" (Richard). Lifelong cyclists such as Chris and Tess see existing cycling facilities in Newcastle as "patchy", and feel 'outmoded' when, for instance, encountering driver transgressions or when road works block the cycle path. They feel personally affected by the physical threat of motor vehicles and, simultaneously, how its physical negotiation has become 'part of life':

I've been doing it for years and years (...), people got screaming and shouting, I've been knocked off my bike. I do sometimes think 'is this how I'm gonna die?' (...) I know an awful lot of people would be terrified to go through that on a regular basis. I mean I would probably class myself as a hardened cycle commuter, so it would take a lot to stop me, because I feel cycling is just a part of my life. (Tess, mid-50s)

Second, participants recurrently speak about temporal and seasonal barriers. Anne, for example, is a resilient cyclist in her 80s who explains she avoids streets at certain moments based on school times, peak hours, and darkness. Seasonal effects are especially expressed among new or re-engaged cyclists, with winter being regarded as (too) dark, cold, windy, or icy to cycle. Some participants also refer to lighting, gritting, road surface, and maintenance issues being worse in winter. Importantly, this leads them to taking detours, preferring walking or use motorised alternatives, and to questioning the reliability of cycling as means for everyday mobility.

Third, the limited integration of cycling in the wider built environment may constrain cycling activity. Participants express access problems to key facilities, including offices, businesses, shops, markets, malls, community centres, transport hubs and even homes. When these places are deprived of cycle (parking) access, participants report how (dis)mounting, lifting the bike, and increasing the distance cycled intensify the required physical effort. Participants for instance find a lack of safe parking space at stations or find parking with limited usability. In own or other's homes, many find how residential design does not accommodate safe and convenient bicycle storage. Tracy, who only cycled as a child is now a novice cyclist in her late 50s trying to cycle to work: "when I bought my bike the first thing I did was cycle to work. But you have to open the lift [while holding] the bike to store it inside work." Equally, she finds how the city centre is inaccessible through the lack of suitable parking. The lack of facilities now causes her to refrain from commute cycling, but also from exploring (and consuming) in the city centre: "I was gonna stop for coffee but couldn't find anywhere to lock up

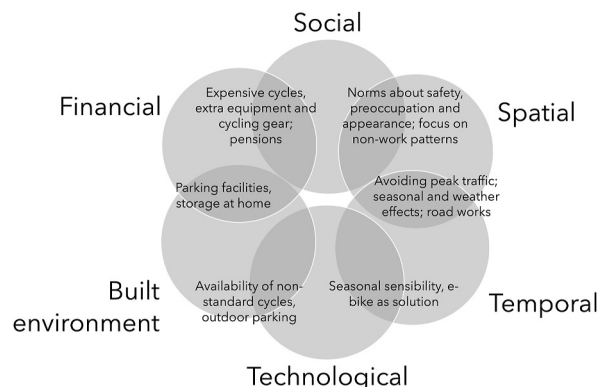


Fig. 2. The six barriers to age-friendly cycling and their overlaps (author's elaboration).

my bike, so I just went back home again.”

Fourth, in economic terms, cycling in a low-cycling context is found to involve a set of resources that make cycling exclusive and privileged. Though some participants see cycling as an economical option to get around, both new and experienced cyclists also mention various equipment needs, amongst others for personal protection and for transporting the bike. Tess, for instance, recalls that she introduced her children to cycling by spending large amounts of time driving out to quiet and safe areas in the countryside. Re-engaged cyclists, who often cycled recreationally before considering cycling for transport, have either purchased a large(r) car, bike rack or other equipment, or a more expensive bicycle or bicycle gear to reach dedicated and remote cycle routes. Thus, a travel option known to be inexpensive may make additional demands on time and finances.

The fifth barrier concerns the social structures in which cycling practices take place. Both the decision to cycle and the route cycled are often subject to the willingness and ability of traveling companions. Some participants explain that when cycling with a friend or partner, they follow an alternative, less direct route to e.g. the city centre. In addition, the willingness to cycle to social activities is a pressing issue. For instance, the usually positive cycling experience of re-engaged riders may not extend beyond recreational activities. When running everyday errands or visiting friends, they express the social stigma that may arise when arriving by bicycle, for example with ‘helmet hair’. They also mention how friends and family associate cycling with danger and how the social spaces in which cycling is accepted or ‘responsible’ are limited. In turn, novice riders express concerns around cycling alone after having experienced the social safety of riding in small groups, e.g. during a cycling course.

Sixth, and last, the technology of the bicycle itself frequently recurs. When reflecting on their barriers to cycling, some participants foresee that a cycle with features to enable a gentler cycling style, such as low-step and step-through designs, wider saddles, higher handlebars, gear systems, side mirrors, or electrical assistance could extend their cycling in the future. However, these tools are hard to find, costly, or add additional difficulties. Whilst attitudes towards electric assistance are mixed in the sample, they seem paramount in sustaining uptake in the longer run. Some view e-bikes as too expensive to purchase, difficult to manoeuvre or to park in public, while others see them as a remedy for joint problems, such as chronic knee or hip injuries. E-cycling is found less tiring, improving the option to socialise and talk to cycling companions without getting out of breath. Dependency on the e-bike seems to increase when other options, particularly car access and walking, are complicated, for instance due to physical impairment.

3.3. Negotiating overlapping barriers to cycling in everyday mobility

Importantly, these six barriers do not function in isolation or per individual, but form an interplay that makes cycling less

During the first interview with Anne, a woman in her 80s and a longstanding Newcastle resident, she names the places she frequents by bicycle. Anne lives with her husband in a suburb about four kilometres from the city centre.

“I go up to the [local] high street probably every two or three days, to shop or do something else. We go to church on the other side of the high street, quite often I walk there but sometimes I cycle. And if I want to go up to the library I go on my bicycle. Usually on a Monday morning I go swimming early, so I’m at the swimming baths by 7am in the morning, so I cycle there. And from the end of September until the end of March I go once a week on a Friday to the central Museum. If we [Anne and husband] are both going we tend to go on the metro, but if I’m going on my own and time is short, I just cycle.”

This pattern turns out to result from a lifelong cycling habit. As a teenager in Cambridge, during her work as teacher, as a young mother (“except when I was very pregnant”), in retirement, and with grandchildren, her cycling has now commenced its ninth decade. Naturally, this involved different cycling practices, corresponding to the priorities, activities, and socialities of her daily life at the time. Her cycling ‘gait’ becomes apparent when we ride through the neighbourhood together and seems particularly suited to her age: she cycles on a durable three-speed bike, equipped with a wicker basket that leaves her without concern about keeping balance and carrying goods. She cycles calmly, without much braking or quick accelerating, and dismounts onto the pavement where this style could be under pressure (e.g., on busy crossings). With these personalised strategies, developed over a lifetime, she does not feel like she particularly fits the current local mobility culture:

“This bicycle just isn’t a fast bicycle, it’s a means of transport, not rapid transport. (...) Some of these other fast cyclists would say I’m a pedestrian, you know that’s a pedestrian and they whizz past. What you have to look out for, always on a bike, is if you’re passing a stationary car in case someone opens the door. And also you don’t want to be on the inside of a line of traffic, if anyone’s turning.”

“I’ve got the sixth sense of dealing with the traffic. Whereas others would be probably ill-advised to start doing it now, if they weren’t used to it.”

Fig. 3. summary of the cycling biography of Anne (late 80s).

convenient or functional, and arguably less likely to be sustained. They preclude access to places and cycling itself, as well as change its capacities for ‘mobility potential’ (Metz, 2000). The spatial barrier is well acknowledged in the literature (Aldred et al., 2017; Heinen et al., 2010), but is lived and weighed between other barriers. For instance, participants’ preoccupations about credibility and appearance to others may inhibit cycling in certain areas only (e.g. the city centre). To some participants, cycling is only an option in combination with access to a (larger) car, carrier equipment, or a (race, electric) bicycle that is relatively expensive. It is possible that these costs accumulate on top of the expenses of car ownership and, with that, substantially reduce purchasing power. This barrier is particularly present among those who exclusively cycle recreationally, for example due to the high (spatial) barriers to cycling in the city.

The same mechanism applies to the temporal barrier: participants deem their local environment to be cyclable, but not at certain moments or seasons. At those times, cycling requires extra effort or distance, negatively affecting mobility potential. Whereas older adults may be sensitive to seasonal effects, weather conditions go together with other barriers: where streets are unsuitable or unsafe, cycle spaces are not gritted, or lanes are covered in leaves or puddles, participants endure these conditions or choose less-direct alternatives. Similarly, in relation to the wider built environment, the limited accessibility, storage, and safe parking options result in less cycling, even if the spatial or temporal barriers can be overcome. The cycling biography of Anne (late 80s) shows the additional importance of practical and social arrangements, as well as negotiations over time to cycling styles, materialities, and social perceptions. These are presented in Fig. 3, a vignette that illustrates how the overlapping areas presented in Fig. 2 interrelate in later life mobility negotiations.

Consequently, barriers to cycling are not just determinants or indicators of utility cycling. Rather, they alter the supposed accessibility of urban locations, the cycling experience, and its collective nature. During the ride-alongs, participants’ negotiations to overcome these barriers are striking, often needing to rely on longstanding cycling experience or physical strength. Even the city’s earmarked cycle network or participants’ most frequented routes contain densely concentrated moments of awareness, bodily mobilisation, anticipation, and responses to other road users, road quality, and diffuse wayfinding. For instance, part of Richard’s commute takes place on larger roads without cycling infrastructure. He says he would not cycle here with a colleague and prefers to wear a helmet and high-viz vest. When observing his ride, various mobile actions appear, such as hand gestures; head movements; fast accelerations; (being prepared for) braking; establishing eye contact; dismounting; pushing the bike; scanning the road surface. The cognitive and physical effort in this example clearly detract from cycling’s interactive and wellbeing qualities, and other practices that add affective value to the ride (Stefansdottir, 2014).

The additional mobile actions confirm that mobility revolve around complex social and physical practices and show that barriers are constantly reproduced by social norms, visible road policy, behaviour of other road users, and personal considerations of what is feasible. For some, these practices pose unrealistic challenges for cycling opportunities to endure. Although participants see these routes as well-evolved, they also imagine them to be unrealistic in their own future mobility. Chris (late 50s), for instance, explains how the current cycling environment may affect his future uptake and distance:

“So yeah, I would hope to carry on using my bike for that, well I suppose I don’t know, when I’m in 10 years’ time maybe I won’t feel so keen to cycle to the station and so on, but I would still like to use my bike locally.”

These expectations imply that mobility is a learned activity, being the product of an acquired skill (the cycling practice) and local expertise (an evolved route), and show that mobility becomes precarious, as something that people sense and imagine (not) doing in the future. This pushes many participants to downscale their cycling activity during mid-to-older-age, roughly between 50 and 70, while in mature cycling contexts, this period is known for a stable or increasing uptake. Ultimately therefore, the barriers described in this section do not only interfere with opportunities to (re-)engage with cycling and with corresponding qualities (Section 3.1). As environmental settings change, so do personal conditions, together shaping the situatedness of cycling as an achievable age-friendly practice.

4. Conclusions

This paper aimed to understand what facilitates or hinders cycling trajectories and experiences in shaping opportunities for ageing, wellbeing, and mobility. By studying these concepts relationally and foregrounding older adults’ lived experiences, it presented successful cycling practices in a low-cycling city alongside barriers and individual negotiations. Such exploration adds to dominant narratives around low-cycling places and age-friendly mobility, and challenges one-dimensional portrayals of cycling practices that are unattainable for older adults or uniquely rely on infrastructural features. It outlined six barriers to everyday cycling that can be infrastructural; temporal; social; economic; technological; and related to the wider urban environment, each serving to reinforce another and manifesting through interplay with the ageing body. Although most middle-to-older cyclists observe a state of composure in this study, and have accumulated cycling experience to recur to, their convenience and wellbeing are compromised when being spatially excluded from cycling to certain places and at certain times, or when social stigma precludes access to places that support societal participation.

Overall, cycling supports social life, collective citizenship, health, and wellbeing, which, with time and experience, entangle as positive ageing resources. They interchangeably arise in different life stages, and are affected by the disruptions, delays, and returns of the lifecourse (Garrard et al., 2021). Cycling is an inherently open and sociable activity, leads to collective socialisation, enhances health in a non-distinctive way, and generates health and wellbeing resources in older age. These unfold in physical mobility environments as much as they root in participants’ mobile biographies, thus heterogeneously available as social, mobile or wellbeing opportunities. The lived multi-modal realities analysed in this paper underline that mobile negotiations are a product of embodied

knowledge and engrained habits which would be problematic for those without such capacity, now or in the future. It is thus crucial for future understandings of later life mobility to understand these realities, as positive representation of all-age cycling and reckoning with enduring active mobility opportunities.

Thus, against the background of urban ageing trends, this paper concludes that thought and design around the social and infrastructural elements of active travel shifts should prioritise cycling's capacities and qualities, and attend to the way people learn, unlearn, and re-engage with cycling over the lifecourse. For cycling's later life qualities to come to full fruition, research and policy in the transport and health domains may pay attention to the multiple ways in which older adults incorporate cycling and negotiate its barriers, beyond infrastructural ones, with the aim to create improvements that are lasting and in line with the diverse (potential) mobility patterns of the population at large (c.f. Fowler et al., 2017). A more mainstream approach to cycling, as attainable for people of all ages, would benefit from the heterogeneous ways in which sustainable mobility options serve as healthy ageing resources. Those interviewed relied on multi-modal mobility, unconscious habits, and ingrained mobile knowledge, thus forming cycling realities that are not easily captured in infrastructural imagery. These realities, however, need to be feasible for those who currently do not cycle will have, who will also require support in wayfinding, confidence, and knowledge in order to fulfil their mobility needs.

In concrete terms, this paper proposes two areas of policy recommendation for low and maturing cycling cities to tackle issues around ageing and active (cycling) mobility. Firstly, public health and transport interventions should approach cycling as an everyday mobility practice: when cycling is normalised in everyday mobility, it is not often spoken of as active or healthy. Although cycling is an impactful component of social health prescriptions, leading to physical activity, new skills, achievements, and self-esteem, this paper showed that a sole health-oriented or recreative function distracts from its potential in everyday travel within the city. It may reproduce feelings of danger, distinct identities, and appearances that impede cycling normalisation or lock-in car ownership (Brand et al., 2021; Chataway et al., 2014; Spotswood et al., 2015). Equally, initiatives that prioritise mass utility cycling using centralised networks may fail to support people who operate more at the neighbourhood scale and between peripheral urban areas. Unaligned interventions between the transport, social, or health domains may fulfil individual policy indicators, but would not foster the systematic growth that makes cycling a likely and lasting option for people of all ages (Winters et al., 2015).

Secondly, and related, promoting cycling is a means to an end. It sustains health and wellbeing, and positively affects life quality as people age. This means the benefits of cycling may need to be rewritten, for instance as healthy urban ageing, liveability, or wellbeing 'optimum', rather than presented as a moral direction or as universally available to all (Jordi-Sánchez, 2016). In this study, people chose to inhabit 'utilitarian' and recreational urban spaces due to the experienced convenience and by building on pre-existing mobile capital. While developing this capital, cycle promotion cannot go without space re-allocation that removes the sensory pressures of motorised traffic and makes room for meaningful interactions and sociality, not just for people cycling (Spencer et al., 2019; Zander et al., 2013). In low-cycling cities, large parts of the population do currently not cycle, so a first step for intervention would be to target streets and neighbourhoods to be primarily pleasant to live and socialise in. Then, when cycling does not push executive functions and sensory capacities to the limit, it may reach the groups typically underrepresented in low-cycling cities. As a last step, a more normalised presence of cycling in a city's mobility landscape, coupled with dedicated riding spaces and cycle types accounting for the diverse needs and preferences of older adults, may then reach larger parts of the population, including (chaperoned) school children, less healthy people, and people with disabilities.

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Declaration of competing interest

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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