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Focusing on the mobility of elderly people and families: How well does shared mobility work for them?

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Abstract

The study focuses on two previously neglected customer groups for MaaS offerings: families and active elderly, and analyses how their mobility practices as well as needs and constraints fit with selected mobility services - carsharing, ridesharing and micro mobility. The results are derived from a qualitative study conducted in the year 2020 in two German case cities, Berlin and Leipzig. Two mobility perspectives were identified: active maintenance of mobility, i.e., maintaining personal mobility as best as possible as people age; and family mobility, characterized by the impact of responsibilities and coordination tasks related to family members. The two mobility perspectives are described in terms of characteristic mobility practices as well as needs and constraints. Subsequently, how the selected mobility options meet the needs of the customer groups under study were analysed. The selected approach provides a lens to identify weaknesses and requirements for current and future mobility services. For both perspectives, none of the mobility options presented would significantly improve the situation, the reason being the lack of focus of MaaS on the needs of its users. Thus, mobility services in future should be better oriented to the needs of the large customer groups of active elderly people and families.

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1. Introduction

In Europe, societies are ageing. Today, already more than 25% of the total population is over the age of 60 years and this figure will rise to 35% at the end of this decade. In only ten years, people over the age of 60 years will make up more than one-third of the total population of Europe. In parallel, the travel needs of the elderly also seem to be increasing, probably due to extended good health even at old ages, and also due to different possibilities and capabilities for travel than previous generations of elderly people had (Haustein und Siren 2015). At the same time,

ageing is associated with physical and mental decline and affects mobility and the capability to drive (O'Neill 2015). Not only for seniors, the car plays a key role for accessibility and mobility and many regions in Germany and worldwide suffer from what is called car dependency. To the end of accessibility and safety, attractive alternatives to the car for the ageing population should be provided and supported.

One solution to reduce car dependency could be demand-responsive mobility services or *Mobility-as-a-Service (MaaS)*. It is an inter- and multimodal concept that integrates all known mobility services. Examples of these mobility services include public transport, car and bike sharing, and ride pooling services from different providers. The central goal is to offer a flexible form of mobility tailored to individual needs, based on the networking of different modes of transport (Jittrapirom et al. 2017; Bitkom 2018). The discussion on MaaS, as with transport innovations in general, still tends to be focusing on technical solutions and organizational aspects of mobility (Gebhardt 2022). However, many studies have shown that the introduction and design of mobility innovations depend on acceptance (Becker & Axhausen 2017; Haboucha et al. 2017) and is therefore connected to everyday life practices of people and their evaluation of an innovation's benefits for their situation (Stark and Galich 2020).

There is a broad body of literature analyzing the mobility of elderly people, but there is still a gap in terms of their acceptance of emerging mobility concepts (König & Grippenkov, 2019). Considering the mobility needs and requirements of families, a study by Gebhardt (2022), which looked at car use, shows that the family car seems to be irreplaceable. For families, the private car often best fulfills transportation, cocooning and convenience needs. According to forecasts, car sharing (Dowling 2015) and MaaS (Kent und Dowling 2016) may provide alternatives to the private car, as these concepts offer some flexibility. It is certainly conceivable that certain requirements or situations could be addressed by such offerings. However, it seems very unlikely that the classic family car, which offers space for all basic necessities to any leisure equipment, can be completely replaced (Gebhardt 2022, 2021). In any case, current new mobility offers hardly take the requirements of family mobility into account (Bauer et al. 2015; Schneider und Hilgert 2017). As already mentioned, many of these new offerings tailored to classic early adopters, are being tested in the urban centers of metropolitan areas, and simply do not focus on families living in decentralized locations. Often families do not feel that their needs are being taken seriously. For this reason, among others, a discussion of new offers or even a testing of such mobility options rarely takes place and the family car seems to be irreplaceable. Therefore, it is important to take the requirements of families into account, to consider them in the development of offers and to tailor these new concepts, for example, not only to urban centers, but also to the realities of life in more decentralized residential areas.

Against this background, in our study we focus on these two relevant groups whose mobility practices and needs are worth being considered more deeply when designing transportation service such as MaaS: families and the active elderly. Both have in common the attribute that they are regularly overlooked but have great potential as a customer group – given their share in population and their travel needs. In the following, we present our methods and findings and discuss implications of the study.

2. Methods

This paper is based on an exploratory, qualitative study on mobility practices and user requirements of different user groups with respect to selected mobility services. Mobility practices and user requirements are complex interactions that cannot be adequately or causally captured by standardized methods. Therefore, qualitative methods were applied that do not aim at measuring a specific behavior, but rather at understanding the mechanisms of action underlying this behavior (Cloke et al. 2004; DeLyser et al. 2010). The method of qualitative interviews was chosen to explore and interpret the different dimensions of mobility practices as well as the requirements of different user groups. Openness as a basic principle of qualitative interviews enables us to understand the personal frame of action of individual cases and ideally brings out deep-seated motivations (Ritchie and Lewis 2011). The study was conducted in the year 2020 in two German case cities, Berlin and Leipzig (Berlin, n=18 and Leipzig n=33). The two cities were chosen for research pragmatic reasons (contacts, existing prior knowledge, project context) and given their differences in characteristics regarding population size, spatial extension and available supply of mobility services. The objective was to find generalizable insights into practices and requirements in the context of MaaS and urban mobility solutions based on the comparison of the two different cities.

Our methodology followed basic principles of Grounded Theory as well as practice theory. The first, in terms of an iterative procedure whereby phases of data selection and interpretation alternated as well as in terms of how data was analyzed, the later in particular in terms of putting special emphasis on their individual mobility practices and their point of view (Cresswell 2006; Shove 2017).

After having difficulties with the recruitment of so-called hard-to-reach groups (low income, the elderly, women) in Berlin we decided to modify our approach in the second case study in Leipzig. We used an “open house” concept, where the researchers spent one week at a place so that people attracted through announcements on social media platforms, in libraries, leisure and social facilities, public places, supermarkets etc. could drop by spontaneously or after prior registration and join a group discussion.

The logic of qualitative research is also reflected in the sample. In the sense of grounded theory, the principle of theoretical saturation (Pentzold et al. 2018) was the guiding principle for the selection of interviewees; in other words, the aim was not a representative survey with a high number of interviewees in the sense of quantitative social research, but rather an interpretative, qualitative understanding of a phenomenon in the sense of qualitative sociological research. A criteria-guided sampling was chosen. In a criterion-guided sampling strategy, cases are not selected randomly, but according to content-related criteria.

2.1. Sample

The following characteristics formed the basis for the sampling: i) walking disabilities and limited digital competence mainly associated with elderly people, ii) multimodal urban dwellers and iii) car orientation and car use. Moreover, we looked for a variation of socio-demographics (esp. gender and income). As mentioned above, we applied two slightly different approaches in our case cities. In both cities, we offered participants some compensation for their participation in the interview.

In Berlin, the selection of participants was motivated by ethnographic or practice theory methods of looking for interesting persons at relevant spots (e. g. Marcus 1995). As relevant spots, we considered parking lots of stores, bike share stations, ride share cars etc. The selection was preceded by a screening questionnaire that was handed out to individuals incidentally present at the chosen spots. The questionnaire was filled out together with the interviewer. The interviewees were then asked if they are interested in an in-depth (group-) interview. On the basis of the information (mobility behavior, sociodemographic data, etc.) filled out in the questionnaire, people were selected and invited to our sessions, thus addressing our focused mobility groups. In addition, we advertised the study on social media platforms, local networks and leisure and social facilities. In Berlin, a total of 18 persons participated.

Because this approach was very time-consuming and also not sufficiently effective in terms of socio-demographic variation, we used, as mentioned, a modified approach in Leipzig. There, an open house was set up for one week in a centrally located office. Shortly beforehand and during the week, advertisements were posted on various social media channels, message boards and in places like universities, employment offices, libraries. Also, we visited places (e.g. seniors café) to find individuals who were presumed to have the characteristics in question and invited them to our pop-up space. The places were chosen according to which groups of people we expected to meet there. Especially those places were visited where underrepresented groups could be expected (i.e. elderly people). We offered an expense allowance in the form of a shopping voucher for participating in the interviews. In total, our sample consist of 69 participants, 18 of Berlin and 51 of Leipzig (Table 1).

Table 1: Summary statistic of participants in Berlin and Leipzig by gender

| | Berlin | Leipzig | in total |
|----------|--------|---------|----------|
| Female | 8 | 30 | 38 |
| Male | 10 | 21 | 31 |
| In total | 18 | 51 | 69 |

2.2. Focus groups

Besides a few one-on-one interviews, mostly, we conducted group interviews with two to six persons at a time, depending on the number of persons being around at the same time. The group discussions had the character of focus groups as we used the elements of moderation, input and homogeneity with respect to user group characteristics.

Unlike Berlin and given the recruitment strategy in Leipzig, focus groups in Leipzig were not consistently homogenous in terms of predefined user group characteristics.

The purpose of the focus group is “to identify a range of perspectives on a research topic, and to gain an understanding of the issues from the perspective of the participants themselves” (Hennink 2014) whereas openness, as a basic principle of qualitative interviews (Lamnek 2005a, 2005b), makes it possible to understand the personal frame of action of the individual cases and ideally brings out deep-seated motivations/drivers/aspects (Ritchie und Lewis 2011). In some cases, one-on-one interviews were conducted. In one case this was because the interviewee needed special attention due to a learning disability.

The focus groups or interviews consisted of two parts. The first part was dedicated to the current mobility practices and travel needs of the participants. The participants were asked to draw one or more typical everyday mobility situations and then explain them to the others. There were no specific guidelines of how the participants should illustrate this. Simple written descriptions were accepted as well, if participants did not want to draw.

In the second part, three new mobility concepts (see table 1) were presented to the participants, which they subsequently discussed and evaluated. These concepts were presented in visual form and described briefly by the interviewer. These visual elements can be seen as “boundary objects” (Christiansen 2005) that enable citizens and scientists of different disciplines to work together and jointly discuss presented solutions. With this approach, all participants share a common definition of the problem based on the characteristics of the object. This helps to simplify the communication and cooperation in heterogeneous work environments (Christiansen, 2005). The participants were asked to evaluate the mobility options based on their requirements. For each mobility option (i.e., use an on-demand bus), the participants were asked to think of their usual daily trips (e.g., to work) and to elaborate upon whether the mobility service in question constituted an attractive alternative compared to their current choices. The participants were asked to write reasons why they would use a certain option or not and how the availability of these options might change their mobility practices.




The guideline questions reflected findings from the academic literature and our own prior research work. Although we moderated the discussions, we also allowed the participants to express their thoughts and opinions and to exchange their ideas. At the same time, we ensured that the discussion touched our topics of interest, such as acceptable ticket prices, barriers to use, attitudes towards sharing vehicles with strangers, opinion on waiting times etc.

At the end of the group discussions or interviews, participants were asked to complete a short screening questionnaire about sociodemographic parameters and their transportation choices. Considering the open house principle, this was a way to check if and how the participants fulfilled the selected characteristics.

Visual Input: Mobility Options

Inspired by the method of ‘photo elicitation’ (Harper, 2002) and ‘dialogic introspection’ (Burkart, 2018; Kleining & Burkart, 2001), the discussion participants were presented with three different possible mobility (relevant) services. The concepts (see table 2) were presented as illustrations. Technical descriptions were omitted deliberately. Participants were then asked to evaluate the concepts with regards to the potential usefulness in their everyday mobility. Finally, they got the opportunity to present their own ideas to the group and concepts and make notes on these on a separate sheet.

Table 2: Presented use cases of mobility options, own illustration

| Visual description of the mobility options | Explanation of the mobility options |
|--|--|
|  | <p>Car sharing</p> <ul style="list-style-type: none"> ➤ Idea of sharing instead of owning a car. |
|  | <p>Micro mobility</p> <ul style="list-style-type: none"> ➤ Idea of covering short trips or the first/last mile with a micro-mobility. That could be e-scooters, a shared bike ... |
|  | <p>Ridesharing (with small busses)</p> <ul style="list-style-type: none"> ➤ Idea of a demand-driven bus without fixed routes and timetable, but dynamically dependant on the user's request. |

2.3. Analysis

We recorded the group discussions and interviews. The recordings were transcribed and analyzed one after another. The analysis was conducted iteratively by three researchers following the principles of grounded theory. So, we developed an inductive code tree that was shaped by the empirical material.

The analysis followed the method of content analysis and was conducted via computer software (MaxQDA) by three researchers intersubjectively. The evolving code system was discussed in regular intervals within the team and consolidated. The categories of the code system represent our guiding questions from the interviews extended by inductively gained insights. As a first step, we built the code system by analyzing each transcript from the total pool of transcripts in turn, adding codes and further aggregating and transforming existing ones. As a result, we identified a set of overarching categories: present mobility practices and impact factors for transport choices, mobility related needs and constraints in general and with respect to the selected mobility options as well as a specific characteristic linked to sociodemographic features that explained differences in mobility practices, needs and constraints and therefore allowed us to differentiate groups. This means that the characteristics we had used as sampling criteria and to determine the original user groups were further developed or discarded in light of the empirical findings.

In a second step, we formed so-called *sets* (a term in MaxQDA) that are homogeneous with respect to this characteristic, assigned the associated transcripts, and analyzed the transcripts a second time set-wise with respect to mobility practices, needs, and constraints to further elaborate the profile.

3. Findings

As described above, in the course of the analysis we found key characteristics to systematically differentiate groups. We identified the following three characteristic perspectives: firstly, *active maintenance of mobility*, that is maintaining personal mobility as much as possible as one ages; secondly, *family mobility*, characterized by the impact

of responsibilities and coordination tasks related to family members and thirdly, *individual independent mobility*, realizing daily activities independently and mainly according to individual needs and constraints. This third group of independent travelers has already received much attention in research and literature, therefore we have taken them only as a comparison group and we neglect it for this paper.

In the following, the two mobility perspectives and their characteristics are first described with respect to mobility practices as well as needs and constraints. Then, the analysis of how the selected mobility options meet the requirements and needs with respect to the mobility perspectives is presented.

3.1. Perspectives on mobility and accompanying practices, needs and constraints

To provide an overview of the following sections, table 3 presents the main aspects of the two perspectives in terms of identified mobility practices as well as needs and constraints.

Table 3: Overview of perspectives

| Characteristic perspective | Mobility practices | Needs and constraints |
|--------------------------------|--|---|
| Active maintenance of mobility | <ul style="list-style-type: none"> • Maintaining the ability to drive and reducing car dependency • Save money • Use of digital services for routing | <ul style="list-style-type: none"> • Support due to physical and mental decline • Affordable prices and tariffs • Appropriate digital services |
| Family mobility | <ul style="list-style-type: none"> • Coordination and task sharing • Vehicle sharing • Selection of accessible places • Subordination of interests to family interests | <ul style="list-style-type: none"> • Compatible mobility choices with family interests • Reliability and guaranteed availability of a transport mode |

2.3.1. Active maintenance of mobility

Characteristic perspective: The perspective is characterized by the fact that an increase in physically related mobility impairments is expected in the foreseeable future and that current living conditions will be adapted in such a way that mobility is maintained in the best possible way even under deteriorated physical conditions. That is, individuals allocated to this perspective are not yet impaired but see it coming. Relevant activities such as going to the grocery store or cultural visits should still be possible.

Mobility practices: A central role is also played by the assessment of how long the ability to drive a car will remain. Here, it is assumed that after a certain age it is no longer reasonable to drive oneself, as an increased risk of accident is seen, for example, due to decreasing reaction speed or stress tolerance. Driving tends not to be given up overnight, but car use is initially reduced and avoided in certain situations, such as heavy traffic or on highways. In any case, most people are aware that they will have to give up driving at some point.

An important strategy of that group is to reduce car dependency, either by moving to places with better access to public transportation or by mobilizing private or family networks for errands and rides to activities. It must be noted, however, that for others the car remains an important means of maintaining their own mobility, despite an expected decline in driving ability. This is especially the case when a change of residence is out of the question and the place of residence is not well connected to public transport and has little utility infrastructure.

Furthermore, we found that physical activities are rather searched than avoided in order to exercise, such as choosing not the most comfortable or shortest way to their destination and walking or cycling – even if this means delays or exhaustion.

Moreover, we found that individuals with this view are more likely to be price sensitive and interested in saving

money by, for example, choosing the discounted monthly pass for seniors or foregoing mobile internet access. Despite that later aspect, digital services for routing or ticketing are popular in this perspective. Smartphone/tablet/PC use, use of apps, is also widespread among older people. Services that encourage or facilitate mobility are explicitly named as valuable. However, we found differences in how these services are used. The computer is rather used at home to check routes and download time tables rather than look for it while moving. One reason was that mobile internet access was not available as mentioned before being considered as too expensive or unnecessary. Another reason was the idea of making oneself too dependent on technology when relying 100 % on a technical device and its navigation.

“I have the timetables offline. You can download the timetables from the stations. However, I can't say now that I want to have all the timetables from [city name]. I have to enter the individual trips from [city name] - bus 424 or 369 - and then I can download them as a PDF and then I also have "departs at 5:23 p.m." or "at 3:32 p.m." or something. I find that a bit unattractive. It would be important to me, or it would be pleasant, if I could then just say: [city name], I can now download the PDF with all the driving options.” active maintenance, interview 1)

Needs and constraints: Based on the mobility practices presented, the following needs and constraints can be identified: given the expected physical and mental decline the ability to drive and the provision of alternatives or substitutes are important needs. With the usually smaller budget of a pensioner, affordable public transport tariffs are admonished.

“I am actually satisfied with the public transport, apart from the price. The price is very high. I think especially pensioners like to go strolling and they also have time, but to get into the city- and here in the immediate vicinity, not everything is available now- I would like to go into the city sometime, but it's really too expensive for me, I'm quite honest.” (active maintenance, interview 2)

In addition, older people are well acquainted with digital devices and services. However, their approach and use may be different, so services need to be designed with seniors in mind to realize their full potential.

2.3.2. Family mobility

Characteristic perspective: Everyday life and mobility practices of family members are intertwined: Personal mobility practices are determined not only by one's own preferences, needs and constraints, but by those of household members. It is characteristic that one's own mobility must be coordinated with that of one's partner as well as children and, if applicable, older family members.

Mobility practices: The responsible members in a family have to coordinate between their own obligations and places to be and those of their partners and children. In more traditional family structures, care tasks are more often distributed to mothers, but in many families care tasks are negotiated and shared. In particular, the task to bring and pick-up children was shared and assigned according to appointments.

“a flexible model with my husband is important because he has to pick up the children from kindergarten and bring them there on that day.” (family mobility, interview 1)

A further aspect also illustrated in the above example refers to family interests influencing individual mobility choices. Purchasing a car is such a choice, moving to a family-friendly place at the outskirts with bad public transport access, or not going by bike even if driving is perceived as annoying. Drawing on the last aspect, fear for children in traffic and their exposure to exhaust fumes was one reason to drive them in a car instead of on a bike.

The fathers and mothers in our sample often depended on at least one car per household to manage the coordination of two persons working at different places and away from home and children in need to be brought to kindergarten or school and picked-up afterwards. In households with only one car, vehicle sharing was also practiced. In a tight schedule, time efficiency or saving time as much as possible is a priority in order to be able to hand over or take over the care tasks shared with the partner.

“So, if we have two cars available, we don't have to coordinate, then he takes his small company car and I take the bus. But there have always been longer situations, whether a car is in the workshop, or the company car is with someone else for a week, or there have also been longer distances where we only had one car, then an agreement is possible every day. The best solution was then actually when I did not go to work, that he brings the children in the morning with the car to the office and takes the car to the office, that is so approximately on the way to kindergarten. Then I go to the office with my bike at lunchtime get the car, get the kids, go home and leave him the bike there, so he can go home by bike after work.” (family mobility, interview 2)

A private car is often seen as the only viable means of transportation for managing everyday family life. Doing without a car often means consciously accepting extra effort in everyday family life and affect the selection of leisure or care facilities. The following quote shows that the accessibility of the kindergarten is prioritized over quality. Others report that they have a car because the kindergarten is inconvenient or too far away.

“Of course, we were very lucky, but when we were looking for a kindergarten, we made sure from the very beginning that we got one that was close by [...] that it had good transport connections. [...] And that also plays a role, that one pays less attention to the concept of the kindergarten, or to other criteria that might otherwise play a role in the selection of a kindergarten. But since we don't have a car, you also have to pay attention to such things.”

Needs and constraints: Related to the described time-spatial challenges of families, means of transport are preferred that are reliable and rather not flexible in the sense that there is no time table to rely on or no guaranteed availability.

“when I am at home afterwards, I have 3 children, 2 are already grown up and little one is now 11. And I accompany him to singing lessons and to swimming lessons, twice a week he swims, or we go to the doctor also with bigger children. Let's go, we visit dentists, eye doctors and to speak to paediatricians also from time to time. As I said not every day, not every week, but when we have appointments we do that regularly. And when we go swimming, for example, we take the streetcar, then we have to drive about half an hour to the swimming pool, walk another 10 minutes, and we do that twice a week.” (family mobility, interview 3)

The second aspect relates to the need to reconcile mobility decisions with the interests of the family. Two criteria in particular can be highlighted here: Traffic safety for the accompanying children and time efficiency in order to be able to hand over or take over the care tasks shared with the partner in the tight schedule.

3.2. Mobility perspectives and how selected mobility options fit them

As described above we had presented selected mobility options to the participants in order to learn about their evaluation and willingness to use them. The evaluation has two parts, first, we summarize the findings from the participants' feedback on the mobility options; second, we apply the identified needs per perspective as criteria to resume the compatibility of each mobility option. The criteria used are the following: for the *active maintenance of mobility perspective* it is support under decreasing ability to drive and walk, affordability and digital accessibility. For the *family mobility perspective*, we consider the fitness in an arrangement with multiple persons to account for, especially in terms of safety and time efficiency, as well as the reliability and guaranteed availability.

Table 4 presents an overview of how the mobility options fit with each perspective with the evaluation simplified in the shape of pluses with one plus being less fitting than two or three pluses.

Table 4: Compatibility of mobility services with the needs of the analyzed perspectives

| Characteristic Perspective | Car sharing | Ridesharing | Micro mobility |
|--------------------------------|-------------|-------------|----------------|
| Active maintenance of mobility | + | +++ | ++ |
| Family mobility | ++ | ++ | + |

3.2.1. Active maintenance of mobility

Car sharing: The individuals of this perspective had no own experience with the existing commercial car sharing, although most of them had a driver's licence or their partners had. There was not much feedback or involvement regarding car sharing as mobility option. However, by some, the presented mobility option of car sharing was considered theoretically useful especially in connection with or in addition to public transport.

Drawing on that, car sharing requires that you drive yourself and have the confidence to be physically and mentally fit - which in this case is up for debate. Considering the need to find alternatives to driving and become less car dependent, car sharing is not a suitable solution. In addition, dockless car sharing requires mobile internet access and a certain level of competence in using apps. It is also more expensive than public transport and therefore not attractive given the price-sensitive people of this perspective.

Ridesharing (with small buses): Among the participants, this mobility option was considered as useful to get to leisure activities or for excursions, but less for everyday trips. The benefits are seen in enhancing accessibility of public transport, especially on routes that are poorly covered by buses and trains and on connections with changes. There was experience with the similar dial-a-bus systems in Germany, but no experience with existing ridesharing systems. In terms of accessibility, it was noted that exclusive access via the internet or smartphone app is a barrier for people who are less familiar with digital devices. Thus, ordering via phone should be an option. In addition, based on experience with existing services, there is a need for the process of ordering and booking to be as simple as possible. The expressed willingness to use was much greater here than with car sharing.

To sum up, ridesharing does not require a car of one's own and can be used by people with walking disabilities or other disabilities – provided it is designed to be barrier-free. If integrated with public transport, it is not too expensive, but probably more expensive than regular public transport. Depending on the design of the service, lack of digital accessibility may be an issue. In conclusion, ridesharing could be a suitable option compatible with the needs of people in this perspective. However, this conclusion depends on the particular use case and business model.

Micro mobility: Micro mobility in the form of e-scooters were seen as rather unnecessary as well as unsafe and not suitable for people with physical limitations. However, a micro-mobility sharing service tailored to older people was welcomed by some.

Micro mobility has been associated mostly with electric scooters and also bike sharing in this study. However, it actually covers a broad spectrum of smaller and bigger vehicles. In the case of electric scooters, the usual design of e-scooters is rather unsuitable for people with limitations that would also prevent them from driving a car, as they require a high degree of balance, concentration and reaction speed. However, micro mobility tailored to the needs of older people could be a support for the first and last mile or for short to medium distances. In terms of digital accessibility, as with all mobility options, ease of use and non-digital alternatives to booking are critical. Similar to ridesharing, affordability depends on the pricing system set by the provider.

3.2.2. Family mobility

Car sharing: Among the participants, car sharing was seen as suitable for family mobility, but especially for special trips such as leisure trips or larger errands when no own car is available. Considering their daily mobility and tight family schedule, however, car sharing was considered only in terms of limited use. In particular, reliability is too low for some. Finding a car exactly when and where you need it is not always possible. Even if there is good coverage with vehicles or docking stations, there remains a residual risk that limits reliability.

To conclude, car sharing expands transportation options for families without cars or with fewer cars than drivers. In addition, children and even the whole family (depending on the size of the family or car) can be transported at the

same time. However, car sharing cars do not come standard with child and baby seats, so families need to plan ahead and bring their own seats if necessary. Similarly, additional organizational effort is required to locate and book an available car nearby. In addition, the availability of a car within an acceptable distance is not guaranteed, so family moms and dads cannot rely on it when schedules are tight. Overall, car sharing is suitable for families insofar as several persons including children can be transported together in a time-saving and safe manner; however, limitations in terms of planning effort and reliability have to be accepted.

Ridesharing (with small buses) was not perceived by the participants as an alternative to other means of transport for everyday mobility, mainly due to the lack of planning and time efficiency. Since this concept does not operate according to fixed schedules and routes, it was doubted if it was suitable for implementing a tightly organized everyday life. Additional planning uncertainties would arise – especially with children – due to the limited space on the bus. In general, the requirements were issued that the equipment would have to be family-friendly, with child seats and with enough space for transporting strollers and other carry-on items.

Drawing on this, ridesharing provides safe rides for parents and their children at the same time. However, due to its limited capacity compared to regular buses, it is not guaranteed to accommodate the entire family on weekend trips, for example. It is faster and more comfortable than a regular bus ride when it takes you from door to door instead of stop to stop, especially when the children have outgrown the stroller, but still tire quickly. Similar to a car, equipment like a child seat would be required. On the other hand, its on-demand nature, flexible departure and arrival times, and flexible stops make it less reliable and predictable than a regular, schedule-based bus. Considering the criteria for family mobility, this mobility option is overall useful in some situations, but not particularly family-friendly.

Micro mobility was less popular with the participants, mainly because of the lack of safety or family-friendliness. E-scooters as well as rental bikes were criticized for being generally not tailored to be used by children or together with children. In addition, there are also age restrictions. In terms of bikes, the size cannot be adapted in order to fit short children, neither are child seats provided, nor helmets. In terms of e-scooters, its use is considered too dangerous especially with or for children driving on their own. Unlike micro mobility sharing, private bikes which are family-friendly equipped were often available and preferred. Nevertheless, the very idea of micro mobility was also considered attractive, for example in exceptional situations in which one's own bike is not available or walking is tiresome or too time-consuming.

Considering the criteria for family mobility, micro mobility especially in the form of a e-scooter and bike sharing system is at the moment rather not suitable or useful. However, models that allow to take children safely and in line with regulations along such as cargo bikes or light weight vehicles with seats, have the potential to meet the needs of families.

4. Discussion & conclusion

In this paper, two *mobility perspectives* were presented, *active maintenance of mobility* and *family mobility* and it was analysed and evaluated how selected mobility options meet the needs of people with these perspectives. The approach of mobility perspectives rooted in practices, needs and constraints joins the tradition of practice-theoretical approaches (Schatzki 2001) as well as Hägerstrands time-space geography (Ellegård and Svedin 2012). Building on this, the concept of perspective is less of a rigid container than user groups are. It encompasses only a section of a person under consideration and focuses on the respective practices and requirements in the current reality of life. In doing so, it emphasizes the social embeddedness of mobility choices as well as their temporal variability.

The present study applied an innovative methodological approach to the field and the object of study by using an open-house approach to recruitment and by looking beyond individual mobility behaviour to include family and other influencing variables as perspectives that vary over time and are reduced to core characteristics. This made it possible to extend the frequent focus on individually traveling, multimodal urban dwellers to the population groups of seniors and families.

Studies on the everyday mobility of elderly persons and of family already exist. There are also investigations on the evaluation and acceptance of new mobility offers. However, most of these studies focus on early adopters or at least younger, urban people and not on elderly people and families. Our study has addressed this gap by combining the perspectives of the *active maintenance of mobility* as well as *family mobility* to new mobility services. These

groups also demand attractive innovative mobility options, but these must be tailored more closely to their needs.

The approach offers a lens to identify weaknesses and requirements of current and future mobility services. For both perspectives, none of the mobility options presented is something that would significantly improve their situation. Reasons for this lie in the lack of alignment of common MaaS offers with various user needs. As our paper has shown, these are not well suited to provide reliable and time-saving mobility, for example, in an arrangement of multiple daily routines that need to be reconciled. With regard to active mobility maintainers, current offerings do not leverage the potential of a large segment of the population that has time and interest in activities, would like to have short-distance support, and are actively (re-)shaping their mobility according to changing conditions and look for alternatives to keeping a car. Overall, MaaS offers would need to be diversified and tailored in terms of the type of vehicles, external communication and targeting of customer groups, and user experience.

To conclude, mobility services should be developed around the needs of diverse user groups and especially with respect to the large customer groups of active elderly and busy family members. It is important to take the requirements of these groups into account, to consider them in the development process of services and to tailor these new concepts not only to urban centers, but also to the realities of life in more decentralized residential areas.

Finally, we would like to point out some limitations. We did not systematically analyze the effects of differences in age or income in our study, although we collected partial information on this topic. We know that the sample included different age groups (old age) and people with low, middle and higher income. Low income could influence the perception and evaluation of mobility services, so further research on this aspect is needed. Similarly, differentiation of age groups could be interesting to identify thresholds for mobility changes during aging. The findings cannot be generalized, although it can be assumed that similar mobility practices and requirements can be found with other samples in Germany or other European countries.

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