E-Scooters appear on bike infrastructure: users and usage, conflicts and coexistence with cycling

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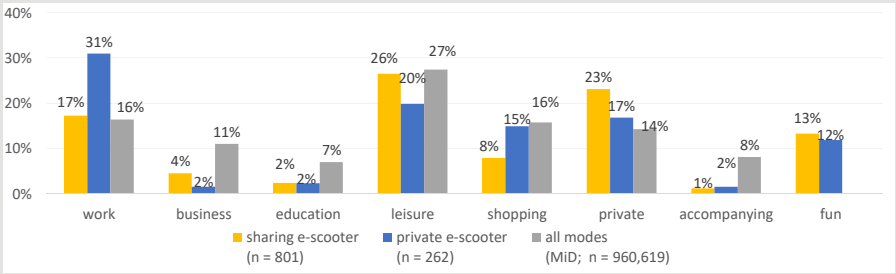

Figure 1. Trip purposes on the last trip with a sharing or private e-scooter and distribution of trip purposes in Germany from the MiD 2017. Source: own data, 2021, and [11].

Introduction

E-scooters are a rather new mode of transport [1]. Nevertheless, in recent years lots of studies have been published. Replaced modes and consequential environmental impacts [2, 3] as well as specific injury pattern [4, 5] are important topics. Regarding shape, speed and usage, e-scooters are most similar to bikes. As a consequence, by law e-scooters use the same road space or infrastructure than bikes do. Concurrently, in recent years we experience a boom of cycling in cities [6] and a significant expansion of the bike infrastructure [7]. Requirements and frequency of usage on the bike infrastructure are growing in cities caused by increasingly diverse cyclists [8]. At the same time, the bike infrastructure is subject new requirements and additional pressure due to the implementation of e-scooters. Allowing e-scooters on bike infrastructure can be seen as a paradigm shift since for the first time a motorized vehicle is allowed to use the infrastructure.
On this background, interrelation between e-scooters and active mobility (walking and cycling) are very important for the future use of the infrastructure and the ongoing transformation of urban mobility. Hence, we use a multi-method approach to investigate these potential conflicts and draw conclusions for regulation as well as improvement in the system.

Methods

The multi-method approach contains three methodological components: First, we conduct an online-survey for users and non-users to evaluate usage behavior, motives and opinions as well as experienced conflicts within the system of active mobility [9]. Second, we analyze data of shared fleets to identify movement patterns and hotspots [10]. Third, we perform expert interviews to assess the appraisal of stakeholders involved.
A Germany-wide online survey on the topic of e-scooters in road traffic was conducted in spring 2021. E-scooter users and non-users participated. Participants were recruited via social media, newsletters, disseminators, and a cooperation with an operator of e-scooter sharing. The questionnaire covers a wide range of questions on e-scooter usage, including trip purposes, combination with public transport, and reasons of use. Furthermore, opinions on e-scooters in cities as well as experienced conflicts between e-scooter users, pedestrians and cyclists were provided by both, users and non-users. A total of 3,834 persons participated in the survey, of which 1,226 were e-scooter users. On that basis, we investigate motives to choose the e-scooter over other modes of transport.
The trip data is based on repeated API-requests of e-scooter locations every two minutes for a timeframe of roughly one year in 2020 and 2021 in the city of Berlin, Germany. The data of each API-request includes, among others, geographic positions, vehicle identifiers and timestamps. By using this combination, start and end locations of vehicle movements can be identified. The derived date allows for spatiotemporal analyses of usage and identify according hotspots. In addition, information on substituted mode of transport derived from the online survey allows to estimate emission balance.
Stakeholders, such as city representatives, researchers and operators of shared e-scooters in several German and European cities are interviewed. We aim to collect their assessment on the topics supply, utilization, regulation as well as conflicts and safety. Thus, we aim to and trace different regulations and experiences in European case study cities.

Results

Results of the online survey show that e-scooter users are rather young, male, employed and have a high education. Regarding trip purposes, compared with the representative German mobility study MiD [11], the share of trips with shared e-scooters to work and leisure activities corresponds approximately to the average of all modes in the MiD, while trips for private errands are much more frequent. With private e-scooters, share of trips for shopping and private errands match well with MiD data for all modes, whereas trips to work are far exceeded. The trip purpose ‘just for fun’ was not gathered in MiD survey.

Regarding substituted modes of transport, figure 2 shows, that for shared e-scooters 81 percent of the trips replace public transport, active mobility, or are induced transport. Nevertheless, additional research shows that due to different trip length and effects on the transport system, the emission impact of shared e-scooters is balanced [12]. On the contrary, privately owned e-scooters replace more car trips but are utilized less often.

Almost 90 percent of the participants already experienced conflicts between e-scooters and active modes and specified information regarding the type of the conflict, location, parties involved, and reason for the conflict. Thereby, most conflicts are experienced as pedestrian while 57.2 percent of cyclists specified at least one conflict. Figure 3 gives an overview about the type of conflicts experienced by pedestrians and cyclists.

The analyses of trip data reveal the spatial distribution of e-scooters in the city of Berlin. Also, we evaluate temporal differences. These analyses allow to identify areas of special importance for the conflicts of interest for further research. Expert interviews allow to widen the perspective and include the assessment of stakeholders involved. Similar to users in the online poll, the experts see parked e-scooters as bigger problem than moving e-scooters. In addition, improper using behavior is stated to cause problems. While the regulatory frameworks de facto differs between the case study cities, most experts agree on desired regulation measures. These refer to general organization of the service in terms of special use permissions or concessions as well as measures like automated speed reductions, zoning and integration into public transport.

Conclusion

The main findings of the research are: The utilization is divers and shared e-scooters are used differently than privately owned. The potential for conflicts is large. Thereby problems caused by parked e-scooters are much bigger than those caused by driving e-scooters. Further reaching regulation is desired by most stakeholders.

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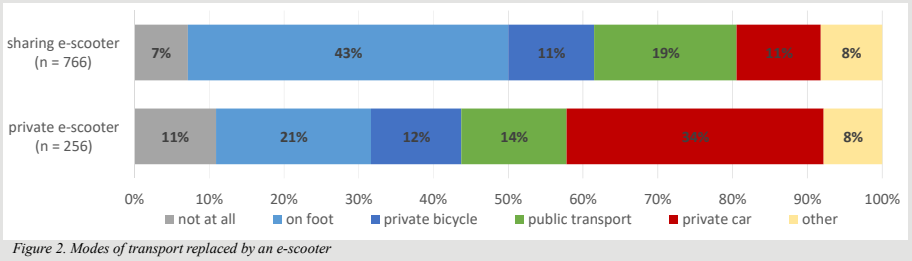

Figure 2. Modes of transport replaced by an e-scooter

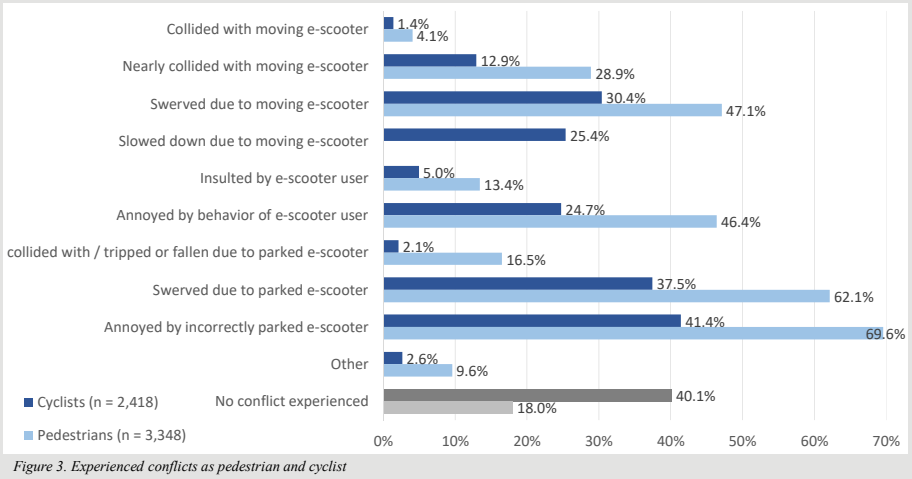

Figure 3. Experienced conflicts as pedestrian and cyclist

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