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'Bike-share-and-ride' users: who they are and what they think of travelling to rail and bus public transport hubs

Abstract: The bicycle has successfully emerged in recent years as a promising alternative to the motorised transport that dominates cities. It also plays a pronounced role in multimodal mobility when combining cycling and public transport using the bike and ride model. Bicycle sharing systems (BSS) present a significant opportunity for the development of this form of mobility, and in combination with public transport they can give rise to a 'bike-share-and-ride' model. This form of transport can, however, be associated with numerous barriers and limitations; therefore, the aim of the study is to analyse the opinions of people using the BSS in the large Polish city of Toruń. The analysis has taken into account the results of a survey conducted among those using the system [N = 1114], including in particular those using it to access public transport hubs [N = 282]. The study observed that people using BSS for multimodal mobility use bike sharing more often than other users and in more months during the year. Women were shown to be less involved in this mobility pattern. In line with previous studies, it was also observed that the most important alternative to bike sharing for multimodal BSS users is public transport.

Key words: bicycle; bicycle sharing system; bike and ride; bike share and ride; cycling policy; Poland; public transport

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Introduction

The bicycle has become a promising alternative to motorised forms of transport in recent years. Numerous studies underline the positive impact of cycling on the quality of urban life, overcoming transport problems – pollution and congestion – as well as improving public health (Oja et al., 2011; Gotschi et al., 2016; Shen et al., 2024). The bicycle

is considered not only as a stand-alone means of mobility, but also as a feeder mode in combination with public transport (Martens, 2004; 2007). As such, it bridges the gaps for the first and last parts of a journey, allowing convenient access from the starting point to a public transport hub and then from another public transport hub to the final destination. However, travelling by private bicycle to public transport hubs may generate some problems, i.e. safe and convenient parking at the hub (Egan et al., 2023) or transporting the bicycle on board a public transport mode (Kwiatkowski, Karbowiński, 2022).

In recent years, BSS have become one of the solutions applied which at the same time promote and increase cycling (Ricci, 2015). They offer the option to rent or return a bicycle directly at a public transport hub, thus solving the problem of parking and transporting a private bicycle. However, in addition to encouraging cycling, these schemes are also designed to promote public transport by creating a multimodal transport chain using cycling to and from such hubs.

However, travelling by bike (especially using BSS) as part of a multimodal journey may depend on a number of factors related to the availability of infrastructure or personal accessibility to cycling. Therefore, the aim of the study was to investigate the opinions and habits of users of BSS regarding combining travel using the system and public transport. The opinions collected from people using BSS in this way provide an opportunity to identify user needs as well as barriers to cycling in multimodal mobility. In pursuing the aim of the paper, the following research questions (RQ1, RQ2, RQ3) were posed:

- [RQ1] What is the share of journeys to public transport hubs in total BSS, and in the context of the different socio-demographic characteristics of the respondents and their mode of cycling?
- [RQ2] Do respondents use BSS to reach public transport hubs regularly and how do they assess this form of mobility against other means of transport?
- [RQ3] What organisational, infrastructural and personal factors encourage or discourage the use of BSS in combination with public transport?

The study has outlined what role a public BSS can play in urban public transport using the example of Toruń, a city in Poland (about 200,000 inhabitants). It has focused specifically on the aspect of the role of BSS in travelling to public transport hubs. This context is particularly important, especially in cities in Central and Eastern Europe, identified in the literature as car-dependent (Bartosiewicz, Pielesiak, 2019; Kudłak et al., 2024).

The bicycle sharing system and reaching public transport hubs

The bicycle can successfully function as a means of transport, providing a healthy and environmentally friendly alternative to motorised transport. It is extremely important to promote cycling as a form of mobility with the idea of reducing the negative impact of transport on the environment and quality of life (Markvica et al., 2020). However, as mentioned earlier, the use of the bicycle for this purpose is quite sensitive to numerous factors and may involve some barriers and limitations, especially in countries with a low cycling culture and a high level of motorisation. Issues related to infrastructure, weather and socio-demographic factors are decisive in the choice of cycling for transport purposes (Adsule, Kadali, 2024). Distance is also significant for this type of travel (Cabral et al., 2018). Therefore, scholars increasingly recognise the bicycle not only as a stand-alone vehicle used for the whole journey, but also for the first and last parts of a journey in combination with public transport (Oeschger et al., 2020; Yu et al., 2021; Dzięcielski et

al., 2024). In this case, the success of such a solution depends on how well the two forms of transport are organised and how they are combined (Kosmidis, Müller-Eie, 2024).

Public transport hubs are accessible by bikes through a bike and ride policy. This is related to the organisation of space in such a way that, firstly, the hub can be reached by bicycle, and secondly, the bicycle can be secured once it has reached the hub (Cervero et al., 2013). The bike and ride formula can be considered in different contexts, including the use of shared or private bicycles (Kwiatkowski, Karbowiński, 2023). In the context of the latter, scholars discuss options for bicycle parking at hubs (La Paix Puello, Geurs, 2015; Molin, Maat, 2015; Arbis et al., 2016; Heinen, Buehler, 2019) or the option to carry the bicycle onto a public transport vehicle (Jonkeren et al., 2021; Kwiatkowski, Karbowiński, 2022). Bike-and-ride solutions using shared bikes take a variety of spatial approaches, from urban to metropolitan and agglomeration-scales (Kwiatkowski, 2021; Kwiatkowski et al., 2024). This dimension is of particular importance in suburban and rural areas (Wolny-Kucińska, 2020), which, thanks to public bike systems, there are new opportunities for their inhabitants to commute by bicycle to public transport hubs (Wojciechowska et al., 2023).

Bicycle sharing systems are successfully employed for transport purposes, and this is also evident in observations of user behaviour. As Jaber and Csonka (2023) point out in the example studied, a larger number of regular users ride bikes regularly during the week on working days. The literature emphasises that BSS should be integrated with public transport (Jahanshahi et al., 2020) as part of multimodal travel. Griffin and Sener (2016) point to the need to combine these two forms of transport in planning policies. This model, operating within a bike-and-ride framework, can be described as 'bike-share and ride' (Kwiatkowski, Karbowiński, 2023). A properly designed bike and ride model using BSS can become competitive with motorised forms of transport (Tavassoli, Tamannaei, 2020) in terms of both travel time and cost (Van Mil et al., 2021). In this context, Liu et al. (2022) highlight the relationship between the regularity of BSS use in multimodal travel and user behaviour and attitudes. BSS stations located at public transport hubs can also solve the problem of providing an adequate number of parking spaces for private bikes (Van Goeverden, Correia, 2018). However, as with private bicycles (Ravensbergen et al., 2018), the use of shared bicycles as a means of transport can come with a number of constraints and barriers. As demonstrated by Adnan et al. (2018), and Guo and He (2021), a number of factors influence the decision to choose bike sharing for travelling to railway hubs, including those related to weather conditions, the way the system operates, and the socio-demographic characteristics of users. Bocker et al. (2020) highlight that women and older people are less likely to use this option.

Guo et al. (2023) found that positive user feedback on BSS promotes more frequent use of this form of mobility in combination with public transport. According to Brons et al. (2009), despite the fact that first and last part of a journey is complementary to rail, it is this leg that is crucial to the overall perception of public transport. These findings are supported by research by Julio et al. (2024), which shows that the quality of the service offered by BSS, especially the experience of accessibility and the bike hire process, is a key factor in the decision to use it. The cost of such a journey is not negligible (Torabi et al., 2022). Perceived distances – both from the place of residence to BSS stations and the subsequent cycling distance (Qin et al., 2018) – are also vital in the use of BSS to reach public transport hubs. In addition to personal factors, spatial accessibility to bicycles (Hamidi et al., 2019), including BSS stations, can also be important. However, these

barriers, at least in part, lose their significance when electrically-assisted bicycles are available as part of BSS (Kong et al., 2025).

In a study in China, Chen et al. (2022) showed that third-generation bike sharing systems, i.e. those based on docking stations, may have greater potential for use in travelling to railway hubs. Cheng et al. (2022a; 2022b) added that the use of bicycles for travelling to public transport hubs is also influenced by the built environment. This was confirmed in a study by Hu et al. (2022), indicating that greater use of bicycles in the bike-and-ride model is observed in the most active urban areas. Pekdemir et al. (2024) also observed that people using BSS for transport purposes attached greater importance to BSS stations in the vicinity of public transport hubs.

From the perspective of the organisation of public transport in towns and cities, the relationship between public transport and BSS is also increasingly topical. Dobruszkes and Dzięcielski (2024) showed that the two systems can be both substitutable and function in combination in multimodal travelling. Radzimski and Dzięcielski (2021) also observed a relationship between BSS usage and frequency of trips – it was shown that users were more willing to cycle to closer hubs. However, apart from complementing public transport, sharing transport systems, including bike sharing, may also compete with it (Jayawardhena et al., 2025). In the study by Ye et al. (2024), it was confirmed that BSS is more of an alternative than a complement to public transport travel.

Although the literature emphasises the positive impact of BSS on the transport situation of urbanised areas, some publications question the uncritical approach to this solution. De Chardon (2019) is sceptical about the benefits of BSS, pointing out that the actual benefits for residents are small in relation to the boosted image of local government officials spearheading their introduction. He also points out that individual BSS lack a clearly defined purpose and the transport problems they are supposed to solve in the places where they operate are not specified (de Chardon et al., 2017). It is therefore widely believed that only a well-prepared system combined with a well-prepared infrastructure for cycling can bring success in its development (Felix et al., 2020).

The literature indicates that a BSS, next to private bikes, can be an important element strengthening the bike-and-ride model. However, as emphasized in the research, a number of factors related to the appropriate infrastructure and promotion of this solution should be taken care of. They may turn out to be decisive for the effectiveness of cooperation between bicycles and public transport.

METHODS

The aim and research questions posed in the study determined the choice of methods. In order to obtain opinions concerning the use of BSS for travelling to public transport hubs, a social survey was conducted in one of the larger cities in Poland (Toruń) where such a system has been operating for 10 years (with a break).

Study area. The city of Toruń, located in the north-central part of Poland, was used as an example for analysis. The city has a population of just under 200,000 and is one of the administrative centres of the Kujawsko-Pomorskie region. It is characterised by its high tourist attractiveness, mainly due to the old town complex which has its place on the UNESCO World Heritage List. The potential for cultural tourism is also evidenced by the numerous events and activities – cyclical and one-off – that are organised in the city (Biegańska et al., 2017). Toruń can also be described as a higher education (HE) city

and it is home to one of the leading research universities in Poland, educating more than 17,000 students in the 2024–2025 academic year (umk.pl). Taking all this into account, the choice of the city as the study area was determined by its functions. The city is the core of the Toruń metropolitan area, and, as mentioned earlier, has a high tourist potential and is an important academic center. These factors contribute to the high importance of travelling to the city using public transport.

The city has been operating a BSS since 2014 (with a break), under the name of *Torvelo* from 2019 to 2024. According to the divisions of BSS into generations as proposed and described in literature, the Toruń system has been operating from the beginning according to the principles of the 3rd generation, i.e. it consists of docking stations, and bikes are rented and returned by unhooking and docking them to such a station. During this time, the system has operated for most of the year outside the winter season. In the first years, the active season was longer and lasted from mid-February almost until the end of December; in the most recent period it has operated from the beginning of March until the end of November. In the survey year there were 52 stations and 360 bicycles available for users at various locations in the city, including the city centre, HE facilities, central parts of housing estates and shopping facilities, as well as public transport hubs. Among those places, bicycle stations were placed at the three main railway hubs (Toruń Główny, Toruń Miasto, Toruń Wschodni) and at the bus station located by the city centre.

Survey. A survey was conducted to obtain the views of users related to how they use the bicycle and in particular how they commute to the rail and bus hubs. It was conducted as a CAWI (Computer Assisted Web Interview) through two main communication channels: it was announced in the local media, and the system operator sent the survey link directly to its users. The survey was conducted in May 2024. It yielded 1167 questionnaires, of which the study took into account 1114 responses from individuals who indicated that they had used the *Torvelo* bike sharing system in Toruń.

The survey was conducted in cooperation with the Municipal Roads Authority in Toruń and the operator of the *Torvelo* bike sharing system, BikeU. The questionnaire consisted of several parts. It included questions on demographics related to gender, age, place of residence and mode of cycling (frequency, seasonality, purposes). It also inquired about the mode of operation and level of satisfaction with BSS in Toruń, serving as a tool for the operator and municipal authority to evaluate its operation to date. For the purposes of the present study, the survey also included a specific section for people using BSS for travelling to rail and bus hubs. These questions concerned the frequency of travelling to the hub using BSS, whether the decision to choose the bicycle as a means of transport was spontaneous or planned, what encourages and what discourages the use of BSS for travelling to hubs, and what other means of transport respondents use when they do not choose a bicycle, or would use if Toruń had no BSS.

The results of the study were analysed using the cross-tabulation method. Firstly, the use of BSS for travelling to public transport hubs was analysed against other purposes for cycling in the context of gender, age and frequency of use (N = 1114). This issue was also discussed with reference to the seasonality of bicycle use declared by the respondents. Further, the author analysed questions asked solely to people using the *Torvelo* system to commute to the public transport hub (N = 282). These responses were analysed in terms of frequency and also by dividing the respondents into those deciding to use bicycles spontaneously (decision taken immediately after using public

transport) and those planning to use BSS in advance. For the cross-tabulated results, chi-square statistical tests were performed to verify the statistical significance of the results obtained. Analyses were conducted using MS Office and IBM SPSS software and the results are presented in tables and graphs.

RESULTS

The results of the study were analysed by considering (i) the issue of travelling using BSS in Toruń to and/or from the rail/bus hubs against other purposes of BSS use, and (ii) the perception of various aspects related to travelling to and from public transport hubs using *Torvelo* bicycles. Therefore, analyses were conducted for two samples of respondents – all survey participants (N = 1114) and those declaring using BSS to get to and from hubs (N = 282). The characteristics of both samples are shown in Table 1.

Table 1. Socio-demographic features and characteristics of survey respondents

Variable		%	
		All respondents [N = 1114]	Respondents travelling to the rail or bus hub [N = 282]
Gender	female	40.7%	34.0%
	male	59.3%	66.0%
Age	under 26	17.8%	17.4%
	26–35	40.3%	45.4%
	36–45	25.9%	19.1%
	over 45	16.1%	18.1%
Frequency of *Torvelo* use	daily	3.7%	4.3%
	several times a week	23.8%	34.4%
	several times a month	36.1%	36.9%
	a few times a year	36.4%	24.5%
Purposes of cycling	commuting to work	36.4%	40.1%
	travelling to school	2.5%	3.5%
	travelling to HE	10.3%	18.4%
	cycling to shops/shopping centres	34.3%	58.2%
	cycling to the Old Town	48.4%	69.5%
	travelling to rail or bus hubs	25.3%	100.0%
	recreational cycling	59.2%	51.1%

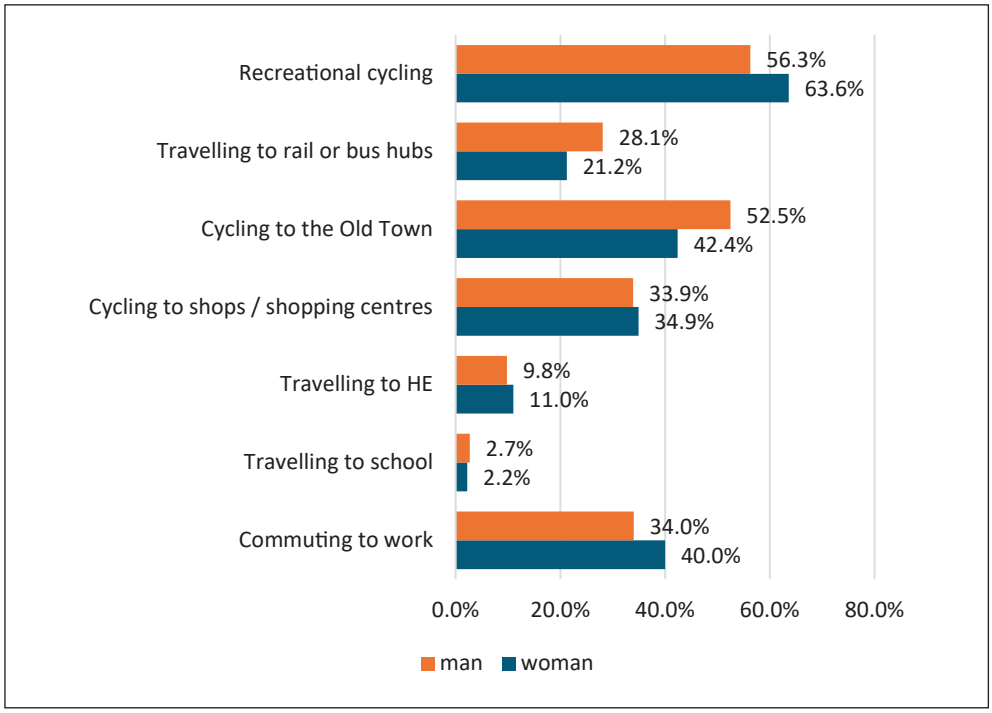
Source: author based on survey [N = 1114, N = 282]

Among the survey participants in both samples, the majority of respondents were male, while the most represented age range was between 26 and 35 years old (Table 1). Significant differences between the groups can be seen in terms of the frequency and purposes of cycling. Those who declared that they travelled to/from rail/bus transport hubs using BSS indicated that they used shared bicycles more often. While 3.7% of all respondents indicated that they used the system every day and 23.8% several times a week, for respondents travelling to or from the hubs these indications were 4.3% and 34.4%, respectively. People in this group more frequently pointed to the transport

purposes of BSS use. Only the recreational purpose received a higher percentage of indications in the entire set of survey participant responses.

Travelling to transport hubs in comparison to other purposes for using BSS in Toruń. Firstly, the author analysed the responses of all respondents to the survey. The aims of BSS use in Toruń were compared in terms of gender, age and frequency and seasonality of use. Among the purposes for cycling, respondents could choose more than one answer from the following: recreational cycling, travelling to rail or bus station hubs, cycling to the Old Town, cycling to shops/shopping centres, travelling to HE, travelling to school, commuting to work. Figure 1 shows the distribution of purpose-related responses by gender of respondents.

Figure 1. Purposes for using the bicycle sharing system in Toruń by gender

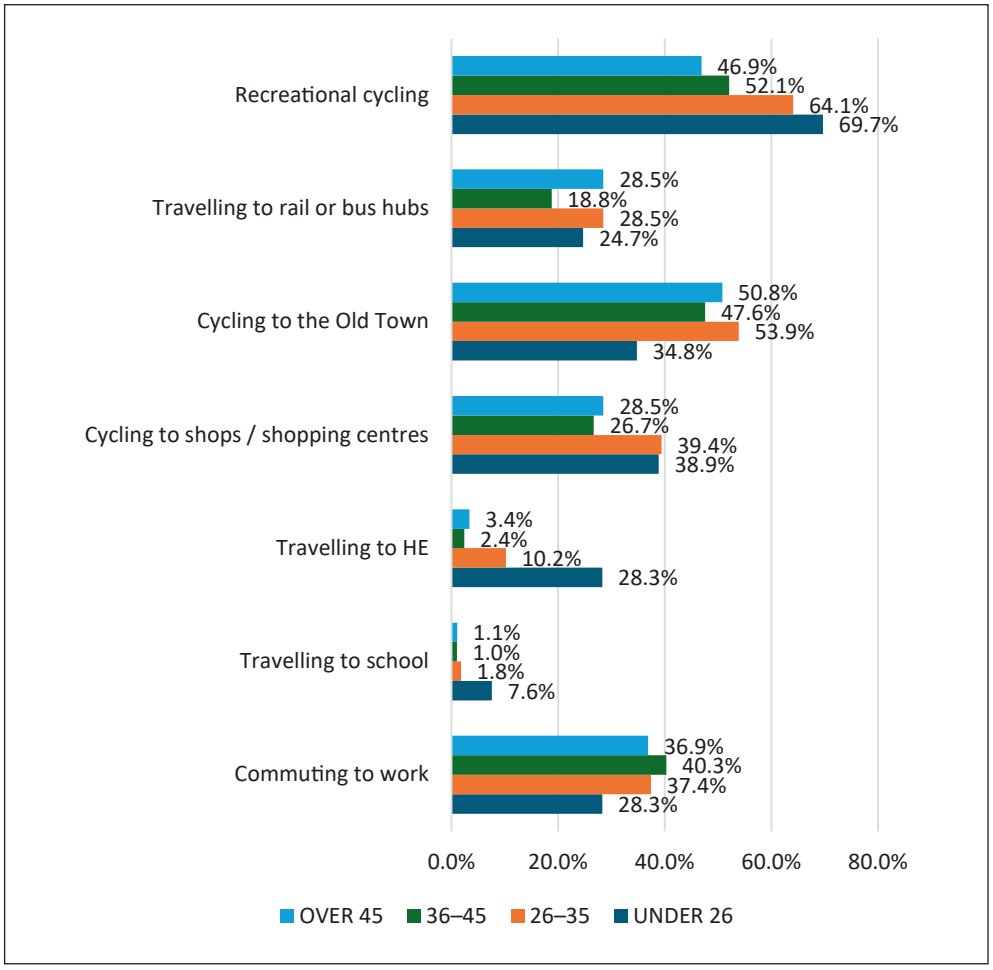


Source: author based on survey [N = 1114]

The data show that women are more likely than men to ride for recreation (63.6% vs 56.3%), to work (40.0% vs 34.0%), to HE (11.0% vs 9.8%) and to go shopping (34.9% vs 33.9%). Men more often indicated the other purposes. Travelling to the transport hubs, discussed in this paper, was more often indicated by men than women, with 28.1% of male and 21.2% of female respondents admitting using BSS in this way.

Some differences in the purposes of BSS use in Toruń are marked between different age groups. In addition to the age-related specificities of travelling to school and HE, major differences were also noted with other categories (Figure 2). It was shown that younger people were more likely to indicate that they use BSS for recreational purposes.

Figure 2. Purposes for using the bicycle sharing system in Toruń by age

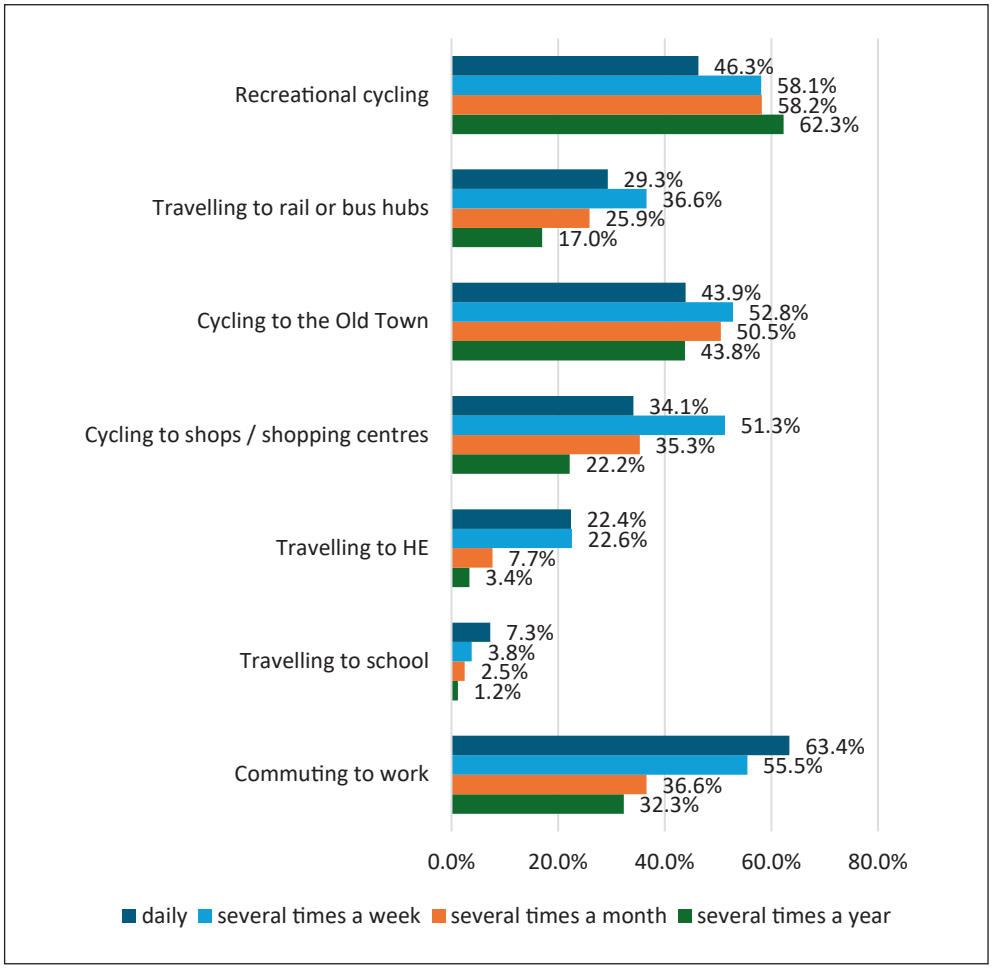


Source: author based on survey [N = 1114]

Travelling to the transport hubs, which is the main focus of the analysis in this study, was not the most common purpose of BSS use in Toruń. For those under 26 years of age, 24.7% used the system in this way, with 28.5% aged 26–35, 18.8% aged 36–45, and 28.5% of the oldest group, over 45.

Among the purposes of using BSS, daily users most often indicated commuting to work (63.4%) (Figure 3). As the frequency of cycling in each group decreased, so did the percentage of indications of this purpose. An inverse relationship was observed for recreational cycling – in this case it was most often indicated by people who used a bike occasionally, i.e. just a few times a year (62.3%). With respect to the journeys to and from the rail or bus transport hubs, those using BSS several times a week (36.6%) and daily (29.3%) indicated this purpose most frequently.

Figure 3. Purposes for using the bicycle sharing system in Toruń by respondents' frequency of use of Torvelo



Source: author based on survey [N = 1114]

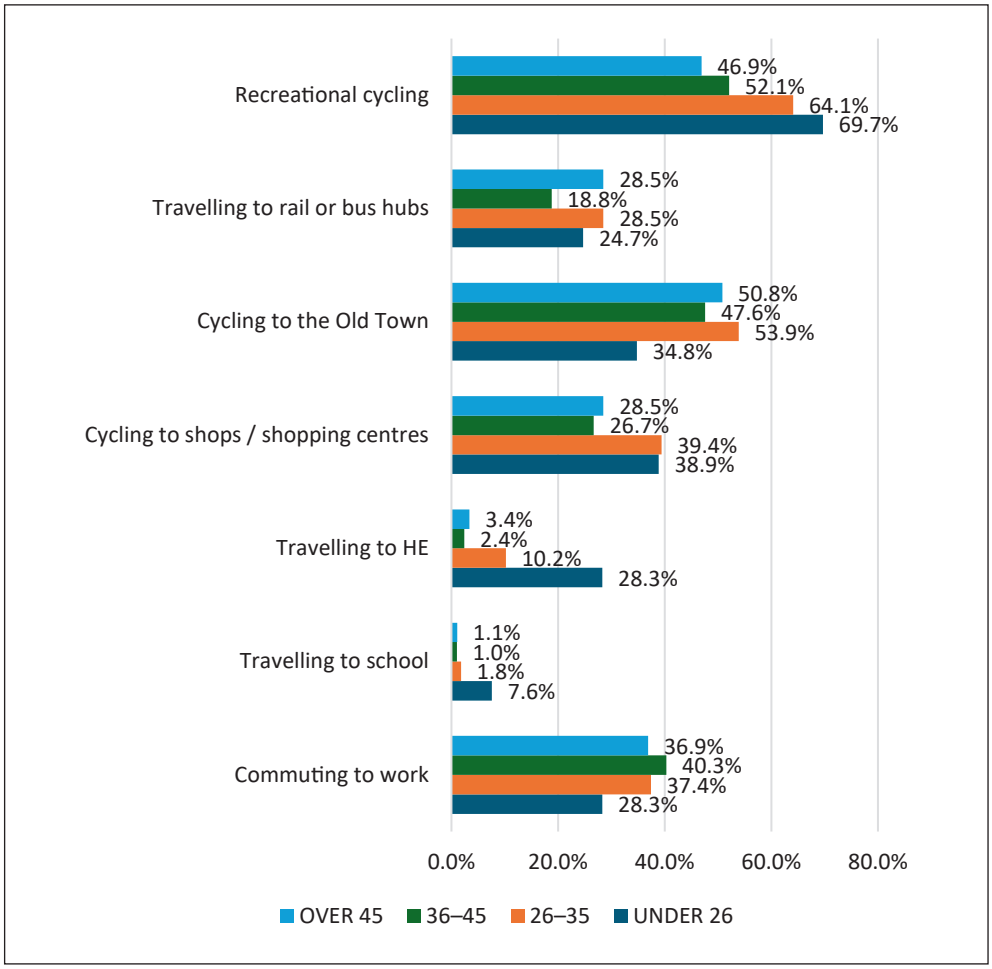
Table 2. Statistical significance of the chi-square test for gender, age, frequency of BSS use, and purposes of BSS use

	Gender of respondents	Age of respondents	Frequency of BSS use
Commuting to work	0.044	0.052	<0.001
Travelling to school	0.589	<0.001	0.040
Travelling to HE	0.517	<0.001	<0.001
Cycling to shops/shopping centres	0.732	<0.001	<0.001
Cycling to the Old Town	<0.001	<0.001	0.090
Travelling to rail or bus transport hubs	0.009	0.019	<0.001
Recreational cycling	0.015	<0.001	0.193

Source: author based on survey [N = 1114]

Analysing the responses concerning the purposes of BSS use in terms of gender, age and frequency of use, chi-square statistical tests were conducted to check the relationships between the variables discussed (Table 2). It was shown that for gender, statistically significant relationships were obtained for commuting to work, cycling to the Old Town, travelling to rail and bus transport hubs, and recreational cycling. All purposes except commuting to work are statistically significant when it comes to age, while all except cycling to the Old Town and recreational cycling in the case of frequency. Therefore, the purpose of travelling to the transport hubs proved to be significantly dependent on gender, age and frequency of BSS use.

Figure 4. Distribution of answers to the question 'In what months do you use the Torvelo BSS in Toruń?' among those travelling to the public transport hubs by shared bike, and those using BSS for other purposes



Source: author based on survey [N = 1114]

The study also compared the seasonality of cycling between those who do or do not use the Torvelo system to travel to and from the rail or bus public transport hubs. For this purpose, the author proposed a question about the months in which respondents

use BSS in Toruń and a multiple-choice question about the purposes of using one. People who choose BSS to travel to and from public transport hubs are more likely than others to cycle in all months (Figure 4). The difference between the groups analysed is the smallest during the summer months (June, July and August). The chi-square test yielded results that were statistically significant (Table 3).

Table 3. Statistical significance of the chi-square test for BSS users by month, including travellers and non-travellers to or from public transport hubs

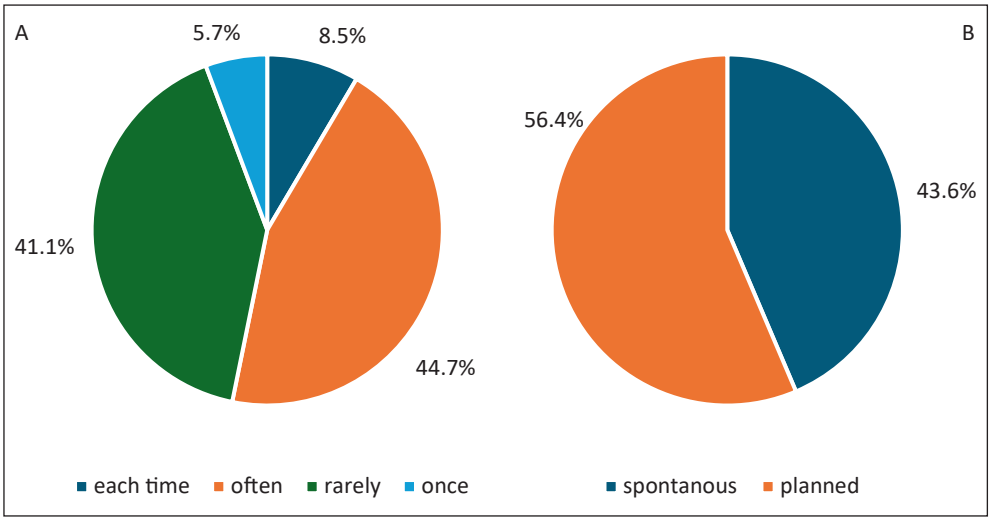
Month	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Travellers and non-travellers to or from public transport hubs	<0.001	<0.001	<0.001	<0.001	<0.001	0.017	0.003	<0.001	<0.001	<0.001	<0.001

Source: author based on survey [N = 1114]

Travelling to rail and bus public transport hubs: assessment of conditions. Individuals who use Torvelo bicycles to travel to the hub were additionally asked about the associated conditions.

Those who use the Torvelo BSS to travel to or from the rail or bus hub declared that they did so either often (44.7%) or rarely (41.1%) (Figure 5A). A smaller proportion indicated that they travelled to or from the hub by BSS each time (8.5%). The fewest respondents indicated that they had only come to or from the hub by Torvelo bike just once (5.7%). For 56.4%, the decision to choose BSS for the journey was planned, while

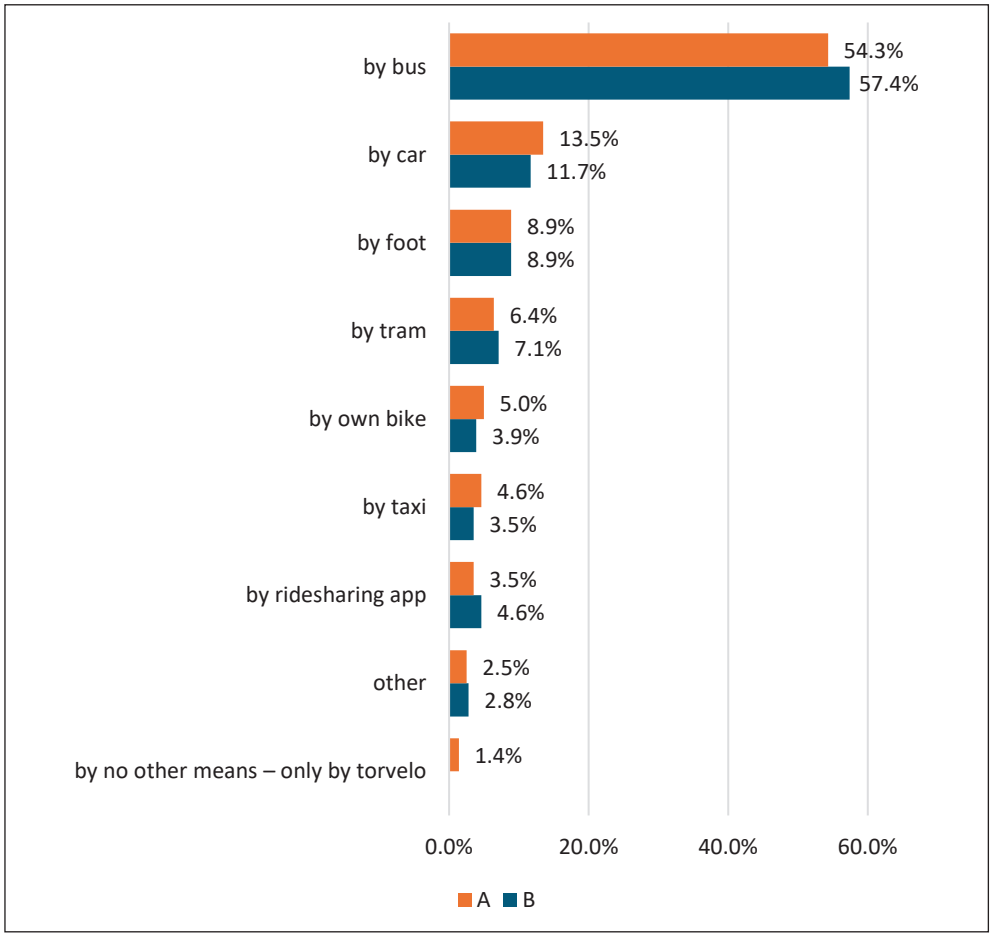
Figure 5. Respondents' frequency of use of Torvelo BSS for travelling to or from the hub (A) and the distribution of responses to the question 'Did you make the decision to use the Torvelo BSS for travelling to or from the hub spontaneously before the journey itself (e.g. as soon as you arrived at the hub by rail/bus) or was it planned in advance?' (B)



Source: author based on survey [N = 282]

43.6% admitted that this decision was taken spontaneously just before the journey itself (e.g. immediately after arriving at the rail/bus hub) (Figure 5 B).

Figure 6. Distribution of answers to the question 'If you do not choose the Torvelo BSS to get to or from the hub, how do you get there most often?' (A), and the question 'If Toruń didn't have the Torvelo system, how would you get to the hub?' (B)



Source: author based on survey [N = 282]

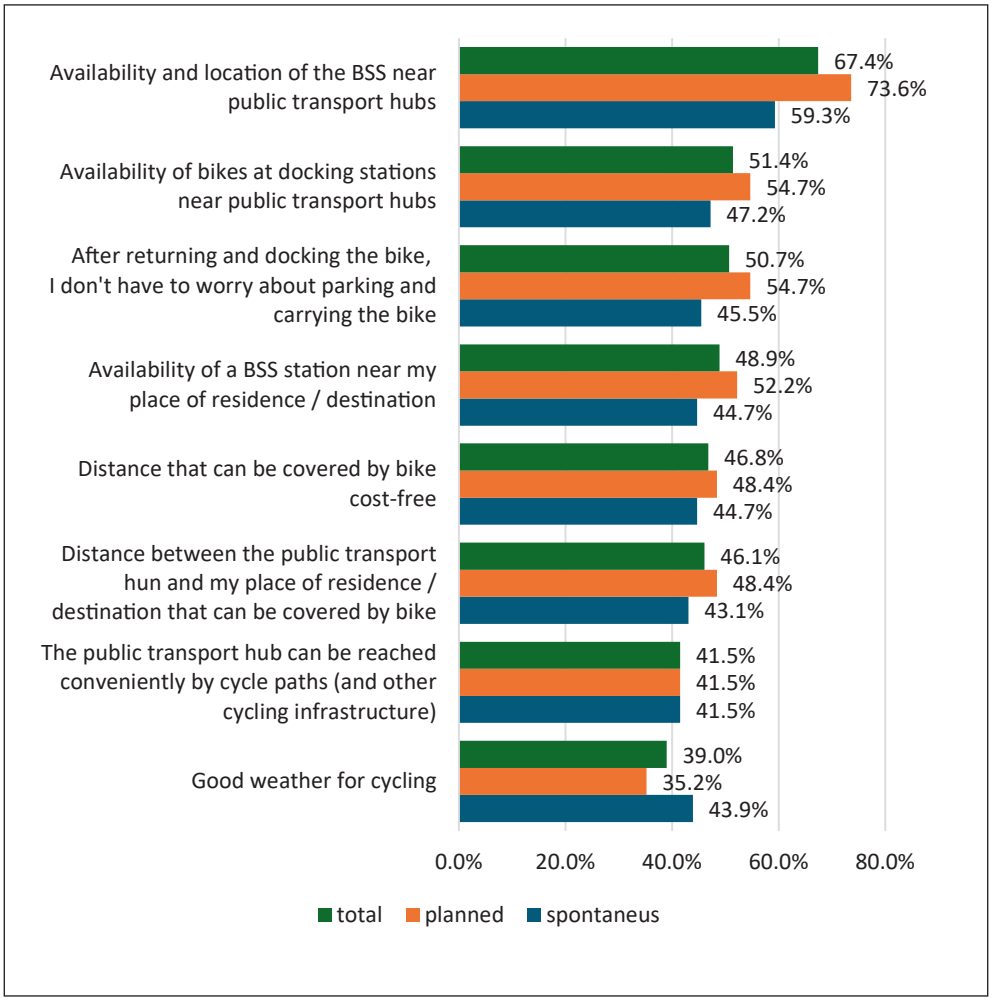
A prominent issue raised in the survey was the problem of an alternative way to get to the rail or bus public transport hubs. The survey questions covered two situations in which a survey participant would not use the BSS. In the first case, the question concerned whether and which means of transport the respondent uses when he or she chooses not to use BSS. The second question regarded travelling to the hub if Toruń did not have a BSS. In both cases, the predominant choice would be bus, with 54.3% indicating this option in the first question (Figure 6A) and 57.4% in the second (Figure 6B). The second choice was by car, which received 13.5% and 11.7% of indications, respectively. The choice of a private bicycle was declared in 5.0% and 3.9%. In addition, in the

first question, 1.4% of respondents admitted that they do not travel to or from the hub by any means of transport other than BSS.

The survey went on to ask about factors encouraging and discouraging the use of BSS for travel to and from rail or bus hubs. The results were filtered according to the respondents' answers to one of the previous questions on the choice of BSS in a spontaneous or planned manner. The results are presented in figures showing the percentage of responses to the question overall and separately for the two groups.

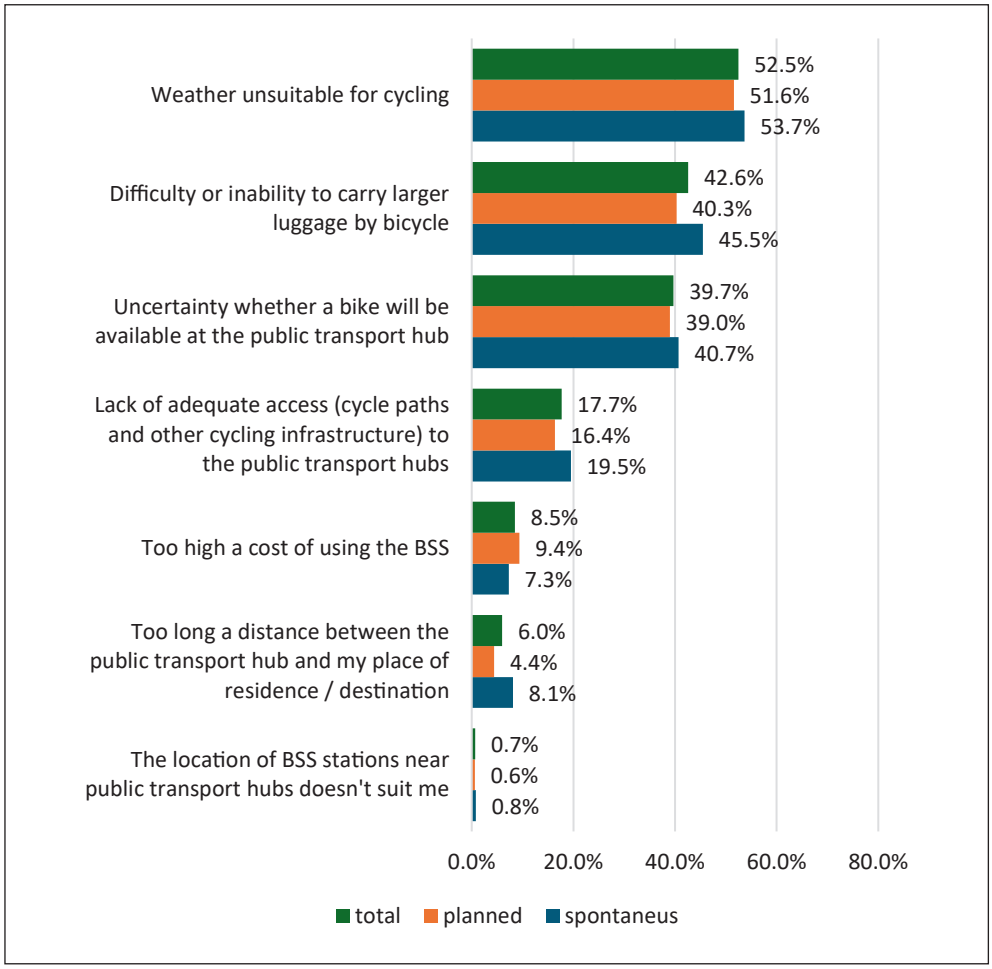
Among the factors which can encourage the use of BSS to get to or from the hub, respondents most often pointed to the availability and location of bike docking stations near the hubs (67.4%) (Figure 7). This aspect was highlighted by those who planned in advance to use the BSS on the way to or from a public transport hub, a response indicated by 73.6% of such respondents, compared to 59.3% of spontaneous Torvelo users.

Figure 7. Distribution of responses to the question 'What encourages you to use the Torvelo BSS to travel to or from rail or bus hubs?'



Source: author based on survey [N = 282]

Figure 8. Distribution of responses to the question 'What discourages you from using the Torvelo BSS to travel to or from rail or bus public transport hubs?'



Source: author based on survey [N = 282]

There was greater variation in responses to the question on disincentives to travelling to and from a rail or bus hub using the Torvelo BSS. Most respondents indicated weather unsuitable for cycling – in total and in both groups analysed (Figure 8). Further frequently selected responses were issues related to the difficulty or inability to carry larger luggage by bicycle (over 40% of respondents) and the uncertainty over whether a bike will be available at the hub (also around 40% of respondents). In addition to the available set of responses, respondents also chose to make their own submissions, most of which related to technical aspects of the system's operation (around 17% of responses). These indications referred mainly to negative experiences during the process of renting, returning or using a shared bike. The analysis of disincentives to use BSS for travelling to and from public transport hubs showed no significant differences between those choosing to use BSS in a planned or spontaneous manner.

Discussion and conclusion

BSS can be one of the most essential elements in the development of the bike and ride model in urban mobility. As pointed out in the literature review, BSS can solve many of the problems associated with travelling by private bicycle to public transport hubs. This study analysed how people who use the BSS analyse it. The perspective of those who use such a solution allowed the author to better assess the functionality of the bike-share-and-ride model and analyse factors that will inform recommendations for the development of multimodal mobility using bike sharing. A survey of people using BSS to travel to public transport hubs yielded a number of observations that have helped to answer the research questions posed in the study. A limitation of the survey was the relatively low percentage among the survey participants who admitted that they use BSS to commute to public transport hubs. The study also did not analyse data related to the use of bicycles (number of rentals and returns) at docking stations located in the vicinity of public transport hubs. However, the results obtained allow for careful generalization and drawing conclusions.

Verifying what proportion of all declared journeys by BSS are multimodal journeys (RQ1), it was observed that one in four BSS users in Toruń use it in this way. The analysis showed that males, and people who frequently ride shared bicycles, are more likely to use this option. Furthermore, those who utilise BSS to commute to public transport hubs are more likely than other users to ride these bikes in each month. In terms of the regularity of use and perceptions of alternatives to bike sharing (RQ2), just over half of those surveyed use the bike-share-and-ride model often or every time. Similarly, slightly more than one in two respondents indicated that the decision to use a bicycle for this type of journey was pre-planned. More than half of the respondents (about 60%) indicated public transport vehicles as an alternative to BSS in multimodal mobility. When analysing the incentives and disincentives to the use of BSS for multimodal journeys (RQ3), it was observed that the most important factor encouraging respondents to use bike sharing for reaching public transport was the availability of docking stations near transport hubs. Opposite to this, the weather was considered the most discouraging factor.

The overall analysis yielded that the potential of bike sharing in the surveyed case has not been fully exploited. The results collected indicated that people travelling to public transport hubs by a shared bike generally cycle more often and have a longer cycling season. It can therefore be concluded that they perceive the bicycle as a means of transport more often than other users.

This study is in accord with existing literature in concluding that instead of a modal shift from motorised individual to sustainable transport, there may be competition between sustainable modes. In fact, the results confirmed that public transport is the main alternative for shared bicycle users to rail and bus hubs. This confirms the findings of Van Marsbergen et al. (2022), indicating that instead of creating a multimodal travel chain, shared bicycles can replace public transport. A similar conclusion was reached in the study by Molinillo et al. (2020), which showed a low share of BSS in multimodal connections and more frequent use of bicycles along the whole travel route. This result is also consistent with the observations of Murphy & Usher (2015), who pointed out that from the perspective of a change of mode by city residents, BSS mainly attracts users of other sustainable forms of transport, including public. If the promotion of sustainable transport is indicated as one of the objectives of BSS, it should aim at increasing the

number of people giving up their cars for bicycles. However, the results clearly showed that the most frequent transport alternative for people currently using bike sharing to get to public transport hubs, is in fact public transport itself and not the car.

The personal characteristics of respondents also play a role in the use of the BSS for multimodal mobility. The survey showed inequalities in the scale of bike sharing to public transport hubs by both gender and age. In the case of gender, this is consistent with the lower participation of women in cycling in general in places with a low cycling culture, as shown in previous studies (Garrard et al., 2008; Aldred et al., 2016). In the context of age, however, in contrast to the results presented in Ji et al. (2017), BSS users did not have a lower proportion of people aged 45+ travelling to public transport hubs.

The survey was conducted among people who are already convinced of this form of mobility. This was to identify the characteristics of this group, as well as the factors that favour and threaten the development of the bike-share-and-ride model. This group is characterised mainly by the way they use bicycle: higher frequency, more transport-oriented purposes, and propensity to use public transport. This is an important observation, which suggests that the example studied of the bike-share-and-ride model attracts above all those who already treat the bicycle as a means of transport and are not predominantly dependent on private cars. Therefore, the results suggest that efforts are still needed to promote cycling and not only as a part of multimodal mobility.

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