Attitudes and Perceptions of Shared E-Scooter Parking in Stockholm, Gothenburg and Malmö

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Short summary

This paper investigates attitudes and perceptions related to the enforcement of a parking policy for e-scooters in Sweden. The study focuses on the effects and opinions of the parking regulation among e-scooter users in Stockholm, Gothenburg, and Malmö. The survey covers demographics, usage patterns, attitudes, and the impact on travel behavior. The study identifies factors influencing both the attitudes towards the policy and change in ridership after enforcement. Density and location of destination parking are identified as key factors influencing both attitudes and change in ridership. Also, users' frequency of usage, change in ride time, and longer walking distances are also identified as significant factors. The main conclusion is that the density and location of parking zones are crucial factors influencing users' attitudes and behaviors regarding parking regulation. The paper suggests that city planners should consider these factors when designing e-scooter parking systems to ensure a positive user experience.
Keywords: E-scooter; Electric scooter; Micromobility; Parking

1 Introduction

Shared e-scooters are now a common sight in many cities, but the mode is still considered a novel element in the streetscape. Initially celebrated for their potential to solve the first/last-mile with public transportation and eco-friendliness, e-scooters quickly became a challenge for many cities. Reports of shared e-scooters cluttering sidewalks and blocking pedestrian paths became frequent. In response to the growing concern, some cities, including Paris, banned e-scooters altogether to curb the nuisance and improve public safety. This backdrop of mixed reactions and regulatory challenges set the stage for the introduction of a parking policy in Sweden.

Sweden imposed a national parking regulation for electric scooters on September 1, 2022. The parking regulation banned parking of shared e-scooters on sidewalks or other pedestrian areas. Instead, e-scooters can now only park in dedicated e-scooter or bicycle parking. The City of Stockholm and the City of Malmö chose two different designs of parking systems for e-scooters. On the contrary, the City of Gothenburg opted to postpone the introduction through local traffic regulations. This study examines the effects and opinions of the parking ban among shared e-scooter users in Stockholm, Gothenburg, and Malmö through a user survey. The purpose of the survey is to understand users' wishes and attitudes related to shared e-scooter parking.

Only a few studies have investigated e-scooter parking and the majority focus on clutter and compliance. Hemphill et al. (2022) investigated how the built environment impacted e-scooter parking compliance in Portland, Oregon. Klein et al. (2023) conducted field experiments before and after three different interventions for e-scooter parking in Washington, DC, and Auckland, New Zealand. Karlsen et al. (2021) tested and observed the effect of e-scooter parking racks and painted corrals in Oslo and Trondheim in Norway. Brown et al. (2020) observed over 3600 parked cars, shared e-scooters, and bikes in five US cities in 2019. Brown et al. (2021) surveyed 391 international shared e-scooter users about their parking regulation knowledge, parking behavior, and their thoughts on effective parking interventions. James et al. (2019) surveyed 181 users and non-users of shared e-scooters about their experience and perception of blocked sidewalks by parked e-scooters. Buehler et al. (2023) surveyed 131 e-scooter users at Virginia Tech's Blacksburg campus both before and after the introduction of mandatory parking in corrals in January 2022.

The mandatory parking was perceived as less favorable after implementation mainly due to the location, visibility, and size of the corrals along with taking too much time to use.

The purpose of the survey study is to gain a better understanding of users' different needs, attitudes, and wishes related to the parking of shared e-scooters. The study intends to use the answers to form guidelines for designing parking systems for the mode. Municipalities and other stakeholders can use the guidelines as support to create the right conditions for the service. Additionally, the guidance can aid operators in their continued work to develop an even better service.

2 Methodology

The survey was sent out to users of the shared e-scooter company Voi in Stockholm, Malmö, and Gothenburg on November 17, 2022. All users who had taken at least one trip in each city both before and after September 1, 2022, received the survey through email. The survey covered demographics, usage, attitudes, impact on travel behavior, parking design, and public transportation. A total of 1584 complete responses were received from all cities. We used responses to four key questions, frequency of usage, usage before and after September 1, and city usage, to determine the final sample for our analysis. 965 users from Stockholm, 159 users from Malmö, and 145 users from Gothenburg were included in the final sample that formed the basis of the results. We developed an ordinal regression model for Stockholm to understand the underlying factors behind the attitude and perception of the parking regulation based on both users demographics and opinions related to the design of the parking system. Additionally, we develop a second model to understand the underlying factors of a change in travel behavior after the implementation of the policy.

3 Results

Majorities of users from all three cities were full-time employed, lived within the operating zone, had at least a post-secondary education, and were of male gender. Age and annual income varied slightly between cities. The demography of the users is presented in Table 1. Users in Stockholm had, on average, used 2.7 shared e-scooter operators in the last six months, while users in Gothenburg had used 2.6 and in Malmö 2.2. In Stockholm and Gothenburg, the most common frequency of use was once or several times per week, while in Malmö it was once or several times a month.

Table 1: Demography of e-scooter users

		Stockholm		Gothenburg		Malmö	
		N	%	N	%	N	%
Gender	Man	703	73	104	72	101	64
	Woman	253	26	40	28	57	36
	Other	4	0	0	0	0	0
	Prefer not to say	5	1	1	1	1	1
Age	20 years or younger	24	2	14	10	7	4
	21–29 years	221	23	26	18	39	25
	30–39 years	263	27	36	25	60	38
	40–49 years	244	25	29	20	37	23
	50 years or older	213	22	40	28	16	10
Annual income (SEK)	Under 200 000	53	5	22	15	17	11
	200 000 - 400 000	116	12	29	20	43	27
	401 000 - 600 000	287	30	49	34	50	31
	601 000 - 800 000	218	23	21	14	27	17
	Above 800 000	236	24	16	11	11	7
	Prefer not to say	55	6	8	6	11	7
Education	Primary	21	2	12	8	1	1
	Secondary	168	17	35	24	35	22
	Post-school	151	16	29	20	33	21
	Bachelor's	271	28	39	27	53	33
	Master's	334	35	29	20	30	19
	Doctoral	20	2	1	1	7	4
Occupation	Full-time employed	719	75	100	69	123	77
	Part-time employed	15	2	1	1	8	5
	Student	72	7	25	17	16	10
	Retired	8	1	1	1	1	1
	Self-employed	135	14	13	9	7	4
	Unemployed	7	1	0	0	3	2
	Other	9	1	5	3	1	1
Area	Within OP zone	673	70	109	75	130	82
	Within OP zone (not sthlm)	50	5				
	Outside	220	23	31	21	24	15
	Unknown	22	2	5	3	5	3
N		965		145		159	

Users in Stockholm and Malmö stated that their frequency of usage, walking distance, and travel time for trips with e-scooters had been affected after September 1. However, users in Gothenburg reported that their use was affected after September 1, 2022, to a lesser extent. Users in Stockholm had the most positive attitude towards the parking regulation, 38%, while users in Malmö were the most negatively inclined, 48%, see Figure 1. The users reported that the introduction of the parking regulation has resulted in more order in the urban environment, but that the availability of shared e-scooters and the possibility of parking near the destination has declined. The density and location of the parking zones for e-scooters were the aspects that users in Stockholm and Malmö were most dissatisfied with, while these were the aspects that users in Gothenburg considered the most important.

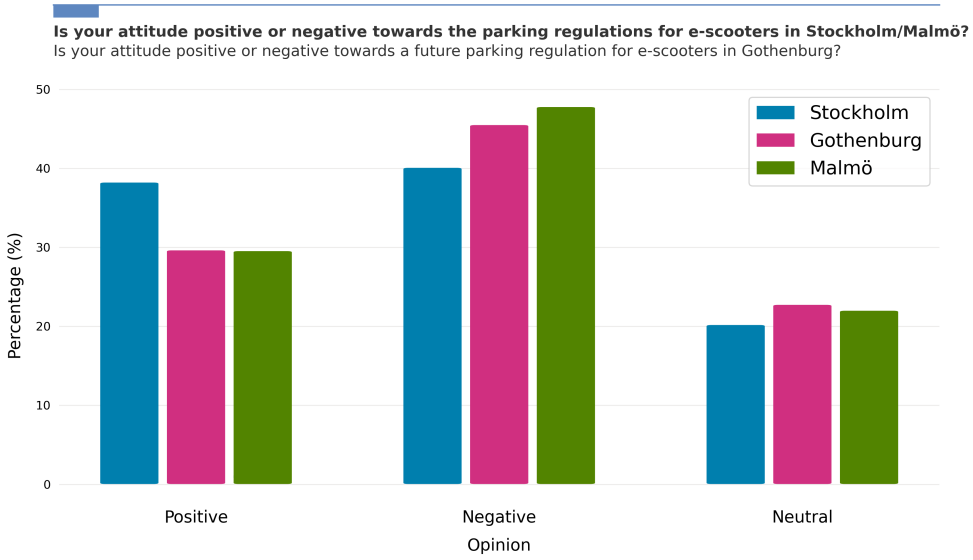

Figure 1: Attitude towards the parking regulation for e-scooters

In addition to density and location, users were also asked about the size, clarity, and simplicity of the parking system and how the operators' app is used to find parking. In general, users in Stockholm were less dissatisfied with the design of the parking system than users in Malmö. This is interpreted to mean that the City of Stockholm has succeeded better with the e-scooter parking system from a user perspective. More than half of the users in all three cities had combined a trip by e-scooter and public transportation. Users in Malmö had done so to the greatest extent but reported to the least extent that it is easy to park by public transport.

Table 2: Parameter Estimates - underlying factors of a positive or negative attitude towards the parking regulation in Stockholm

		N	Estimate	Std. Error	df	Sig.	Lower Bound	Upper Bound
Threshold	[Negative=1,00]	336	-2,873	0,470	1	0,000	-3,794	-1,951
	[Neutral =2,00]	153	-1,583	0,463	1	0,001	-2,490	-0,675
Density	Disagree completely	313	-2,204	0,384	1	0,000	-2,957	-1,450
	Disagree partially	171	-1,542	0,380	1	0,000	-2,287	-0,798
	Agree partially	207	-0,704	0,360	1	0,051	-1,410	0,003
	Agree completely	108	0a		0			
Destination	Disagree completely	194	-2,599	0,442	1	0,000	-3,465	-1,733
	Disagree partially	228	-1,725	0,415	1	0,000	-2,539	-0,912
	Agree partially	268	-1,034	0,378	1	0,006	-1,775	-0,293
	Agree completely	109	0a		0			
Usage freq	Less than monthly	53	0,031	0,390	1	0,937	-0,733	0,796
	Monthly	267	0,594	0,260	1	0,022	0,085	1,104
	Weekly	362	0,499	0,246	1	0,042	0,017	0,981
	Daily	117	0a		0			
Ride time	Shorter	161	-0,387	0,210	1	0,065	-0,798	0,025
	No change	276	0,550	0,200	1	0,006	0,159	0,941
	Longer	362	0a		0			
Walking	No change	109	0,955	0,300	1	0,001	0,368	1,543
	Longer to or from	310	0,287	0,168	1	0,089	-0,043	0,617
	Longer to and from	380	0a		0			
PT	Yes	477	-0,329	0,163	1	0,044	-0,649	-0,010
	No	322	0a		0			

Link function: Logit.

a. This parameter is set to zero because it is redundant.

The ordinal regression model, presented in Table 2, revealed that density and locations of destination parking zones are the main statistically significant contributing factors to a negative perception of the parking regulation in Stockholm. No other design factors are statistically significant. Users who use the service monthly or weekly seem to have a slightly more positive perception compared to the reference category (daily users), as indicated by the positive coefficients that are statistically significant. Users with no change in ride time per trip have a positive effect on perception compared to the reference category (longer ride time), with shorter ride time showing a non-significant trend towards a negative perception. Users who experience no change in walking distance to or from the shared e-scooters are more likely to have a positive attitude toward the policy change. However, having to walk longer to or from the parked vehicle does not have a significant effect on the attitude. Users who had combined public transport and shared e-scooters have a negative coefficient, indicating a less positive perception of the policy compared to those who do not make combined trips. No demographic factors such as age, gender, education, occupation, income, and living area are significantly associated with the perception of the regulation.

Table 3: Parameter Estimates - changed travel behavior in Stockholm

		Estimate	Std. Error	df	Sig.	95% conf.int Lower Bound	95% conf.int Upper Bound
Threshold	[Ride less often=1,00]	-1,837	0,421	1	0,000	-2,661	-1,012
	[No change=2,00]	3,044	0,449	1	0,000	2,165	3,923
Density	Disagree completely	-1,090	0,378	1	0,004	-1,832	-0,349
	Disagree partially	-1,069	0,368	1	0,004	-1,790	-0,348
	Agree partially	-0,072	0,317	1	0,821	-0,693	0,550
	Agree completely	0a		0			
Destination	Disagree completely	-2,870	0,481	1	0,000	-3,813	-1,926
	Disagree partially	-2,061	0,413	1	0,000	-2,871	-1,251
	Agree partially	-1,239	0,349	1	0,000	-1,924	-0,554
	Agree completely	0a		0			
Usage freq	Less than monthly	-0,162	0,408	1	0,691	-0,962	0,638
	Monthly	-1,024	0,292	1	0,000	-1,596	-0,452
	Weekly	-0,610	0,265	1	0,021	-1,129	-0,091
	Daily	0a		0			
Ride time	Shorter	-0,637	0,281	1	0,023	-1,187	-0,087
	No change	0,661	0,226	1	0,004	0,217	1,104
	Longer	0a		0			
Walking	No change	1,361	0,307	1	0,000	0,760	1,962
	Longer to or from	0,248	0,206	1	0,230	-0,157	0,652
	Longer to and from	0a		0			

Link function: Logit.

a. This parameter is set to zero because it is redundant.

The second model, presented in Table 3, reveals, similarly to the first one, that density and locations of parking zones are the main statistically significant contributing factors to decreased e-scooter ridership. Higher usage frequency (up to daily) is associated with riding less often after the policy change, with the exception of the group riding less than once per month which is non-significant. Those with perceived reduced ride time per trip after the parking regulation also ride less often after the implementation, and the positive coefficient for the group that experienced no change suggests no significant difference in riding frequency for this group. The group who perceived no change in walking distance to or from the shared e-scooter has a positive coefficient, implying they might ride more often compared to those who have to walk longer distances after September 1, 2022.

4 Conclusions

In this paper we report on the results of a survey among shared e-scooter users in the Swedish cities of Stockholm, Malmö and Gothenburg, investigating attitudes to shared e-scooter parking restrictions. The typical user in all three cities is a full-time employed man above the age of 30 with a university diploma and living within the e-scooter company operation zone. Users in Stockholm have a more positive attitude towards the parking regulation compared to Malmö, with Malmö providing far fewer parking zones where the scooters could be legally parked. According to our survey results density and location of parking zones for e-scooters are the main contributing factors to both a negative attitude towards the parking regulation and a change in ridership after the policy was enforced, among shared e-scooter users. This should be considered by cities when planning for e-scooter parking to ensure accessibility of the mode and encourage multimodal trips combining shared e-scooters and public transportation.

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