

The difference in motives of rental e-scooter and rental e-bike use in Groningen



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Date: June 2022
Wordcount: 5725
Bachelor Thesis Human Geography and Planning
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Abstract

Since February 2022, a major construction work takes place on the ring road of Groningen, causing a lot of car traffic congestion. Next to the already known e-scooters, rental e-bikes help to ensure mobility in and around the city. This research explores the difference in motives to either take the rental e-bike or e-scooter. A literature review and quantitative analysis will research the main question: *'What are the different motives of inhabitants of Groningen to either use the rental e-bike or e-scooter?'* In this paper price, exercise, speed and owning a driver's license are seen as the most essential factors in transport mode choice. However, future research is needed for validation of the findings, for example by extending the number of respondents and including more factors.

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1. Introduction

Over the past few years the use of e-bikes⁽¹⁾ and e-scooters⁽²⁾ has been growing rapidly in bigger cities around the world. E-scooters and e-bikes are used to replace short trips which were first done by foot and bike, but also bigger trips done by car (D'Andreagiovanni et al., 2022). In Groningen, a middle sized city located in the north of the Netherlands, different brands of e-scooters have been available since 2020 (Sikkema, 2020). A current factor is that from the 11th of February to the 9th of May 2022, a big construction work takes place around the city of Groningen (Groningen Bereikbaar, n.d). 'Het Julianaplein,' an important intersection to enter the city and drive around it, is largely closed off for car traffic. This significantly halts accessibility into the city. To ensure mobility in the city, around 600 e-bikes of the brand 'Bird' are provided in the city and in important P+R locations around the city (Groningen Bereikbaar, n.d). The e-bikes are meant as an alternative to taking the car and are made available in consultation with the municipality of Groningen and the company Bird.

The construction works around the city affects a lot of people working and living in Groningen, not only in the period February to May 2022, but also until the construction works are finished in 2024. Next to the e-bikes and e-scooters, people could also use buses, trains and regular bikes. However, this paper specifically focuses on e-bikes and e-scooters. To understand why people choose to take either an e-bike or e-scooter, the different motives are analysed. Since the literature is limited on this topic, this paper aims to shed light on which type of rental e-transport people prefer and why. Some motives that are further elaborated on and researched in this paper are that taking an e-bike improves physical health (Bikeplus, 2016) and the influence of price on transport mode choice (Grigolon et al., 2012). The motives that this paper will find could be useful for the companies offering the e-transport in the promotion and advertising of either e-bikes or e-scooters, and for the municipality of Groningen in the regulation and traffic policy.

This paper will be comparing the different motives of people using either an e-scooter or e-bike in the city of Groningen by using the following research question:

'What are the different motives of inhabitants of Groningen to either use the rental e-bike or e-scooter?'

This question will be answered in several sections, starting with a theoretical framework based on scientific articles that are relevant to answering the research question. From these articles, a conceptual model and hypothesis will be formed. This research conducts a questionnaire which will first be discussed in the methodology, followed by background information found by the researcher and the results. The thesis will end with a discussion and reflection on the results.

(1) Throughout the whole paper 'shared rental e-bikes' are called 'e-bikes'

(2) Throughout the whole paper 'shared rental e-scooters' are called 'e-scooters'

2. Theoretical Framework

Over the past few years, the use and offer of rental e-bikes and e-scooters has grown rapidly in the big cities over the world (D'Andreagiovanni et al., 2022). The success of these e-scooters and e-bikes can be explained by some of the following advantages; low buying and maintaining costs, ease of driving and parking them, decreased pollution and traffic and a more sustainable transportation mode than private car transport (O'Hern and Estgfaeller., 2020).

2.1 Difference between e-scooters and e-bikes

So far multiple studies about types of rental transport have been done, however. There is little research on the comparison of the e-scooter and e-bike. In Washington, D.C., comparative analysis of the spatiotemporal relation between scooter-share and bike-share usage patters has been conducted. (McKenzie, 2019). The differences and similarities between dockless e-scooters and existing bike-sharing services are explored. An article used in this research states that electric bike-share programs have been demonstrated to attract riders from public transportation, taxis, and metro systems (Campbell et al., 2016). In this research, two urban mobility services have been used; a docked bike-sharing system and a dockless e-scooter sharing system. According to the findings from usage data from both services, there are significant differences between the two services. Individuals travelling to and from work primarily use bike-sharing programs in Washington, D.C., although scooter-share usage is more similar to the usage pattern of normal bikes. Besides commuting, shared scooters support leisure, relaxation, and tourism activities. However, McKenzie (2019) states that little is understood about the impact of e-scooters on the already existing city services. Hence, this thesis aims to fill this gap in the literature.

Ricci (2015) aims to identify and critically assess the available information on bike-sharing to date, concentrating on both the impacts and the implementation and operation processes. While bike-sharing is mostly used for commuting, it also allows riders to engage in other important economic, social, and recreational activities. Ricci (2015) reflects on the rapid growth of bike-sharing services by analysing policy documents and grey literature. This analysis is divided into 3 types of evidence based on users and usage of bike-sharing, the impacts of bike-sharing, and the process of bike-sharing implementation and operation. Improved health, enhanced transportation options and convenience, reduced travel times and expenses, and a better travel experience are just a few of the advantages.

McKenzie (2019) mainly discusses the mobility patterns of shared bikes and e-scooters. In this paper, the two different types of electric vehicle sharing are directly compared. Ricci (2015) also writes about the mobility of shared bikes and also includes the physical advantages of using an (e-)bike.

2.2 Motives

Research by Bikeplus (2016) confirms the impact on improved health by analysing data about a shared e-bike programme all across England. It is concluded that e-bikes can improve health and well-being. The most frequently named motive for people choosing to use the e-bike is that it gives them exercise. Another interesting finding in this research is that e-bikes can reduce car use (Bikeplus, 2016). 46% of the trips replaced by e-bikes were

first done by car. This is an important consideration for the city of Groningen, since the e-bikes, first of all, are placed in Groningen to replace cars.

Another important factor to take into account is the price of transport mode. Grigolon et al. (2012) and Hergesell and Dickinger (2013) show that of the different attributes (travel time, travel costs and convenience) of transport mode choice amongst students, price is the most important attribute. Bachand-Marleau et al. (2012) conducted a survey about shared bike use to determine the factors that influence the shared bike use system and elements that influenced the frequency of use. They found out that the most important factor that influenced the shared bike use system is the proximity of the home to docking stations. An increase in the number of users is likely to result from the addition of more docking stations near the origins of potential users in residential districts.

McKenzie (2019) suggests that people tend to use e-bikes for commuting to their work in contrast to the shared scooters. Another article states that there are different advantages of using a shared bike over other types of transport (Ricci, 2015). One of these benefits is improved health. This research aims to find out what people's motives are to either take the e-scooter or e-bike. Furthermore, article already compares the two different types of rental transport.

2.3 Groningen

Since May 2020 e-scooters have been present in the city of Groningen (Sikkema, 2020). An evaluation by the municipality of Groningen shows that the average age of e-scooters users in Groningen is quite young; 25,5 years (Gemeente Groningen, 2020). This indicates that a big share of the e-scooter users is younger people, something that has to be taken into account here, is that Groningen has a large student population. The city of Groningen has 202747 inhabitants, of which 25% per cent is students and half of the citizens are aged under 35 years old (Hanze, 2021). Additionally, a short questionnaire was included in the evaluation. Here the municipality asked what mode of transport the respondents would use if the e-scooters were not available anymore. The majority (51%) of the respondents said that they would use the bike instead. This research tries to find out if people in Groningen would choose to use the e-bike over the e-scooter or the other way around by taking into account the following motives; price, physical well-being, parking options, commuting and speed. This brings this research to the following Conceptual Model:

2.4 Conceptual Model

Factors influencing transport choice

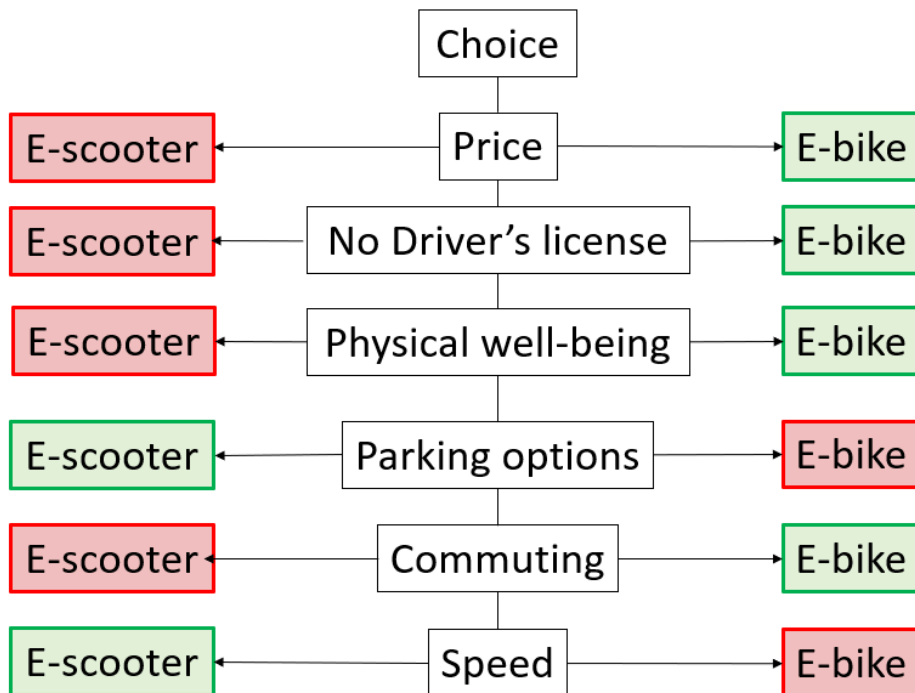


Figure 1: Conceptual model (Created by author, 2022)

The main focus of this research is on the difference in motives to choose either a rental e-bike or a rental e-scooter. In the Conceptual Model (figure 1), the different factors which influence the choice of transport mode are represented. When the colour of the mode of transport is green, it means that, based on the theoretical framework, people would choose that mode of transport above the other.

The motives price, parking options and speed have been researched by using the different modes of transport and analysing the factors. For physical well-being, the e-bike is coloured green, because using an e-bike improves well-being (Bikeplus, 2016).

McKenzie (2019) states that e-bikes are mainly used for commuting, whereas e-scooters mainly for leisure, relaxation, and tourism activities. Since the average age of e-scooter users in Groningen (Gemeente Groningen, 2020) is relatively low, the majority of users are students. Furthermore, the fact that the e-bikes have been placed in Groningen as an alternative way of transport for car traffic (Groningen Bereikbaar, n.d.), the e-bike has been coloured green in the conceptual model according to the motive 'commuting' (figure 3).

2.5 Hypotheses

Since there is not a lot of literature on the comparison of the e-scooter and the e-bike, the hypotheses are more open-ended. Based on the theoretical framework and conceptual model, the following hypotheses have been formulated:

- *What are the different motives of inhabitants of Groningen to either use the rental e-bike or e-scooter?* The main motives to use the e-bike are price, physical well-being and commuting. The main motives to use the e-scooter are parking options and speed.
- People choose to use an e-bike over an e-scooter because the costs of an e-bike are lower (Table 1).
- People without a driver's license would prefer to take the e-bike because they are not allowed to use the e-scooter.
- Improved health is one of the advantages of using an e-bike (Ricci, 2015), as a result people would choose the e-bike over an e-scooter concerning this motive.
- The parking options and accessibility for e-bikes are limited compared to the e-scooters. Therefore, people would prefer to take the e-scooter based on parking location (figure 2).
- The rental e-scooter will be chosen above the rental e-bike looking at speed because the average speed on a rental e-scooter is higher (figure 3).

3. Methodology

3.1 Data collection strategy

The research question is answered with the help of a questionnaire (Appendix 1A) together with an analysis done by using the e-bike and e-scooter in the city of Groningen. The questionnaire is made on the website Qualtrics. In Qualtrics the information from the respondents is stored safely and anonymously. Qualtrics also gives the possibility to distribute the questionnaire via social media, email or make a QR code from the link. The questionnaire is distributed amongst inhabitants of the province of Groningen with an age above 18, as this is the age threshold people need to have to either use a rental e-scooter or a rental e-bike. The questionnaire is distributed via Instagram, Facebook and Whatsapp. A lot of people can be reached by the network of the researcher, via big study Whatsapp groups, family members that live in Groningen and their acquaintances. At the beginning of the questionnaire, a short piece of background information about the research is given.

3.2 Sampling strategy

For finding the respondents a non-probability sample is being used. As it is desirable to have as many respondents as possible for this research, convenience sampling is the best method to use (Burt et al., 2009). The respondents are found by availability. One of the disadvantages of using convenience sampling in this research is the risk of sampling inaccuracy and a lack of population representation.

3.3 Choice of method

A lot of respondents can be reached with a questionnaire to end up with the most significant result. With a questionnaire, a large group of respondents in the target group can be reached in a short period. In the questionnaire general questions regarding age and residence are asked, followed by questions about the preferred type of rental transport and the reason behind this choice.

3.4 Data analysis

Data from the questionnaire is analysed with descriptive statistics and the help of several statistical tests in SPSS. Age and location where the respondents live have been used to find the perfect target group and filter out the non-usable respondents. The dependent variable is the mode of transport, so the e-bike and e-scooter. The independent variable influences the dependent variable. In this case, the independent variables are the motives of transport choice, which affect the preference of taking an e-bike or e-scooter.

The variable 'gender' is used as the control variable because this variable presumably does not differ a lot between the e-bike and e-scooter. Since this research looks into the motives for choosing an e-bike or e-scooter, the variable gender is not of interest. The effect of the control variable is an effect that you want to eliminate. It protects against a biased result by adding it to the model, so it does not bias the other variables included (Burt et al., 2009).

The statistical tests that are used to draw conclusions from the data from the questionnaire are a binary logistic regression and a chi-square test. Before entering the data in SPSS the data is filtered. All respondents younger than 18 are filtered out because they do not

represent the population that is researched since they are not allowed to use either e-scooter or e-bike. Next to that, all respondents that do not live in the city or province of Groningen are filtered out, as the research is about e-scooter and e-bike use in the city of Groningen. After filtering the data, we apply several transformations. The dependent variable (preferred mode of transport) is a binary variable, which is coded into 0 and 1.

The goal of the questionnaire is to answer the main research question: What are the different motives of inhabitants of Groningen to either use the rental e-bike or e-scooter? In total, the questionnaire consists of 10 questions. The most important questions to answer the main research question are: *'Below a few factors which could influence your choice of mode of transport are stated. Please rate how important each factor is to you from 1 to 5 (Where 5 is the most important). With the following motives: price, exercise, parking options/accessibility, speed and not having a driver's license,'* Concerning the question of which mode of transport the respondents prefer. Together with the questions: *'Why would you use the e-scooter?'* And *'Why would you use the e-bike?'*

3.5 Ethical considerations

The questionnaire is filled in anonymously to ensure respondents' privacy. The questionnaire answers are stored in Qualtrics. Within this programme, the researcher is the only one who can access the questionnaire data. While recruiting the respondents no one is forced to participate in the questionnaire, this will be fully voluntary. When the respondents filled in the questionnaire, they are told that the questionnaire is anonymous and confidential. Next to that, the respondents have the right to withdraw from the questionnaire at any time. The respondents have to confirm in the first question that they participate freely and can withdraw at any time. Lastly, the questionnaire results will be deleted after completing the whole research.

4. Results

4.1 E-scooters and e-bikes in Groningen

The first part of this results section consists of research done by the researcher itself by using the e-bike and e-scooter in the city of Groningen and analysing the apps from Bird, Felyx and Check. From the 8th of February to the 15th of May 2022 people can make use of e-bikes from the brand Bird (Groningen Bereikbaar, n.d). According to the policymakers of Groningen, 600 of the e-bikes should stay after this as permanent means of transport. The e-bikes are available in more than 60 places in and around the city. To use the e-bikes the Bird app has to be downloaded first. After registering and adding your payment data, a map is shown with the location of the individual e-bikes. Bikes can be parked at certain spots around the city, like P+R spots, educational locations, the Euroborg, Campus Groningen and locations in the city centre. The costs are normally €0,15 per minute plus a starting rate of €1. The bikes are new in the city, so the start rate is a bit cheaper now; €0,50. After the 15th of May, the starting rate will change back to €1.

On the other hand, since May 2020 e-scooters can be found in the city of Groningen (Sikkema, 2020). Starting with the brand 'GoSharing,' which is currently not present in Groningen anymore. The two companies now operating rental e-scooters in Groningen are 'Felyx' and 'Check.' The costs for Check are €0,25 per minute with a starting rate of €0,50 (Check, n.d). The costs for the Felyx are €0,30 per minute and no starting rate (Felyx, n.d). In the cost overview (table 1) it can be seen that the price of an e-bike ride is significantly cheaper than a ride on an e-scooter, especially when the distance increases.

Cost comparison	Bird	Check	Felyx
Starting rate	€ 0,50	€ 0,50	€ 0,00
Costs per minute	€ 0,15	€ 0,25	€ 0,30
Total for 5 minutes	€ 1,25	€ 1,75	€ 1,50
Total for 10 minutes	€ 2,00	€ 3,00	€ 3,00
Total for 20 minutes	€ 3,50	€ 5,50	€ 6,00

Table 1: Cost overview rental e-transport (Created by author, 2022)

Next to comparing the costs of the different rental e-transports, the parking locations and range can be compared as well. In figure 2 the parking locations of the 3 different companies are displayed. For the Bird e-bikes, the parking locations are very specific, because the only spots the bikes can be parked are in the red dots displayed on the map. On the contrary, the e-scooter can be parked almost everywhere around the city (figure 2). Only in the neighbourhoods further away from the city centre, the parking options are more limited.

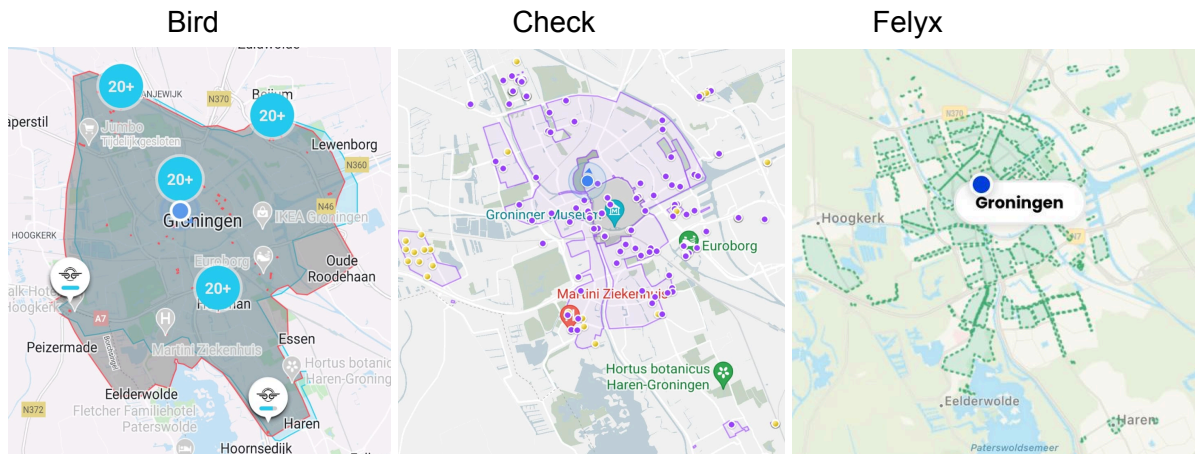


Figure 2: Parking locations of Bird, Check and Felyx (Bird, Check, Felyx app, 2022)

Another thing that is different between the e-scooter and e-bike is the speed limit. By personally trying out both vehicles, it can be concluded that the maximum speed of the Check e-scooter is 32 km/h. The maximum speed of the Bird e-bike is 24 km/h (figure 3). By putting this data in a table, the travel time per distance for e-scooter and e-bike is compared (table 2). From the table, it can be derived that taking the e-scooter is faster than taking the e-bike (Sidenote: the traffic(lights) are not taken into account in this comparison). Although the e-scooter is faster, this can also have its downsides. Research by Ragot-Court et al. (2021) shows that accidents are more likely to happen and be more severe while driving at higher speeds.



Figure 3: Maximum speed of e-scooter and e-bike (Created by the author, 2022)

Length of the trip / type of transport	E-scooter	E-bike
3 kilometers	5,6 minutes	7,5 minutes
5 kilometers	9,4 minutes	12,5 minutes
10 kilometers	18,8 minutes	25,0 minutes

Table 2: Comparison travel time e-scooter and e-bike (Created by the author, 2022)

Lastly, to use the e-scooter a driver's license is required. To use the e-bike the only requirement is an age above 18 years old. For people without a driver's license, this could be an important motive to use the e-bike (Check, n.d.;Felyx, n.d.).

4.2 Questionnaire

In total there are 131 respondents. From the questionnaire can be concluded that 83% of the respondents are students. This is a result of convenience sampling because the researcher itself is also a student. Before doing any statistical tests, the data needs to be filtered. All respondents below 18 years old are filtered out because they are not allowed to use an e-bike or e-scooter yet. Of the 131 respondents, everyone was 18 years or older. All respondents that do not live in the city or province of Groningen are also filtered out because this research is specifically about the e-bikes and e-scooters in the city of Groningen.

Using an e-bike or e-scooter before filling in the questionnaire was no requirement, since it would have been very difficult to find respondents who used the rental e-bike and e-scooter before since the e-bikes have recently been introduced in the city. From the questionnaire, it appears that this indeed would have been very difficult, since only 1 respondent used the e-bike before (Appendix B). In contrast, this would have been easier for the e-scooter, given that more than half of the respondents used an e-scooter before (Appendix B).

A key question to find out the difference in motives between e-scooter and e-bike choices is the preferred mode of transport (figure 4). The option for neither mode of transport was given in the questionnaire but filtered out before doing the analysis.

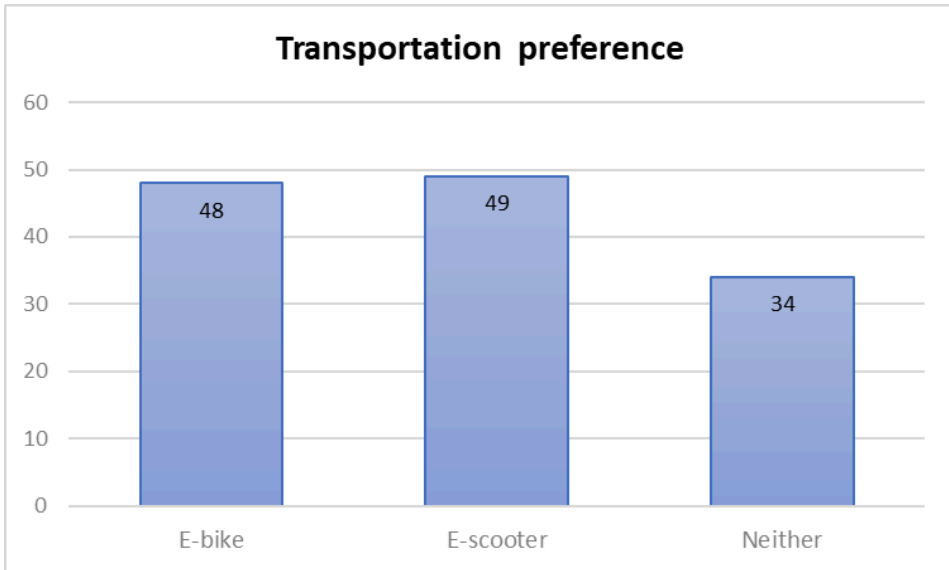


Figure 4: Number of respondents related to transportation preference (Created by author, 2022)

4.1 Transportation choice concerning different motives

One of the most important questions concerning this research was the question where respondents had to rate the different factors/motives that could influence the mode of transport. From the descriptive statistics (figure 5) can be seen that the motives for transport choices differ quite a lot.

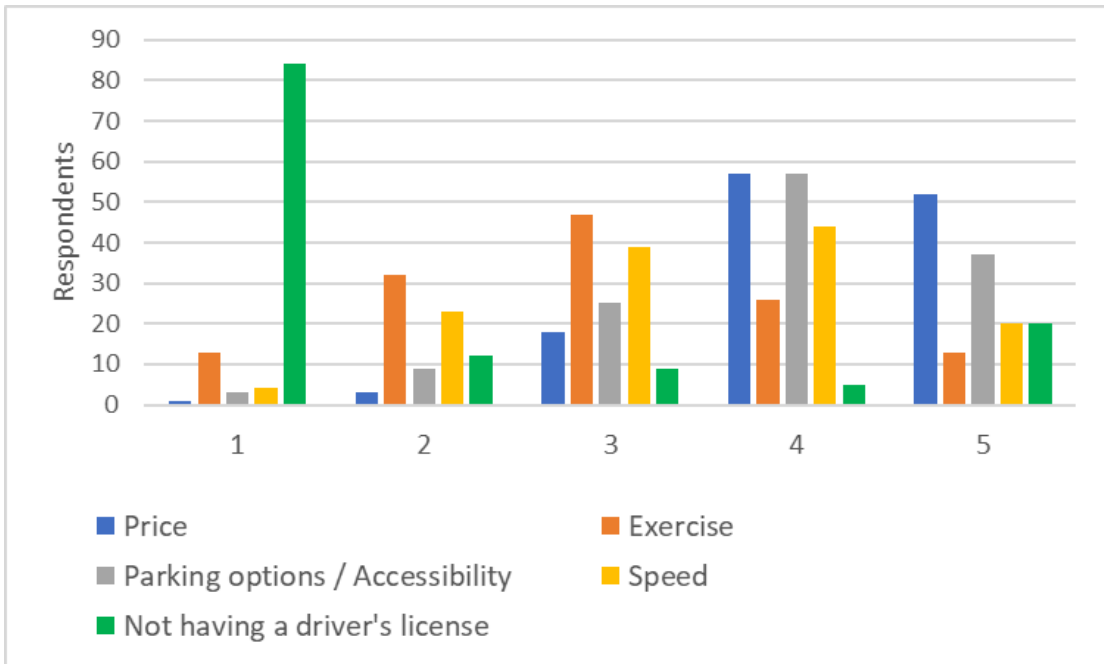


Figure 5: Frequencies of the rating of different motives (Created by Qualtrics, 2022)

In order to find out if the motives of using an e-bike or an e-scooter are different, a binary logistic regression is used. Before performing the test, the dependent binary variable 'mode of transport' is transformed into a dummy variable (table 3). The probability value is set to 5%. The null hypothesis that comes with a binary logistic regression is: 'All regression coefficients are equal to 0.'

		Frequency	Percent
Valid	E-scooter	44	51,8
	E-bike	41	48,2
	Total	85	100
Missing	System	32	
Total		117	

Table 3: Frequencies of the dummy variable (Created by the author, 2022)

After running the test in SPSS, the first thing that needs to be checked is the significance of the whole model. From the Omnibus tests of model coefficients (table 4) can be concluded that the whole model is significant since the p-value is below 5%. Therefore we reject the null hypothesis, so the regression coefficients are not equal to 0.

		Chi-square	df	Significance
Step 1	Step	38,931	8	,000
	Block	38,931	8	,000
	Model	38,931	8	,000

Table 4: Omnibus test of model coefficients (Created by the author, 2022)

After concluding that the whole model is significant ($p = .000$), the separate motives can be analysed. In table 5 all separate motives are displayed together with information about the significance and strength of the relation. The motives, employment status ($p = .005$), price ($p = .004$), exercise ($p = .032$), speed ($p = .013$) and whether or not you have a driver's license ($p = .024$) are significant. Therefore we can say that there is a relationship between preferring an e-scooter or e-bike and the significant motives.

From the constant(B) can be derived whether the relationship is positive or negative. The reference category of the dependent variable is the e-bike since the e-bike is coded as 1 and the e-scooter as 0. All constants are positive, except for the constant of speed($B = -.729$), this one is negative. Meaning that respondents who chose the e-scooter as their preferred mode of transport, rate the factor speed higher than respondents that preferred using an e-bike. The motives, price ($B = 1.274$), exercise ($B = .630$) and whether or not you have a driver's license ($B = .442$) have a positive constant. This indicates that respondents who chose the e-bike as their preferred mode of transport rated these three motives higher than respondents who chose e-scooter as the preferred mode of transport. By looking at the Wald statistic, it can be determined which motives are more important. The highest Wald statistic, in this case the motive price (Wald = 8.245), is the most important motive.

Variable	B	Wald	Significance	Explanatory B
Where do you live?	0,31	0,001	0,981	1,031
What is your gender?	1,102	2,935	0,087	3,011
What is your employment status?	3,602	7,915	0,005	36,665
Factor Price	1,274	8,245	0,004	3,576
Factor Exercise	0,63	4,582	0,032	1,878
Factor Parking options/Accessibility	0,192	0,346	0,556	1,211
Factor Speed	-0,729	6,134	0,013	0,482
Factor Not having a driver's license	0,442	5,126	0,024	1,555

Table 5: Variables in the equation (Created by the author, 2022)

4.2 Usage of e-bike and e-scooter

The last two questionnaire questions asked why people would use the e-scooter or e-bike. Multiple answers could be selected. While looking at the descriptive statistics in figures 6 and 7, it can be noticed that the respondents mostly use the e-scooter and e-bike to go to University or school. This can be a consequence of the high percentage (83%) of students that filled in the questionnaire. From figures 6 and 7 can be concluded that the biggest difference in why to use one of the two modes of transport is between people that would like to use the e-scooter (n= 37) and the e-bike to go to work (n= 57).

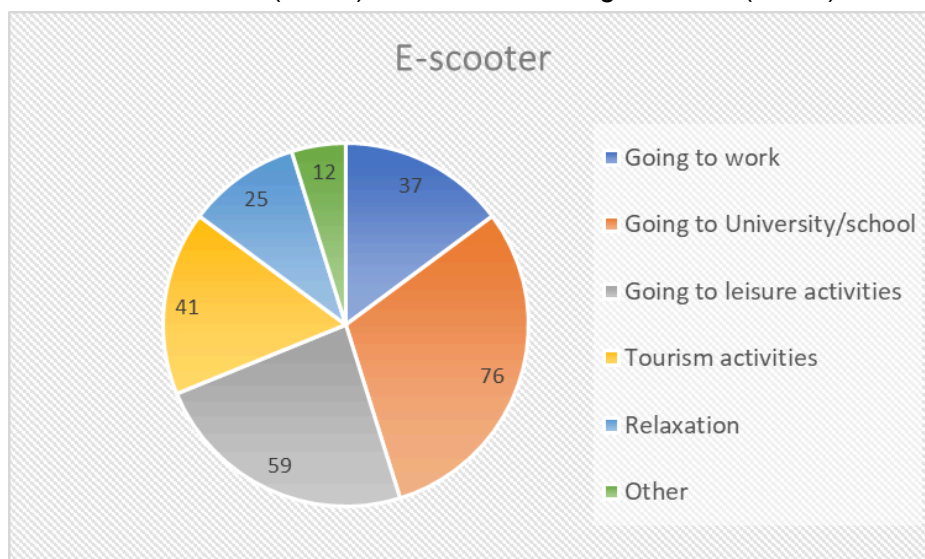


Figure 6: Reasons why people would use the E-scooter (Created by the author, 2022)

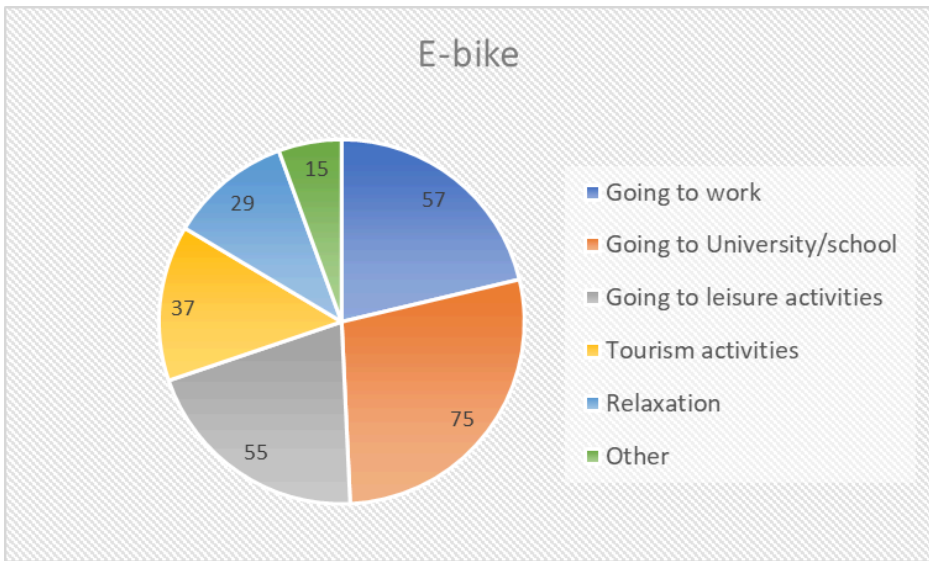


Figure 7: Reasons why people would use the E-bike (Created by the author, 2022)

The data needed to be transformed, before testing if there is a difference in why respondents like to use the e-scooter or e-bike. Since respondents could select multiple answers, the data is separated per answer. The missing values will be recoded into 0, as a result, the variables are binary. When the answer is selected, it is coded as 'yes' and when the variable is not selected it is coded as 'no'. Next to this, the type of variable coding is changed from numeric to string, because as numeric the variables can not be used in a meaningful way in the statistical tests (Burt et al., 2009). The statistical test that is used for this analysis is a chi-square test in combination with the measure of association 'kappa.' The probability value is set to 5%. The null hypothesis that comes with a chi-square test is: 'In the population, there is no relationship between the e-bike and e-scooter per different variable.' The outcomes of the test show that all separate variables are significant (table 6), so the null hypothesis can be rejected. When looking at the Measure of Association 'kappa,' it can be concluded that going to work has the strongest relationship (K = .648), so the difference between using the e-scooter and e-bike for going to work is the biggest.

Use of mode of transport	Significant	Kappa	Strength of relationship
Going to work	Yes	0,648	Strong
Going to University/school	Yes	0,592	Strong
Going to leisure activities	Yes	0,493	Moderate
Tourism activities	Yes	0,565	Strong
Relaxation	Yes	0,47	Moderate

Table 6: Results from the Chi-square test and MoA (Created by the author, 2022)

5. Conclusion and discussion

The aim of this study was to answer the main research question: *'What are the different motives of inhabitants of Groningen to either use the rental e-bike or e-scooter?'*

The findings show that the main motives to use either an e-bike or e-scooter are employment status, price, exercise, speed and whether or not you have a driver's license. The motive price is rated as the most important motive to either choose the e-bike over the e-scooter. This is in line with the research of Grigolon et al. (2012), who state that price is the most important attribute of transport mode choice for students, combined with the fact that 83% of the respondents are students. Using an e-bike improves health (Bikeplus, 2016) and makes people exercise, the e-scooter does not. This fact is confirmed since respondents rated the motive exercise higher for e-bikes than for e-scooters. Furthermore, the quantitative analysis concluded that respondents without a driver's license, prefer to take the e-bike. This is in line with the fact that the e-bike can be used without a driver's license and the e-scooter can not. The only motive to choose an e-scooter over an e-bike is the motive speed. This can be explained by table 2, which shows that the e-scooter is considerably faster than the e-bike. One motive was not significant, is the motive parking options / accessibility. This does not correspond to the hypothesis and the literature by Bachand-Marleau et al. (2012), who stated that the most important factor that influenced the shared bike use system is the proximity of the home to docking stations. This could be explained by the fact that there are a lot of parking areas for the e-bikes and e-scooters in Groningen (figure 2).

Furthermore, the reason why people use either the e-scooter or e-bike is significantly different for all usage options given in the questionnaire. The biggest difference is that people prefer to use the e-bike to go to their work over the e-scooter. Similarly, research by McKenzie (2019) confirms that bike-sharing programs are used more often to travel to and from work than e-scooters. Additionally, this can be linked to the fact that almost half of the trips replaced by e-bikes were first done by car according to Bikeplus (2016). Yet, only a small difference was found in using an e-bike or e-scooter for leisure activities, relaxation and tourism activities.

However, this research has some factors that were not taken into account and could limit the research. For instance, wearing a helmet on an (e-)scooter will become mandatory in the Netherlands from the 1st of July 2022 (Rijksoverheid, 2021). This might lead to more people choosing to take an e-bike over an e-scooter because they do not want to wear a helmet. This policy has not been implemented yet, so this could be something to take into account for future research. Another factor that is not considered in this research is the dangers of using an e-scooter or e-bike. Since the e-scooter drives faster than an e-bike, accidents are more likely to appear (Ragot-Court et al. 2021). The sampling method could have given a distorted picture of the outcome of this research as well. To find respondents for the questionnaire a convenience sampling method has been used. This method reached a lot of people in the researchers' circle, which are mainly students (83%). This does not represent the population of Groningen accurately. To have gained a more reliable result, more respondents from other age categories could have been found.

Moreover, concerning further research, the factors mentioned above should be taken into account. The research could be extended by gathering more respondents, perhaps in the whole country, to make the results more trustworthy. Additionally, in this research, only one respondent used the e-bike before and about half of the respondents used the e-scooter before. To make the results more extensive and reliable, in-depth interviews could be conducted with participants who used the e-bike and e-scooter before. Future research on the same topic could consider looking at other modes of transport like normal bikes, cars, and public transport.

Concerning policy implications, e-scooter and e-bike providers should take the rental price into account, since price emerged as the most important motive of this research. To attract more e-bike users, factors like exercising on an e-bike and being allowed to use an e-bike without a driver's license can be promoted.

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7. Appendix

A Questionnaire questions with answer options

Dear respondent, before filling in this questionnaire, I would like to give you some background information. This research investigates which type of rental e-transport(e-bike or e-scooter) people living in and around the city of Groningen prefer. The e-scooters, Felyx and Check, have been in the city for a few years already. Since the construction works at the ring road of Groningen started this February, the municipality also placed rental e-bikes in and around Groningen, to improve mobility. The price of renting an e-bike is €0.15 per minute and the price of renting an e-scooter is €0.25 - €0.30 per minute. For the e-bike, you don't need to have a driver's license, but for the e-scooter you do. If you haven't used either e-bike or e-scooter, you can still answer this questionnaire. The questionnaire is fully anonymous.

Where do you live?

- City of Groningen
- Province of Groningen
- Somewhere else

What is your age?

Open

What is gender?

- Male
- Female

What is your employment status?

- Student
- Employed
- Unemployed
- Retired
- Other

Have you ever used a rental e-bike before(Bird)?

- Yes
- No

Have you ever used a rental e-scooter before(Felyx, check, GoSharing)?

- Yes
- No

Let's assume if you need transportation daily, which of the two options would you prefer?

- E-scooter
- E-bike
- Neither

What are the factors that are more important to you? Please rate the importance of each factor from 1 to 5

- Price
- Exercise
- Parking options / Accessibility
- Speed
- Drivers license

Why would you use the e-scooter?

- Commuting
- Going to school/university
- Going to leisure activities
- Tourism activities
- Relaxation
- Other

Why would you use the e-bike?

- Commuting
- Going to school/university
- Going to leisure activities
- Tourism activities
- Relaxation
- Other

B Questionnaire results

Default Report

Q2 - Where do you live?

#	Answer	%	Count
1	The city of Groningen	87.20%	109
2	The province of Groningen	6.40%	8
3	Somewhere else	6.40%	8
	Total	100%	125

Q3 - What is your age?

Age	Count
18	7
19	15
20	19

21	27
22	21
23	16
24	5
25	3
26	1
27	1
30	1
33	1
44	1
53	2
54	1
55	2
57	1
59	1
65	1

Q4 - What is your gender?

#	Answer	%	Count
1	Male	40.46%	53
2	Female	59.54%	78
3	Prefer not to say	0.00%	0

	Total	100%	131
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Q5 - What is your employment status?

#	Answer	%	Count
1	Student	83.21%	109
2	Employed	16.03%	21
3	Unemployed	0.76%	1
4	Retired	0.00%	0
5	Different	0.00%	0
	Total	100%	131

Q8 - Have you ever used a rental e-bike from the brand 'Bird' before?

#	Answer	%	Count
1	Yes	0.76%	1
2	No	99.24%	130
	Total	100%	131

Q9 - Have you ever used a rental e-scooter from the brand 'Felyx,' 'Check,' or 'GoSharing' before?

#	Answer	%	Count
1	Yes	55.73%	73
2	No	44.27%	58

	Total	100%	131
--	-------	------	-----

Q10 - Assuming you need transportation daily, which of the two options would you prefer?

#	Answer	%	Count
1	E-bike	36.64%	48
2	E-scooter	37.40%	49
3	Neither	25.95%	34
	Total	100%	131

Q11 - Below a few factors which could influence your choice of mode of transport are stated. Please rate how important each factor is to you from 1 to 5 (Where 5 is the most important).

1	Price	0.76 %	1	2.29 %	3	13.7 4%	1	43.5 8	5	39.6 7	5	1
								1%		9%	2	3
												1
2	Exercise	9.92 %	1	24.4 3%	3	35.8 2	4	19.8 7	2	9.92 6	1	1
			3			8%		5%		%	3	3
												1
3	Parking options / accessibility	2.29 %	3	6.87 %	9	19.0 8%	2	43.5 5	5	28.2 7	3	1
								1%		4%	7	3
												1
4	Speed	3.08 %	4	17.6 9%	2	30.0 3	3	33.8 9	4	15.3 4	2	1
						0%		5%		8%	0	3
												0
5	Not having a driver's license	64.6 2%	8	9.23 %	1	6.92 2	9	3.85 %	5	15.3 8%	2	1
			4			%		%			0	3
												0

Q12 - Why would you use the e-scooter?

#	Answer	%	Count
1	Going to work	14.80%	37

2	Going to university/school	30.40%	76
3	Going to leisure activities	23.60%	59
4	Tourism activities	16.40%	41
5	Relaxation	10.00%	25
6	Other	4.80%	12
	Total		250

Q14 - Why would you use the e-bike?

#	Answer	%	Count
1	Going to work	21.27%	57
2	Going to university/school	27.99%	75
3	Going to leisure activities	20.52%	55
4	Tourism activities	13.81%	37
5	Relaxation	10.82%	29
6	Other	5.60%	15
	Total		268

C SPSS Syntax

```

DATASET ACTIVATE DataSet1.
USE ALL.
COMPUTE filter_$=(Q2 = 1 | Q2 = 2).
VARIABLE LABELS filter_$ 'Q2 = 1 | Q2 = 2 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).

```

```
FILTER BY filter_$.  
EXECUTE.
```

```
RECODE Q10 (1=1) (2=0) (ELSE=SYSMIS) INTO QDummyTransport.  
VARIABLE LABELS QDummyTransport 'Dummy e-bike e-scooter'.  
EXECUTE.
```

```
LOGISTIC REGRESSION VARIABLES QDummyTransport  
/METHOD=ENTER Q2 Q4 Q5 Q11_1 Q11_2 Q11_3 Q11_4 Q11_5  
/CRITERIA=PIN(.05) POUT(.10) ITERATE(20) CUT(.5).
```

```
DATASET ACTIVATE DataSet1.  
RECODE Q12_1 (SYSMIS=0) INTO GoingToWorkEscooter.  
VARIABLE LABELS WorkEscooter 'Going to work escooter'.  
EXECUTE.
```

```
RECODE Q14_1 (SYSMIS=0) INTO GoingToWorkEbike.  
VARIABLE LABELS WorkEbike 'going to work ebike'.  
EXECUTE.
```

```
RECODE Q12_2 (SYSMIS=0) INTO GoingToUniversityEscooter.  
VARIABLE LABELS UniversityEscooter 'going to university escooter'.  
EXECUTE.
```

```
RECODE Q14_2 (SYSMIS=0) INTO GoingToUniversityEbike.  
VARIABLE LABELS UniversityEbike 'going to university ebike'.  
EXECUTE.
```

```
RECODE Q12_3 (SYSMIS=0) INTO LeisureActivitiesEscooter.  
VARIABLE LABELS LeisureActivitiesEscooter 'Going to leisure activities escooter'.  
EXECUTE.
```

```
RECODE Q14_3 (SYSMIS=0) INTO LeisureActivitiesEbike.  
VARIABLE LABELS LeisureActivitiesEbike 'Going to leisure activities ebike'.  
EXECUTE.
```

```
RECODE Q12_4 (SYSMIS=0) INTO TourismActivitiesEscooter.  
VARIABLE LABELS TourismActivitiesEscooter 'going to tourism activities escooter'.  
EXECUTE.
```

```
RECODE Q14_4 (SYSMIS=0) INTO TourismActivitiesEbike.  
VARIABLE LABELS TourismActivitiesEbike 'going to tourism activities ebike'.  
EXECUTE.
```

```
RECODE Q12_5 (SYSMIS=0) INTO RelaxationEscooter.  
VARIABLE LABELS RelaxationEscooter 'Relaxation escooter'.  
EXECUTE.
```



```
RECODE Q14_5 (SYSMIS=0) INTO RelaxationEbike.  
VARIABLE LABELS RelaxationEbike 'Relaxation ebike'.  
EXECUTE.
```

```
RECODE Q12_6 (SYSMIS=0) INTO OtherEscooter.  
VARIABLE LABELS OtherEscooter 'other escooter'.  
EXECUTE.
```

```
RECODE Q14_6 (SYSMIS=0) INTO OtherEbike.  
VARIABLE LABELS OtherEbike 'other ebike'.  
EXECUTE.
```

```
.  
CROSSTABS  
  /TABLES=LeisureActivitiesEscooter BY LeisureActivitiesEbike  
  /FORMAT=AVALUE TABLES  
  /STATISTICS=CHISQ PHI KAPPA  
  /CELLS=COUNT  
  /COUNT ROUND CELL.
```

```
CROSSTABS  
  /TABLES=GoingToWorkEscooter BY GoingToWorkEbike  
  /FORMAT=AVALUE TABLES  
  /STATISTICS=CHISQ PHI KAPPA  
  /CELLS=COUNT  
  /COUNT ROUND CELL.
```

```
CROSSTABS  
  /TABLES=GoingToUniversityEscooter BY GoingToUniversityEbike  
  /FORMAT=AVALUE TABLES  
  /STATISTICS=CHISQ PHI KAPPA  
  /CELLS=COUNT  
  /COUNT ROUND CELL.
```

```
CROSSTABS  
  /TABLES=TourismActivitiesEscooter BY TourismActivitiesEbike  
  /FORMAT=AVALUE TABLES  
  /STATISTICS=CHISQ PHI KAPPA  
  /CELLS=COUNT  
  /COUNT ROUND CELL.
```

```
CROSSTABS  
  /TABLES=RelaxationEscooter BY RelaxationEbike  
  /FORMAT=AVALUE TABLES  
  /STATISTICS=CHISQ PHI KAPPA  
  /CELLS=COUNT  
  /COUNT ROUND CELL.
```