The behaviour regarding priority on a bicycle boulevard

A study focussing on the interaction from cyclists to cars on bicycle boulevards

H.L.E.Vincken

Photo retrieved from the NOS (NOS, 2018)

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Transport & Planning Bachelor Thesis

By

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Preface

In this report, a research is performed on the safety of cyclists on a bicycle boulevard. This is a thesis as part of the Bachelor of science for Civil Engineering at the TU Delft. The study is commissioned by the Transport and Planning department. The report is written within the months of April and June of the year 2021.

For the realisation of this report, I would like to express my gratitude to the supervisors, Yufei Yuan and Jisup Shim, for their guidance during this project. Furthermore, I would like to thank my peers, Bodhi Vermeulen, Erik Smit, Evelien Knopper, Lisa Scholtens and Schelto Blanken for their weekly feedback on my report. I also wish to thank Olmo van der Mast for his assistance with the performance of the statistical tests.

Hidde Vincken

Delft, June 2021

Summary

A bicycle boulevard is a street where cyclists have priority over motorised vehicles. However, little research has been done in this relatively new upcoming concept. This report examines if there is a relation between the presence of cars on the one hand, and the experience of safety and the behaviour towards the priority rules on the other hand on these bicycle boulevards.

The design of a bicycle boulevard can be generalised into three different categories based on the pavement: bicycle boulevards covered with asphalt, brick or a mixture of these two. Furthermore, existing literature has stated that the rating of experience of bicycle boulevards is almost certainly dependent on the width of the street (CROW-Fietsberaad, 2019). The pavement and width are thus taken into account for the investigation as independent variables.

Other influential factors can be split in two categories: the internal factors and external factors. The internal factors can influence the investigation because of the differences between individuals or groups of people. The external factors are based on the distinction of situations. The following factors are taken into account in this investigation:

- Internal factors: Age, gender and the possession of a driver's licence
- External factors: Intensity of cars, pavement and width of the street

The investigation is based on a survey with 104 respondents. The respondents are asked to determine the rating of physical safety of bicycle boulevards with different pavements and different intensities and they could give reasons why they filled in certain ratings. After this, the respondent is asked what she/he will do in two situations on a bicycle boulevard with respect to the car to gain knowledge on the behaviour of the user.

For a relation between the dependent variable, rating of safety, and the independent variable, intensity of cars, a one way ANOVA test is performed. The relation between the behaviour and the rating of safety is tested with a t-test with the assumption that the observed data is normally distributed. The remaining factors are verified by a multiple linear regression analysis.

In this report a relation is found between the intensity of cars and the rating of safety of a certain street according to the significance tests. If the intensity of the cars increases on bicycle boulevards, people judge the street as less safe. Considering the behaviour towards the priority rules, this report considers two cases. It appears that there is a significant difference in the situation where one cyclist is approached by a car and the average rating of safety that is given. The individuals that stay in the middle, rate a bicycle boulevard significantly more unsafe, than people that go to the side.

There is a significant relation between the width of the street and the rating of safety. A street is given a higher rating of safety when the street is considered wide. The pavement of the street has no significant impact on the rating of safety of a bicycle boulevard. This holds for the internal factors as well.

Finally, it can be concluded that the presence of cars on a bicycle boulevard has a negative influence on the rating of safety. Furthermore, the priority for cyclists on bicycle boulevards has a negative effect on the rating of safety when cars are present. It is therefore recommended that the design of bicycle boulevards stimulates cars to overtake cyclists, so the moment of conflict is reduced. This can be done by a wide street design, which improves the feeling of physical safety as well.

Contents

1. Introduction

A bicycle boulevard is a street where cyclists are meant to be prioritised over motor vehicles. Though the bicycle boulevard has no juridical status, the car on these streets is seen as a 'guest', due to the fact that bicycle boulevards are only applied when the car intensity on the street is low (Godefrooij & Hulshof, 2017). Because this is in favour of the cyclists, bicycle boulevards are frequently applied in the Netherlands to achieve more safety and comfort. The question however remains how physically safe the cyclists on these boulevards feel with respect to the car. Furthermore, it is unclear if cyclists behave themselves according to the intended priority rules on these streets. In this investigation the safety of cyclists is determined by analysing the experience of the cyclists and physical behaviour in these bicycle boulevards, especially with the presence of the car. The research question is thus:

How does the presence of the car affect the cyclist's experience of safety and behaviour towards the priority rules on a bicycle boulevard?

The research question of this investigation is answered by formulating sub questions. This report has answered the following sub questions:

1. *What are the different forms of a bicycle boulevard and what rules are applied?*
   Understanding the different designs of bicycle boulevards clarifies what distinguishes them from 'normal' streets. Apart from that, it is important to gain knowledge on the rules that are applied in these streets to monitor whether the rules are followed.
2. *How do cyclists experience the safety of bicycle boulevards with respect to the car?*
   The feeling of safety for cyclists can be influenced by many factors. The car has a significant role in the experience of the cyclist. It is important to retrieve the opinion of the cyclist with respect to the car and to take other influencing factors into account in the research.
3. *How does the experience of safety affect the behaviour towards priority rules of cyclists?*
   The feeling of physical safety of a cyclist can influence the behaviour of a cyclist in several ways. In some ways, the change in behaviour can result in confusing or more dangerous situations for cyclists. It is therefore key to gain knowledge on the possibility that cyclists could be influenced in their behaviour to that extent that it results in misinterpreting their priority on a bicycle boulevard.
4. *How does the intensity of cars on a bicycle boulevard influence the behaviour of cyclists?*
   The intensity of cars on bicycle boulevards can differ a lot, depending on the location and time. These different intensities create different circumstances for the cyclists on bicycle boulevards. Thus, research should be done on the relation between the intensity of cars and the response of cyclists to these different intensities.

These sub questions are answered in this report by a theoretical investigation on the bicycle boulevard and by an analysis of the data of a survey that asked respondents for their ratings of safety on bicycle boulevards and for their behaviour with respect to the car. This analysis will be done by means of statistical tests.

1.1. Motivation

The importance of the safety of cycling traffic has grown over the years. A recent news article stated that the number of fatal accidents for cyclists in 2020 has an increase with respect to 2019 (NOS Nieuws, 2021). One of the reasons for this increase is that people have made use of the bike more often in the period of the Covid-19 pandemic. But when observing the data of the CBS from the years before (figure 1), these show a similar pattern of rising fatal accidents (Het Centraal Bureau voor de Statistiek, 2021). This can be attributed to the use of e-bikes, of which the fatality rate has grown over the years, see also figure 1. This is in line with the fact that in 2019 18% of all cycling trips were done with the e-bike, compared to 8% in 2013 (Meer, 2020). The increase in the use of different kinds of bicycles demands bicycle infrastructure that has sufficient capacity for these cyclists.

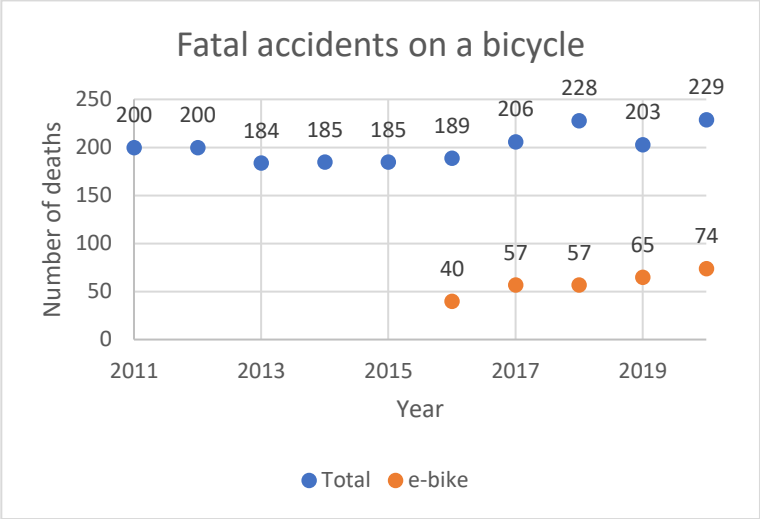

Figure 1: The number of fatal accidents on a bicycle of the past decade. Since 2015 there has been an increase in deaths every year with exception of 2019. The contribution of e-bikes has grown since the start of the measurements. (Het Centraal Bureau voor de Statistiek, 2021)

The bicycle boulevard can offer these high capacities due to the fact that cyclists can make use of the whole width of the street. However, cars are allowed on these streets, which might confuse the road users on the priority rules. These unclarities can cause dangerous situations, for the cyclists in particular, and can eventually result in a change in behaviour on these streets. Therefore, this report has investigated a possible relation between the experiences and the behaviour on these boulevards from the perspective of the cyclist.

1.2. Stakeholders

The most important stakeholders that are involved in bicycle boulevards are listed below with their interest and the amount of influence they have on the decisions that are made considering bicycle boulevards:

1. Cyclists: the cyclists have two main preferences considering the use of the bicycle boulevards: a safe and comfortable street to pass. The purpose of the bicycle boulevard is to attract cyclists to these streets and these two aspects mainly determine whether cyclists make use of the street or need to avoid it. The influence of the cyclist on the decisions that are made about bicycle boulevards is however relatively low. Cyclists can be approached for their opinions, but they barely have the influence to decide on any specifications of these streets.
2. Drivers: the drivers on the bicycle boulevard mainly want a fast connection with distributor roads with as little disturbance as possible. The driver also benefits from a comfortable road on which they can drive smoothly. Furthermore, the driver tends to overtake when encountering disturbances, for example cyclists. As for the cyclists, the influence of the driver is relatively low.
3. Municipality: the municipality has the interest of keeping the city/village safe and comfortable. A safe environment can only be created when streets are designed in such a way that people feel about it that way. The municipality tries to achieve this by generally prioritising the bicycle

over the car. Another important interest for the municipality is a flow capacity that is sufficient enough for all modes of transport. The influence of the municipality is relatively high, because it can decide on the locations and design of bicycle boulevards throughout the city.

4. Ministry of Infrastructure: the Ministry of Infrastructure has an interest in the bicycle boulevards in a sense that the number of (fatal) accidents stays as low as possible. This means that this ministry also has an interest in the safe design of these streets and they try to improve these streets by creating reports that analyse the safety of bicycle boulevards. This results in the fact that this the ministry also has a lot of influence when it comes to the bicycle boulevard. Not only because they decide on the expenses, but also because many municipalities base their designs on the investigations performed by the ministry.
5. Province: the province wants the infrastructure of the municipalities to connect with the provincial roads and cycling paths. Therefore, the province also has interest in a good connection for all transport modes. The influence of the province is however not that high compared to the municipality. The province creates structural plans for the destinations of roads and the municipality should take these into account when creating plans for the urban area.

Table 1 below gives a short overview of the different stakeholders with their interest and influence.

Table 1: The stakeholders and their interest and influence.

Stakeholder	Interest	Influence
Cyclists	Safe and comfortable environment to travel	Low
Drivers	Fast connection with as little disturbance as possible	Low
Municipality	Safe streets with high flow capacity	High
Ministry of Infrastructure	Low (fatal) accidents	High
Province	Fast connection for all modes of transport	Medium

1.3. Structure

In chapter 2, some theoretical background on the bicycle boulevard is given. Chapter 3 describes the approach of the research and the role of the survey. In chapter 4, the results are given based on the survey and an analysis of the data is performed. Chapter 5 discusses the results of the survey and analysis. In chapter 6, a conclusion is given based on the data and analysis. After this, a recommendation is given on possible studies that will follow.

2. Theoretical background

The bicycle boulevard found its origin in Germany in 1980 in Bremen. It arose in a time when a lot of residential zones were being created. Traffic engineers were looking for ways to create efficient, yet attractive, safe and clear cycling routes, so the bicycle boulevard was introduced. The idea of the bicycle boulevard has spread to different countries and mainly in the Netherlands these streets form an important part of the bicycle infrastructure inside and outside the urban area (CROW Fietsberaad, 2005).

A bicycle boulevard can be defined as a street combining a main bicycle route for cyclists and an access road for car traffic. The speed limit on these streets is 30 km/h. An important note on these types of streets is that the car is subordinate to the bicycle. The main advantage of applying a bicycle boulevard is the efficiency of the use of space in a street. (Boggelen, 2019).

The bicycle boulevard does not have a juridical status in the Netherlands. This means that the normal traffic rules apply on these types of streets. Since the normal rules apply, cars are allowed to overtake cyclists if the situation is safe enough. At the same time, the law states that in the case of an accident between a motorised vehicle and a non-motorised vehicle, the driver of the motorised vehicle is liable for the damage that has been done, unless force majeure can be proven (Juridisch Bureau Letselschade & Gezondheidsrecht, n.d.). In this way, cyclists are better protected.

Furthermore, the street should be designed in such a way that it is clear to see that the users are on a bicycle boulevard, while signs indicate that the car is a 'guest'. The design together with the character of the bicycle boulevard make sure that cyclists have priority on bicycle boulevards and the car should comply with this.

The bicycle boulevard should be designed in such a way that it complies with the five demands for cycling infrastructure: consistency, directness, safety, comfort and attractiveness (CROW-Fietsberaad, 2016). Besides these requirements, every street should visualise clearly what is to be expected of the street users in terms of speed limits and overtaking. Because every street has other circumstances that need to be taken into account, the bicycle boulevards do not have one specific design, but rather a few guidelines. These guidelines are listed below (Boggelen, 2019).

1. The width of the street corresponds to the car and bicycle intensities
2. Traffic signs indicate the oncoming bicycle boulevard
3. The street should be covered with preferably red asphalt
4. The lane has several features that can be and are frequently added to the layout:
    a. Strips (of other pavement) to the side of the street (rabatstroken)
    b. Strip (of other pavement) in the middle of the street (middenstrook)
    c. Driving lane preferably covered with asphalt
5. The lane has several features that can be added to the layout, but are mostly prevented:
    a. Speed bumps that decrease the speed and comfort of cars (and cyclists)
    b. Road surface markings in longitudinal direction
6. Use of light poles, trees or other vertical elements improve the ambiance

From this list of guidelines, the first three are strongly advised to be applied; the others can be solutions for the design of a specific street. Because of these non-binding guidelines, the designs of bicycle boulevards can differ a lot. Figure 2 shows the variables of a bicycle boulevard with the corresponding numbers from the guidelines.

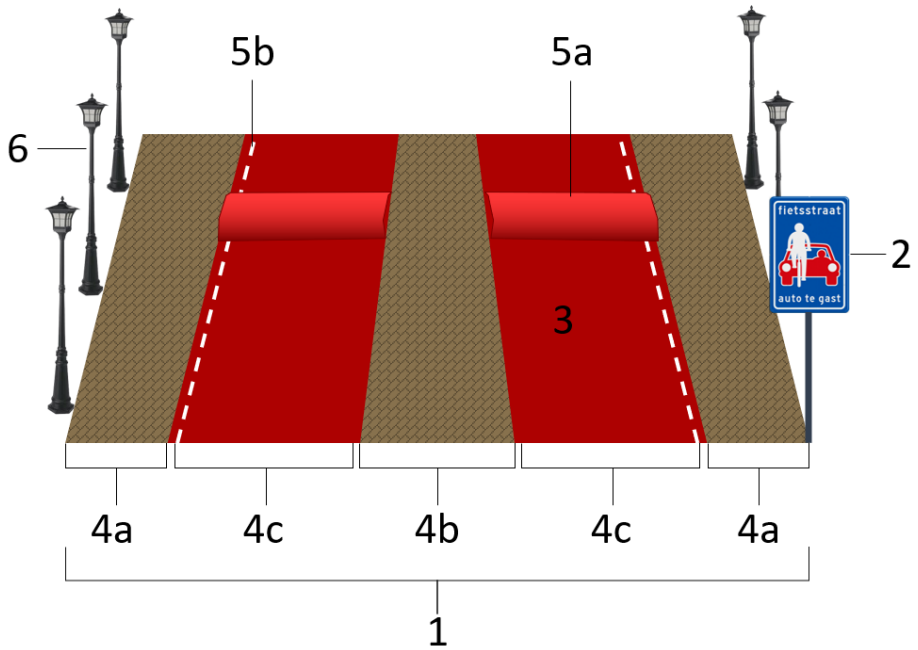

Figure 2: Design options of the bicycle boulevard

The three figures below show some of the different design guidelines in practice.

Figure 4: A bicycle boulevard with a strip of different pavement in the middle of the street and a wide design corresponding with the high intensity of cyclists (and cars) (NOS, 2018)

Figure 3: A bicycle boulevard designed almost as a cycling path, due to the low intensities the street can be more narrow. Also the sign indicates the bicycle boulevard (Wikipedia, 2016)

Figure 5: A bicycle boulevard with a strip of different pavement to the side of the street, to force cyclists more to the center of the street to maintain their priority (Provincie Gelderland, n.d.)

All bicycle boulevards feature the red pavement and the signs indicating that people enter a bicycle boulevard. Despite these similarities, these examples show clear differences as well. These can for example be observed in the width, pavement, road surface markings and the use of vertical elements in the streets.

The layout of a bicycle boulevard is thus adjusted by the municipality to meet the requirements for each street. The designs can however be generalised into three different categories based on the pavement: bicycle boulevards covered with asphalt, brick or a mixture of these two. These three types of pavement are taken into account in the research.

Research of CROW Fietsberaad has stated that the rating of experience of bicycle boulevards is almost certainly dependent on the width of the street, while other factors of the design have no verifiable impact (CROW-Fietsberaad, 2019). Furthermore, the intensities of cars are another important factor for the granting of this rating (Boggelen, 2019). However, the investigation in this report has focused on the level of physical safety on these bicycle boulevards. Nonetheless, the factors width of the street and intensity of cars are taken into account for this investigation, because it is assumed that there is a relation between the level of experience and the level of physical safety.

3. Methodology

In this chapter the methods will be discussed, that are applied for this investigation. Firstly, a description of the investigation divided into a few phases is given. After that, the possible influential factors for the investigation will be discussed. Lastly, the structure of the survey is given with the method of quantification and analysis.

3.1. Phases

The investigation is performed in three different phases to create a complete overview on the research topic. The phases all contribute to the answering of the main and sub-questions.

In the first phase, a theoretical investigation on the different forms of the bicycle boulevard has been done. This has been done by observing different designs of bicycle boulevards and generalising these into a few different categories. The knowledge has been introduced in the theoretical background, so for the remaining part of the methodology, there is sufficient information regarding the different forms of bicycle boulevards.

The second phase, also the main part of the approach, consisted of the writing of the survey and the sharing of this survey. The survey had a few questions regarding the bicycle boulevard that are discussed in the methodology. Because it took time for the survey to receive enough answers, this was shared on the 13th and closed on the 26th of May. The survey was aiming for at least 100 respondents, because the margin of error in the survey would be around 10%, which is reasonable for the scope of this investigation (Graglia, n.d.).

In the third phase, the data of the survey has been collected and analysed. This has been done within approximately two weeks after the release of the survey, so there was enough time to find respondents. The collected data has been quantified and analysed. The method for this is discussed in the Survey design and data analysis. The quantified data has been implemented in the Results and then a conclusion has been written on the two data sets.

3.2. Influential factors

The answers that are given in the survey are influenced by many factors. These influential factors need to be listed to determine how the research should be conducted in order to prevent other factors from interfering the results. The factors that can have influence on the outcome of the investigation are divided in two parts: the internal and external factors.

3.2.1. Internal factors

The internal factors are described as the factors that distinguish each respondent or participant in the investigation. The differences of people can influence the outcomes of the research, because each individual can assess and handle a situation differently. However, these factors can be generalised by dividing the group into different categories. Table 2 gives an overview of these general categories.

Table 2: Internal factors

Category	Explanation
Age	The age (group) of the respondent is an influence factor that can determine how someone responds to a situation, due to their response time and experience in traffic. It is therefore important to know the age of the respondent.
Gender	There is a possible relation between the responses and the gender of each individual. This may also influence the physical behaviour on a bicycle, which is why it is important to ask someone to specify their gender.
Driver's licence	The possession of a driver's license can change the responses as well, because the cyclist also has experience as a car driver.
Mood	The mood of the respondent can be of influence on the results of the survey. However, it is infeasible to find out the mood, because mainly this is not a factor on which the respondent is self-aware of.
Experience with accidents	The respondents might have another idea on the physical safety when he/she has experienced an accident as a cyclist. There could be an underlying traumatic experience that can have influence on the outcome. However, asking people for these experiences can be personal and generate negative emotions, which would not be beneficial for the outcome.

3.2.2. External factors

Apart from the individual differences, the answers can differ based on external factors. these are prevented by creating circumstances that are identical, except for the to-be-investigated variables. Most of the external factors needed to be avoided, because these can influence the opinion of the respondents or change the behaviour of the cyclists. The table below mentions the external factors in this research.

Table 3: External factors

Category	Explanation
Weather conditions	The weather conditions can have influence on the opinion of the safety of a street, because weather conditions change the visibility and capabilities of a cyclist. The objective is therefore to investigate with similar weather circumstances for the survey.
Day or night	The time of the day influences the feeling of safety as well. People experience streets differently during the day, than in the night, due to the change in visibility. Therefore, the photos of bicycle boulevards should approximately be equally bright and preferably taken at daytime.
Angle of the photo	The angle of the photo can influence the estimations of the size of the streets. Thus, this has an effect on the safety judgement of the situation. The photos should be taken from one side of the street and from approximately the same height.
Intensity of cyclists	The intensity of cyclists can have influence on the experience of physical safety. Research has proven that cyclists feel safer in an environment surrounded with more cyclists, thus a positive influence on the experience (Boggelen, 2019). However, the intensity of cyclists goes beyond the scope of this investigation, which is about the

	interaction between cars and cyclists. The presence of cyclists will thus be prevented as much as possible.
Intensity of cars	In the research question, it is specified that the objective is to determine whether the car has influence on the cyclist's experience of safety and the behaviour towards the priority rules. In this case it is important as well to distinguish several situations with different intensities of the car on both sides of the street, to retrieve a complete picture on the safety judgement.
Pavements	The type of pavement can influence the cyclist's experience of physical safety on a bicycle boulevard. In general, the pavement can be asphalt, brick or a combination of these two. Brick might slow the car down, while asphalt provides a more comfortable ride for cyclists. For the mix of these two factors, the location of the brick pavement can be of influence on the experience as well. Because the bicycle boulevard does not have a specific type of pavement, this is an important influential factor that needs to be taken into account.
Width	The width of the bicycle boulevard can have influence on the experience of safety as well. Studies confirm that there is a relation between the width of the street and the functioning of the bicycle boulevard (Boggelen, 2019). Because the bicycle boulevards have various widths, this factor should also be taken into account.
Speed bumps	The speed bump is designed to slow traffic down and can thus have an effect on the experience of physical safety of cyclists. These are however not necessary parts in the design of bicycle boulevards and are not frequently used, so this investigation has not focused on speed bumps.
Connection with the intersection	For the connections with intersections, there are no general rules on how the intersection should be implemented in the design. It is therefore important that the intersections cannot have influence on the respondents' estimation of safety. For this reason, intersections were not shown in the pictures of the survey.
Traffic signs	The presence of traffic signs can influence the opinions of cyclists as well. Traffic signs force cars and cyclists to slow down, which has an impact on the experience between cyclists and cars. Nevertheless, traffic signs are rarely placed on bicycle boulevards, because the intensities (of cars) are too low in general.

3.2.3. Processing the influential factors

For the internal factors, the mood and experience with accidents were not tested in the form of the survey, because it is hard to determine the mood of the respondents and the experience with accidents can cause negative associations. The other factors were tested by asking the respondents for their age, gender and whether they are in possession of a driver's licence.

There are a lot of external factors that go beyond the scope of this investigation. This investigation has focused on the intensity of cars, the pavement and width of streets, because these factors help answering the research questions. The other factors were not taken into account, thus every picture has as much as possible the same weather conditions, lighting, angle, little to no intensity of cyclists, no speed bumps and connections with the intersections were not visible, nor were traffic signs.

Figure 6 below gives an overview of the influential factors and the research approach corresponding with each category. Furthermore the categories that were tested are circumscribed. These factors were implemented in the survey.

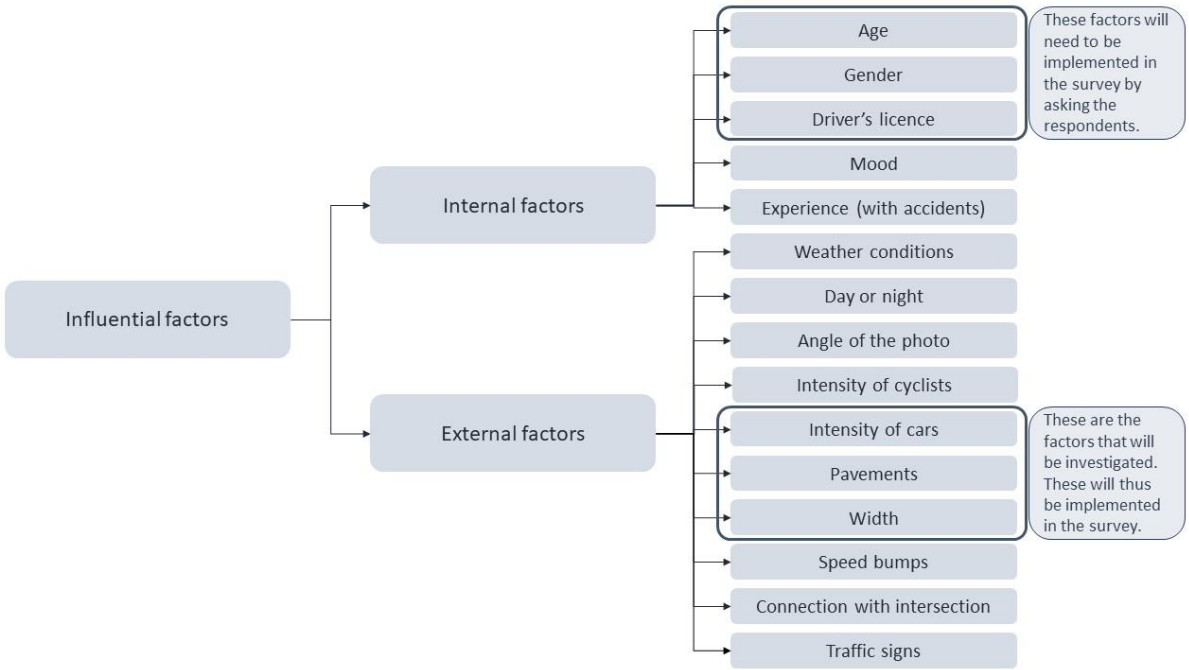

Figure 6: Overview of the influential factors

3.3. Survey design and data analysis

For the survey design and data analysis, the questions of the survey are given together with the answer options of each question. An explanation of the survey is given in the Quantification of the survey with an explanation on how the answers are visualised. After the quantification, the method of analysation for the dataset is explained.

3.3.1. Survey

The survey contained questions that took respondents 10 minutes in total to answer. The respective questions are listed in Table 4 below and the answer options are given in the column next to this. The full survey can be found in Appendix E. The real questions were also formulated in Dutch, so respondents could choose their preferred language.

Table 4: Questions of the survey

Question	Answer options
Title: bicycle boulevard	Introduction
1. What is your age?	[Optional]: Fill in the number of years
2. What is your gender?	[Optional]: - Female - Male - Something else, namely: … - Prefer not to say

3. Are you in possession of a driver's licence	[Optional]: - Yes - No - Prefer not to say
Short explanation	Explanation on the functions and rules of a bicycle boulevard
From a rating 1 to 10, how safe would you describe the following bicycle boulevard as a cyclist? [show pictures of bicycle boulevards with different intensities in a random order, see figures in Appendix A] Give a description for each figure of the used pavement and the number of cars (zero, one or two), to highlight the differences.	Answer: 1=very unsafe to 10=very safe Give the possibility to choose from a specific list of options on why the respondent thinks the street is (un)safe [optional]
A car is approaching you as a cyclist from behind on a bicycle boulevard, what do you do? [show picture for clarification]	Answer options: - I go to the side of the street as far as I can to let the car pass. - I keep cycling as I do, because I am on a bicycle boulevard. - Something else, namely: …
A car is approaching you and your friend as a cyclist from behind on a bicycle boulevard, what do you do? [show picture for clarification]	Answer options: - We go cycle behind each other to let the car pass - We keep cycling as we do, because we are on a bicycle boulevard - Something else, namely: …

The survey is performed on Google forms and has been spread via social media (WhatsApp and LinkedIn). In this format, the questions were supported with the figures given per question. For the rating questions, these were set from 1 to 10 because this is a commonly used rating in the Netherlands (Rijksoverheid, 2021), which is the country where the most respondents are from. This rating also forces the respondents to choose whether a street is a bit more to the safe side or the unsafe side, instead of an answer that is exactly in between, which would be the case with an uneven rating.

3.3.2. Quantification of the survey

The answers that were given in the survey needed to be quantified in a certain way. The questions that were asked were divided into different sections in the survey. For each section, a different quantification method has been applied. For all methods, the program Microsoft Excel has been used.

Starting with the first section, the respondents were asked to fill in their age, gender and whether they are in possession of a driver's licence, these are all internal factors. These questions were relevant to divide the respondents into different categories to see if there was any relation with the responses. The ratings were then compared between the different subgroups. The factors of gender (female or male) and possession of a driver's licence (yes or no) were assigned a 1 for the answer options 'male' and 'yes' and a 0 for 'female' and 'no', while age remained the number in years. The division was as follows, denoted with a comma in between each group:

- Age: In years as a ratio dataset
- Gender: Female (0), Male (1)
- Driver's licence: No (0), Yes (1)

In the second section, the respondents gave their rating of safety to the bicycle boulevards that were almost empty and that incorporated a car intensity of one or two cars. The intensities did not have to be larger than this, because the bicycle boulevard is only applied in streets where car intensities are generally very low. This resulted in a separation of the intensities in low, medium and high. The rating has been given on a scale of one to ten to create an interval dataset. Because the same (photos of) bicycle boulevards are used in both situations, the investigation could focus solely on the presence of the car(s), so these results are comparable.

For each bicycle boulevard there was a comparison between the ratings with and without cars. People chose voluntarily from a list of reasons why they judged a specific street as safe or unsafe. This list included the intensity of cars, the pavement and the width of the street, so the external factors that this research focussed on, were investigated. Because the intensity of cars was already tested in all the different photo's, only the width and the pavement was processed in the dataset to verify the significance of these factors (see 3.3.3 Analysis).

In the third section, the respondent was asked for their specific behaviour on the street. Two situations were shown on similar bicycle boulevards where respectively one cyclist and two cyclists were being approached from behind by a car. There are several things that can be done, but in general there are two possibilities for the cyclist: one where the cyclist makes room for the car and one where they do not. On the bicycle boulevard, the cyclist has priority over the car, which means that the cyclist does not have to go to the side, but the question remained whether the cyclist abided by this rule. For the quantification, the number of respondents that went to the side was counted and compared to the number of respondents that stayed in the middle of the lane.

After these three sections, the result of the last two sections were compared. The last questions with two answer options, had split the group of respondents in two separate groups: the group that went to the side and the group that did not. In this way, it was determined whether there was a connection between the experience of physical safety and the behaviour towards the priority rules on a bicycle boulevard.

3.3.3. Analysis

After processing the data in the report, it should be verified if the data was statistically significant. This was determined by creating several hypotheses and by performing different statistical tests. The different tests were performed with the software package IBM SPSS. The results of these tests are explained in 4.3 Statistical Relevance. The significance of the test was evaluated using an alfa criterion of 0.05, so the statistical significant results have a 95% certainty which was assumed to be valid enough for the scope of this research.

Hypotheses

For the research, several hypotheses are set up. The hypotheses discussed here focus on the external variables mentioned earlier in 3.2 Influential factors. The internal variables are considered the control variables. So these factors were taken into account in the tests, if there was a possible relation. The null hypotheses (H_0) and alternative hypotheses (H_1) are described below:

1. H_0: There is no significant relation between the ratings of safety and intensities of cars.
   H_1: There is a significant relation between the ratings of safety and intensities of cars.
2. H_0: There is no significant relation between the ratings and the pavement of the street.
   H_1: There is a significant relation between the ratings and the pavement of the street.
3. H_0: There is no significant relation between the ratings of safety and the width of the street.
   H_1: There is a significant relation between the ratings of safety and the width of the street.

4. H_0: There is no significant relation between the ratings of safety and the behaviour towards the priority rules.
   H_1: There is a significant relation between the ratings of safety and the behaviour towards the priority rules.

Statistical tests

There are different statistical tests that can determine the significance of the compared data. Each hypothesis or set of hypotheses had to be verified with a statistical test. The first hypothesis considered one dependent variable, which was the rating of safety, and one independent variable, which was intensity. The intensity can be seen as ordinal data since there is an intensity of zero, one or two cars. The intensity of one car was split into two situations, because there was a car on either side of the street. The safety ratings that were considered here were the average ratings of the three bicycle boulevards with the same intensity, so four average ratings were used for each respondent. Because this is a test on the ratings of four groups in total, the one way ANOVA test is suitable for this set of data if it was conform the following six assumptions (Laerd Statistics, n.d.):

1. The dependent variable (average rating of safety) is measured at the interval level
2. The independent variable (intensity) should consist of two or more categorical, independent groups
3. There is no relation in observations in between groups or within a group
4. There should be no significant outliers
5. The dependent variable should be approximately normally distributed
6. There is homogeneity of variances

The last three points were verified with the collected dataset in the Results. This test is used to verify if there is a statistical significant difference between two or more unrelated groups, which in this case are the different intensities. In this particular case, the data had to be restructured to assign four ratings and intensities to each respondent.

The variables of the pavement and width of the street are variables that were considered significant in one test. In this same test the control variables of age, gender and possession of a driver's licence were taken into account as well. For this, the data of the answers to the multiple choice questions were analysed by assigning a value 1 to a ticked box and a 0 if not. This has only been done for the width and the pavement, because these external factors were being investigated. The other factors that people have selected are mentioned in the results, if these could explain specific differences. Because there was one dependent variable measured on a scale (rating of safety) and there were several independent variables that might contribute to this rating, a multiple linear regression analysis was performed. The dataset had to be conform the following assumptions (Laerd Statistics, sd):

1. The dependent variable (rating of safety) is measured at the interval level
2. There are two or more independent variables which are either measured at continuous or categorical scale, so the variables can be nominal, ordinal, interval or ratio data
3. There is no relation in observations in between groups or within a group
4. The relationship between the variables should be linear
5. There is homogeneity of variances
6. There should not be independent variables that are highly correlated
7. There should be no significant outliers
8. The residuals (errors) should approximately be normally distributed

This test is performed to observe if the dependent variable has a relation between multiple different factors and whether the relation is positive (has a positive influence on the rating) or negative (has a negative influence on the rating).

An important note on this test is that this test has been performed three times, since there were three different streets. Each street had its own pavement and width, so the data could only be relevant when each street was examined separately. The respondents could tick the boxes of each street four times, because every street was shown with the different intensities. This meant that someone could judge a specific street as wide based on one picture and as a narrow street based on another picture. The values of each factor (wide, narrow, asphalt or brick) therefore varied between zero, when none of the boxes of the specific factors were ticked, to four, when all these boxes were ticked.

The average ratings of safety of the respondents was compared with the behaviour stated in the last section of the survey. The answers of the respondents were split into two categories: go to the side or stay in the middle. These groups were assigned the values 1 and 0 respectively. People that have given other options as an answer instead of the two options given were left out and were assigned a value of 999. The behaviour was the independent variable. The dependent variable was in this case the average rating over all the bicycle boulevards. Because a distinction of only two groups was made, the required test that corresponded to this procedure of statistical significance was the independent-samples t-test. For this test, the following assumptions were made:

1. The dependent variable (average rating of safety) is measured at the interval level
2. The independent variable (behaviour) should consist of two categorical, independent groups
3. There is no relation in observations in between groups or within a group
4. There should be no significant outliers
5. The dependent variable should be approximately normally distributed for each group
6. There is homogeneity of variances

The last three points were verified with the collected dataset in the Results. This test was used to verify if there was a statistically significant difference between two unrelated groups, which in this case were the two different behaviours of cyclists.

3.4. Summary

The methodology consisted of three phases. In the first phase a theoretical investigation has been performed, in the second phase a survey was created and spread and in the third phase the results were quantified and analysed.

There are influential factors included in this investigation divided in the internal and external factors. The internal factors are the age, the gender and the possession of a driver's licence of the respondent. The external factors are the intensity of cars, the pavement and the width of streets.

A survey was performed that asked the respondents for their rating of safety and their behaviour on bicycle boulevards. The collected data was quantified in Microsoft Excel and analysed in IBM SPSS. Three different statistical tests were performed. The one way ANOVA test was performed for the relation between the intensity of cars and the rating of safety. The multiple linear regression test was used for a relation between all the other influential factors and the rating of safety. The independent-samples t-test related the stated behaviour of cyclists to the average rating.

4. Results

This chapter discusses the results of the survey. This is done by first showing the data that can be observed directly from the answers, to create an understanding of the respondent group. After this, the datasets are combined to retrieve possible relevant relations between certain responses. At last, the relations are tested on their statistical relevance as previously described in 3.3.3 Analysis.

4.1. Observed Data

The results consider a respondent group of 104 people, so the target of at least 100 respondents is reached. The bar graph of Figure 7 gives an overview of the frequency of the different age groups. Most of the respondents were in the age group between 18 and 24 years old. At the same time, there was very little response of the 65+ group. The verified relations between rating of safety and age might therefore not be valid for the age group that is 65 years or older.

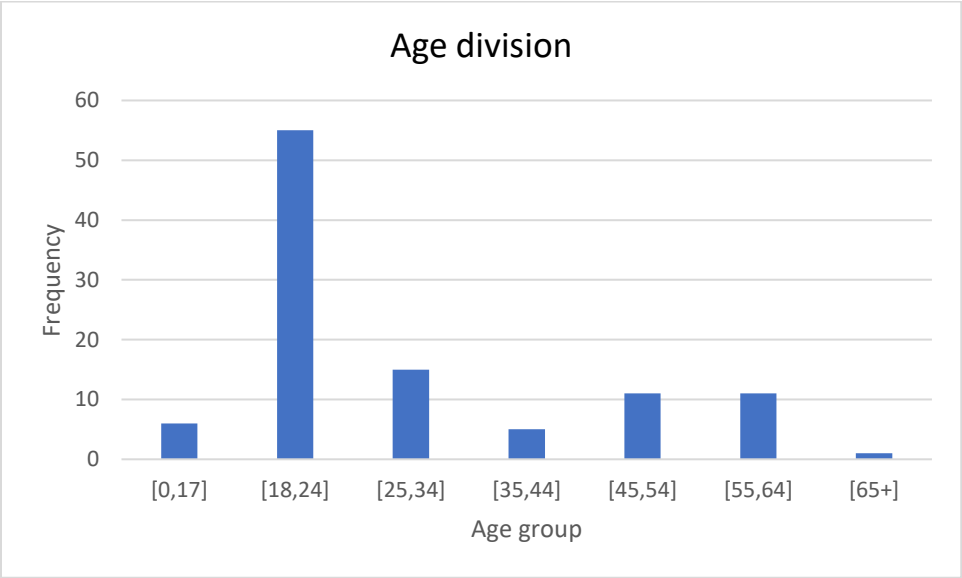

Figure 7: The frequency respondents of each age group

The pie chart of Figure 8 shows the distribution of females and males that have participated in this investigation. There were more males that have participated in this investigation. This difference is however not big enough to lead to insignificance of the data, since there still was a sufficient number of 44 females that have participated.

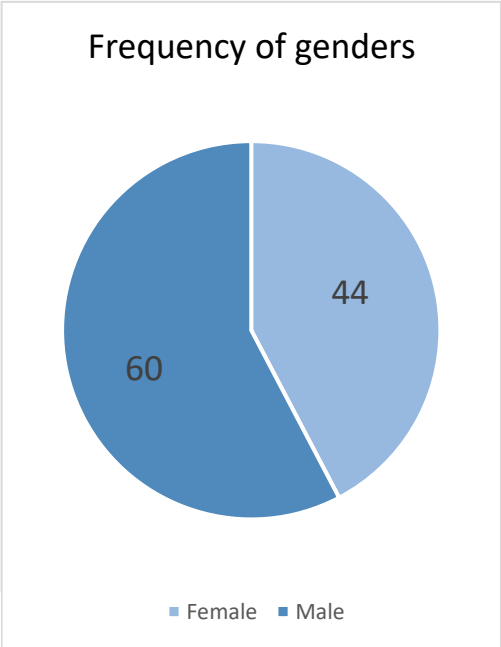

Figure 8: The division of gender from the respondent group

The pie chart of Figure 9 shows the division of people that are in possession of a driver's licence and people that are not. The respondent group that has a driver's licence is significantly larger than the group that does not have a driver's licence. The division of these two groups is however more representable considering the fact that more people are in possession of a driver's licence than people who are not in the Netherlands (Centraal Bureau voor de Statistiek, 2021). In addition, the size of the group of people without a driver's licence was assumed sufficient, because the multiple linear regression test was able to determine the significance of this influential factor as well.

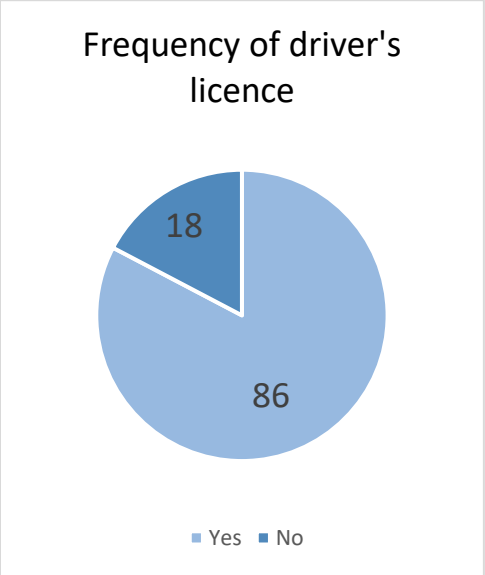

Figure 9: The division of possession of a driver's licence from the respondent group

4.2. Processed Data

Based on the survey data, the distributions of ratings were compared with other variables, such as the type of street, the intensity of cars and the behaviour of cyclists. This data is processed in the form of histograms, to observe the way of distribution.

Safety ratings for each street

The following graphs (Figure 10Figure 11 andFigure 12) show the distributions of the answers to the survey. For each of the bicycle boulevards (asphalt, mixed and brick pavement respectively) a histogram is plotted with the rating of safety for all of the intensities combined.

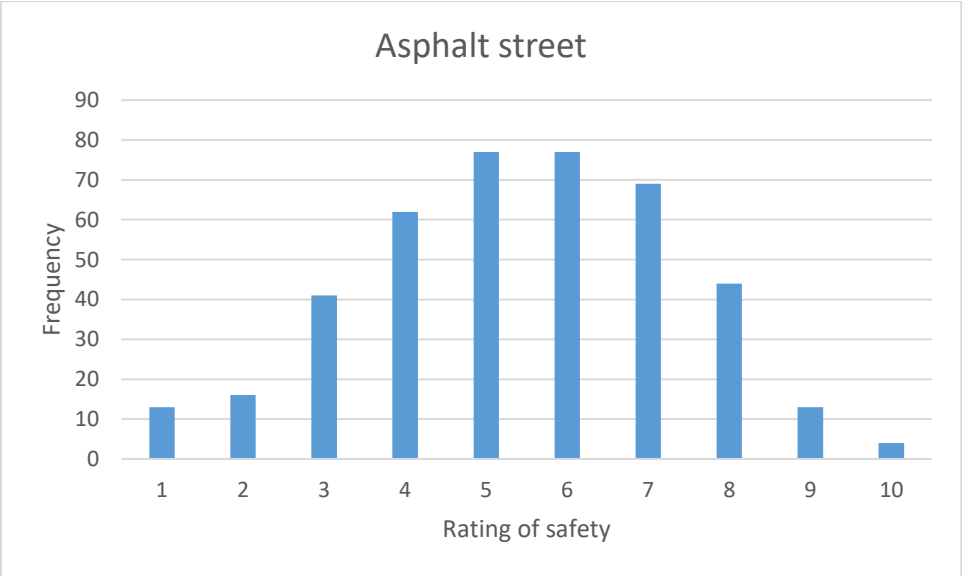

Figure 10: Ratings of the asphalt street

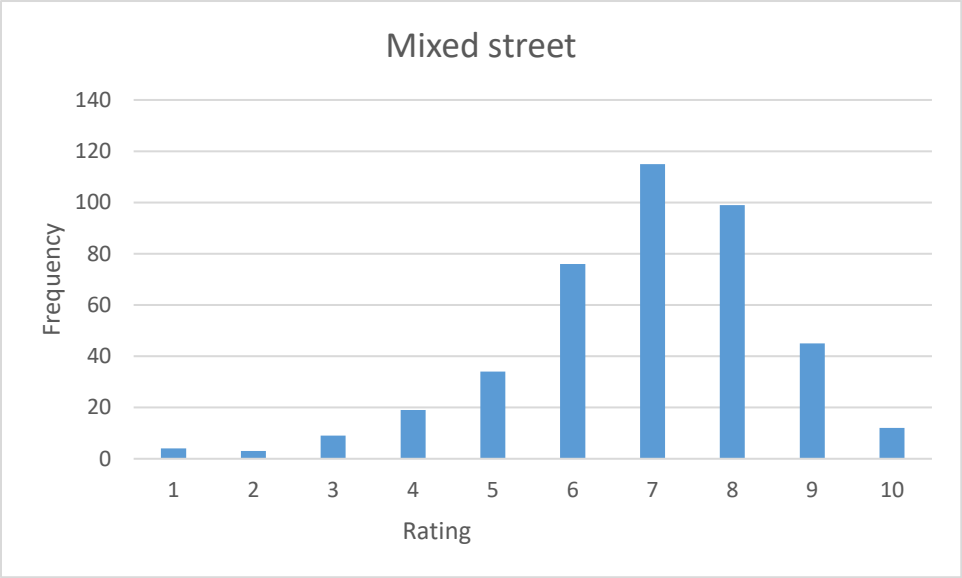

Figure 11: Ratings of the Mixed pavement street

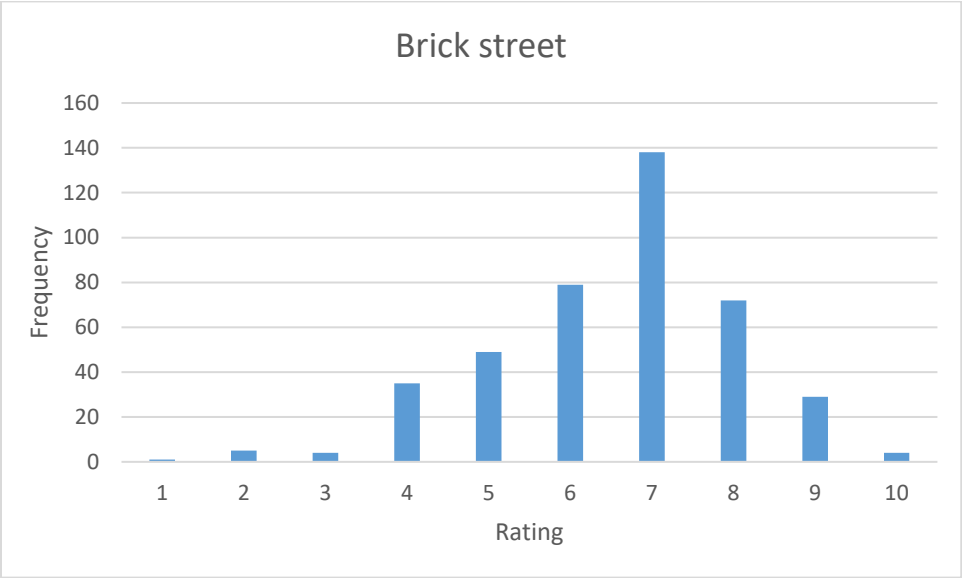

Figure 12: Ratings of the brick street

What can be seen from these figures is that the asphalt street scored lowest overall. This is mainly due to the spread of the ratings, which have a bigger range for this street. Table 5 below confirms this observation with the average ratings of each bicycle boulevard and the standard deviations of the ratings.

Table 5: Average ratings of safety for each street

Street (pavement)	Average rating	Standard deviation
Asphalt	5.42	1.94
Mixed	6.88	1.65
Brick	6.55	1.52

Safety ratings for each intensity

The following graphs (Figure 13,Figure 14Figure 15 and Figure 16) show the distributions of the rating of safety for each intensity. A histogram is plotted with the rating of safety for all of the streets combined. These intensities are the situations with zero cars (Intensity 0), one on the other side of the street (Intensity 1.1), one on the same side of the street (Intensity 1.2) and two cars (intensity 2).

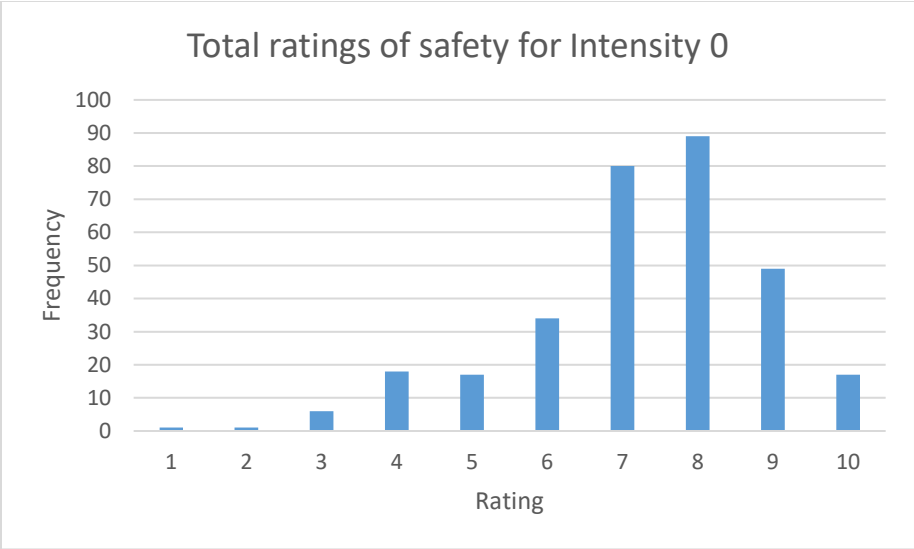

Figure 13: Ratings for intensity 0

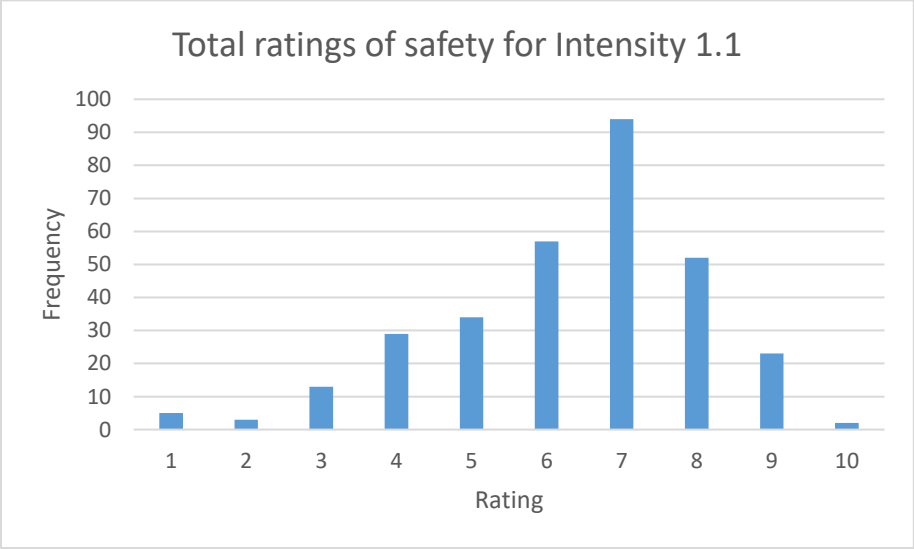

Figure 14: Ratings for intensity 1.1

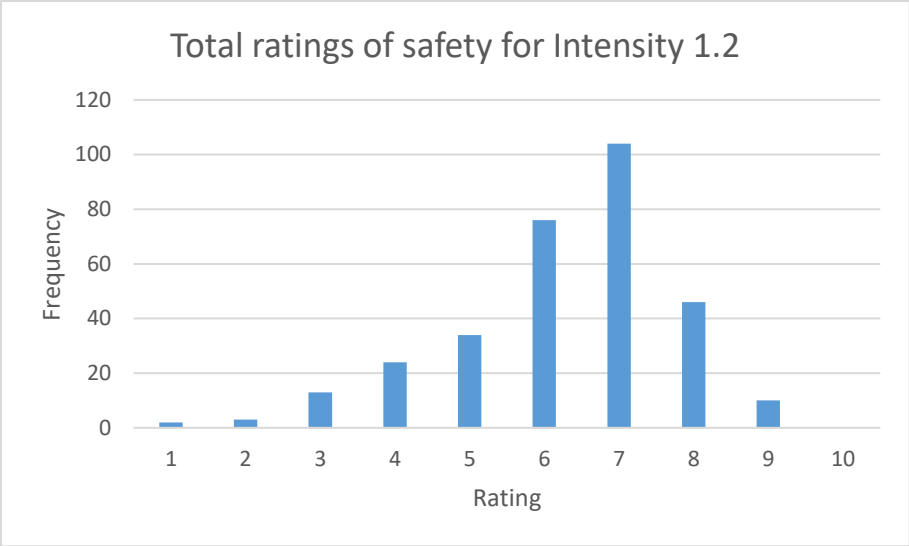

Figure 15: Ratings for intensity 1.2

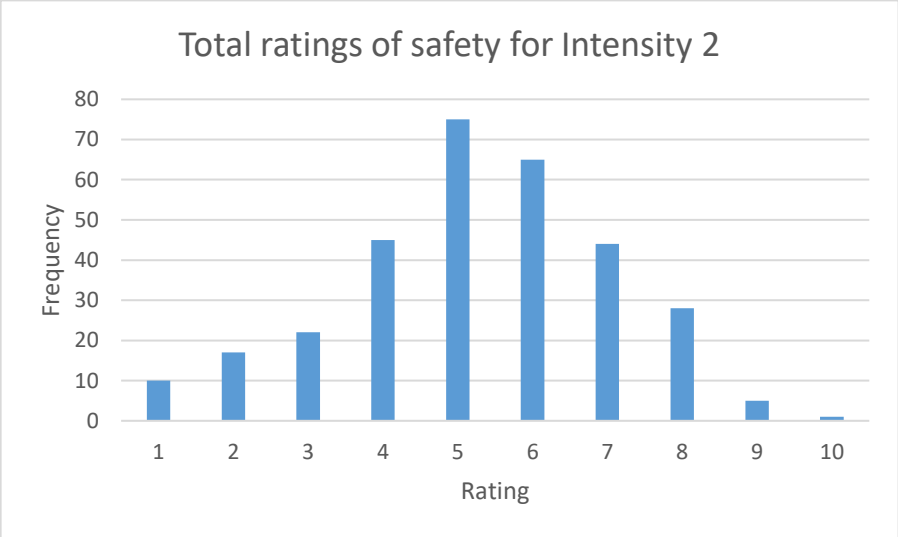

Figure 16: Ratings for intensity 2

It can be seen that low intensities have higher ratings than the high intensities, based on the distributions of this data. This implies that the streets with lower intensities score on average higher than streets with higher intensities. This is also confirmed by Table 6 and Figure 17 which show the average ratings and standard deviations of the ratings at different intensities.

Table 6: Average ratings for the different intensities and the standard deviation

Intensity	Average rating	Standard deviation
0	7.26	1.64
1.1	6.34	1.74
1.2	6.27	1.50
2	5.26	1.81

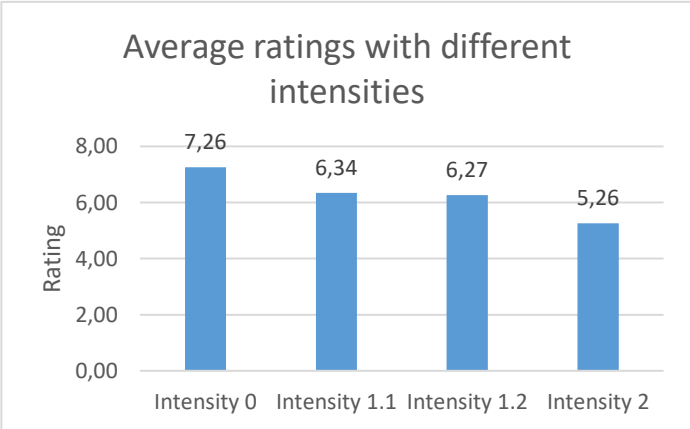

Figure 17: Average ratings for different intensities

Based on the shape of the distributions for each intensity, it can further be concluded that the data is approximately normally distributed. The variance of the ratings, which is defined as the square of the standard deviation is approximately the same for all intensities. In addition, there are no significant outliers in the distribution. The one way ANOVA test to measure the significance of the data was therefore valid to be applied with this dataset.

Safety ratings for both behaviours

When considering the situation in the survey where one and two cyclists were being approached by a car, there were two main options that the respondents could choose from. In most cases one of the two options was filled in, so a division of two groups has been made. The sizes of the groups are visualised in the pie charts below. In both groups it was visible that a significant number of cyclists goes to the side of the street when a car approaches. In the significance tests it was checked whether there is a relation between this behaviour and the rating of safety that both groups gave.

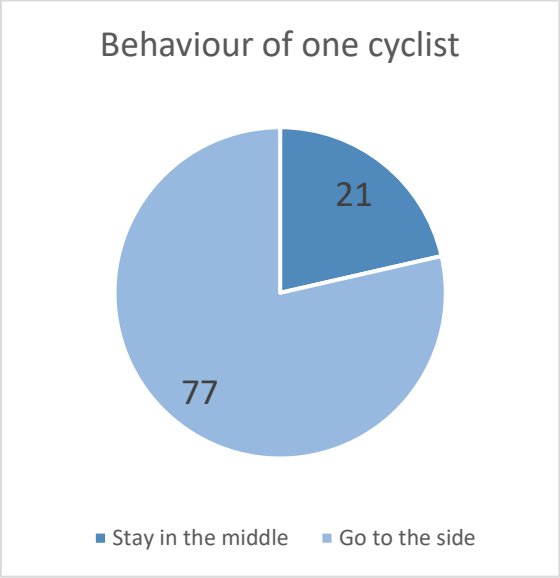

Figure 19: The behaviour of the respondents considering the case when cycling alone

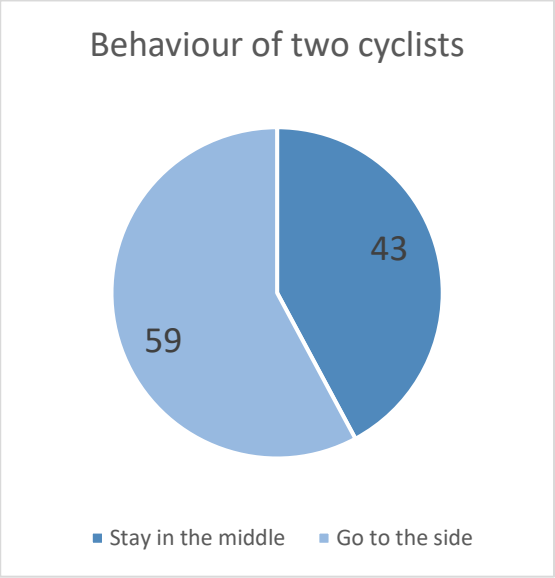

Figure 18: The behaviour of the respondents considering the case when cycling with a friend

For the verification of this possible relation, a distribution of the ratings had to be made. The graphs on the next page (Figure 20 andFigure 21) show the distributions of the rating of safety for both behaviour options the respondents could fill in. This distribution is made for the situation where one cyclist was approached by a car. A histogram is plotted with the total average rating of safety for both the cyclists that would go to the side and the cyclists that would stay in the middle.

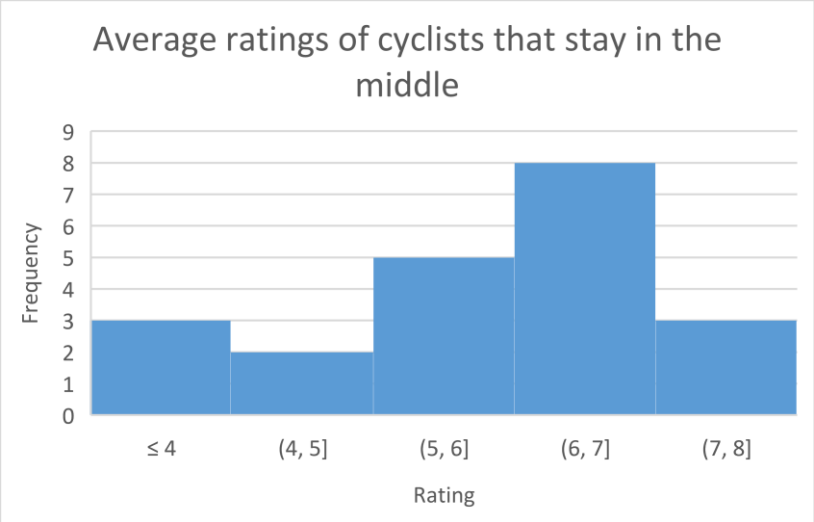

Figure 20: Distribution of the average ratings of individuals that would stay in the middle of the lane

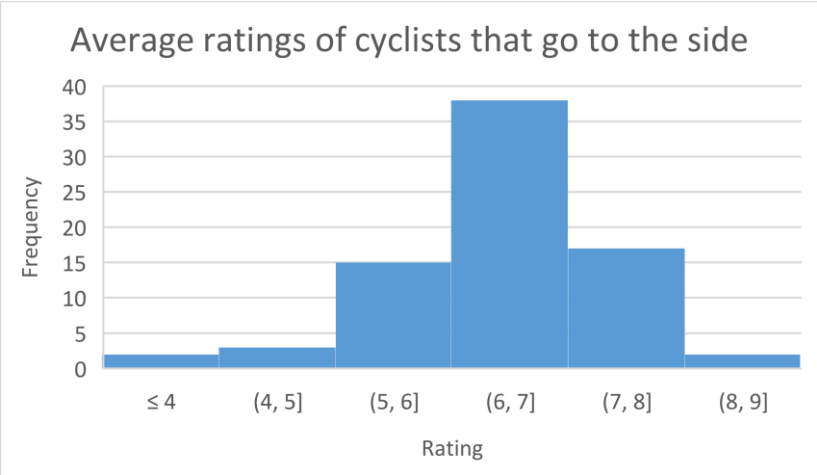

Figure 21: Distribution of the average ratings of individuals that would go to the side of the lane

Table 7 below gives the values of average ratings of the two distributions and the corresponding standard deviations. Also the group size is mentioned

Table 7: The average rating, standard deviation and group size of the groups corresponding with figures 20 and 21

Behaviour	Average rating	Standard deviation	Group size
Middle	5.81	1.32	21
Side	6.43	0.92	77

Again, based on the shape of these distributions it was concluded that the data is approximately normally distributed. The variance of the ratings was a bit different, which can be attributed to the fact that the size of the group that stays in the middle is relatively small, so the true variance of this group can differ from this value. It was therefore assumed that the variances were approximately equal. In addition, there were no significant outliers in the distribution. The independent t-test to measure the significance of the data was therefore valid to be applied with this dataset.

4.3. Statistical Relevance

Now that there is an overview of the data, the statistical relevance is measured by means of IBM SPSS. The important tables that SPSS delivered are all given in Appendix C with the necessary explanations on the values.

4.3.1. One way ANOVA test intensities

The first test that was performed verifies if there is a relation between the intensity of cars and the rating of safety that was given. For this verification, a one way ANOVA test was performed in SPSS and the values were given in the tables in Appendix C, where important factors were highlighted with red frames and explained.

The alternative hypothesis stated: there is a significant relation between the ratings of safety and intensities of cars. The ratings of safety of a street with a low intensity of cars was considered significantly higher than the ratings of safety with a relatively high intensity of cars. There was however no significant difference in the position of the car with respect to the cyclist considering the case of intensity 1.1 and 1.2. The alternative hypothesis could thus be accepted.

This relation could also be verified when observing the multiple choice answers of the survey. Figure 22 and Figure 23 show the number of times that these multiple choice options were ticked, so this was a reason for the rating they have given. It is clear to see that a street with a low intensity of cars was considered a reason for people to rate the street higher, when these results are combined with the average ratings of Table 6.

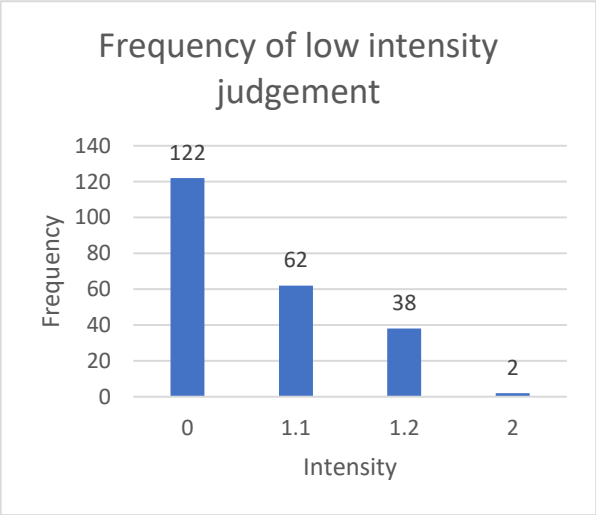

Figure 23: Number of times people consider a low intensity of cars for the different intensities

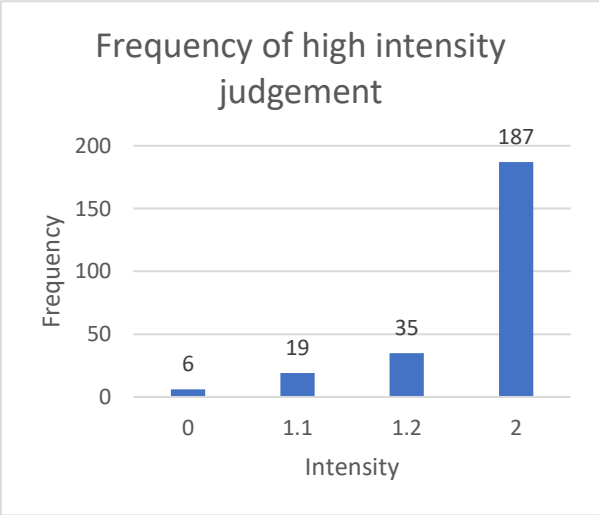

Figure 22: Number of times people consider a high intensity of cars for the different intensities

4.3.2. Multiple regression

The second test that was performed was the multiple linear regression test. The dependent value that was implemented was the average score of a specific street and the independent variables were the age, gender, driver's licence, wide, narrow, asphalt and brick variables that were discussed in 3.3.3 Analysis. Whether a certain factor was significant enough is determined by verifying if the P value of the different tests was lower than the alfa criterion of 0.05.

Asphalt street

The first multiple regression test that was performed was based on the asphalt street. SPSS delivers the tables that are shown in the Appendix C, where important factors are highlighted with red frames. The way of reading the values in the table is explained as well.

There were two alternative hypotheses that were tested in this linear multiple regression test. The hypotheses are:

- There is a significant relation between the ratings and the pavement of the street.
  A regression analysis showed that pavement of the street is not a significant predictor of the ratings of safety ($B_{asphalt}$ = -0.012, B_{brick} = 0.752, $P_{asphalt}$ > 0.05, P_{brick} > 0.05).
- There is a significant relation between the ratings of safety and the width of the street.
  A regression analysis showed that the width of the street is a significant predictor of the ratings of safety, when a street was considered wide (B_{wide} = 0.508, P_{wide} = 0.000 < 0.05). The impact is medium (0.2 < Beta < 0.5) and in a positive direction, so if the street was considered wide, it scored a significantly higher rating. This relation however was not considered significant the other way around, so if this street was considered narrow, there was no significant proof that the rating scores lower (B_{narrow} = -0.058, P_{narrow} > 0.05).

Mixed pavement street

The second test that was performed was based on the mixed pavement street. SPSS delivers the tables in the Appendix C, where important factors are highlighted with red frames and an explanation is provided.

Again, there were two alternative hypotheses that were tested in this linear multiple regression test. The hypotheses are:

- There is a significant relation between the ratings and the pavement of the street.
  A regression analysis showed that pavement of the street is not a significant predictor of the ratings of safety ($B_{asphalt}$ = 0.111, B_{brick} = -0.008, $P_{asphalt}$ > 0.05, P_{brick} > 0.05).
- There is a significant relation between the ratings of safety and the width of the street.
  A regression analysis showed that the width of the street is a significant predictor of the ratings of safety (B_{wide} = 0.508, B_{narrow} = -0.058, , P_{wide} < 0.05, P_{narrow} < 0.05). The impact is medium (0.2 < |Beta| < 0.5). A wide street is thus considered safer and a narrow street less safe.

This test furthermore showed that age is also a significant predictor of the average rating. The B value was negative, which means that older people consider this street significantly less safe. The effect on the rating is also medium (0.2 < |Beta| < 0.5).

Brick street

The third test that was performed was based on the brick pavement street. SPSS delivered the tables in the Appendix C, where important factors are highlighted with red frames.

Again, there were two alternative hypotheses that were tested in this linear multiple regression test. The hypotheses are:

- There is a significant relation between the ratings and the pavement of the street.
  A regression analysis showed that pavement of the street is not a significant predictor of the ratings of safety ($B_{asphalt}$ = -0.259, B_{brick} = -0.083, $P_{asphalt}$ > 0.05, P_{brick} > 0.05).
- There is a significant relation between the ratings of safety and the width of the street.

A regression analysis shows that the width of the street is a significant predictor of the ratings of safety, when a street was considered wide (B_{wide} = 0.508, P_{wide} = 0.000 < 0.05). The impact is medium (0.2 < Beta < 0.5), while higher than other Beta values before. The value was positive, so if the street was considered wide, it scored a significantly higher rating. This relation however was not considered significant the other way around, so if this street was considered narrow, there was no significant proof that the rating scores lower (B_{narrow} = -0.067, P_{narrow} > 0.05).

This test showed as well that age is a significant predictor of the average rating. The B value was again negative, which meant that older people consider this street significantly less safe. The effect on the rating is medium (0.2 < |Beta| < 0.5).

Summary

For all three bicycle boulevards, there was no significant relation between the rating of safety and the pavement of the street. However, the width was in all three cases a significant predictor of the rating of safety. This was because the ratings are significantly higher when the street was considered as wide for all cases and the ratings were significantly lower when the street was considered narrow for the mixed pavement street. For the control variables only the age was considered a predictor of the rating of safety. In two out of three cases, older people rated the bicycle boulevards as significantly less safe.

4.3.3. T-test Behaviour and rating

The next test that was performed tests if there is a possible correlation between the behaviour of cyclists towards the priority rules and the average ratings the cyclists have given. The test that was used in SPSS is the independent-samples t-test

Situation one cyclist

The first situation that is discussed is the situation with one cyclist that was approached by a car. The respondents would go to the side or stay in the middle. The t-test considered the average ratings of these two groups and tests whether this rating was significantly different. The tables in Appendix C are the outcomes of the t-test, where important factors are highlighted with red frames and explained.

The alternative hypothesis stated: there is a significant relation between the ratings of safety and the behaviour towards the priority rules. The average rating of the people that would go to the side is 6.43 and the people that would stay in the middle is 5.81. According to the T-test for equality of means, this difference was indeed significant.

Situation two cyclists

The second situation that is discussed is the situation with two cyclists that were approached by a car. The respondents would again go to the side or stay in the middle. The t-test considered the average ratings of these two groups and tests whether this rating was significantly different. The tables in Appendix C are the outcomes of the T test, where important factors are highlighted with red frames and explained.

The alternative hypothesis stated: there is a significant relation between the ratings of safety and the behaviour towards the priority rules. The average rating of the people that would go to the side is 6.31 and the people that would stay in the middle is 6.22. According to the t-test for equality of means, this difference was not significant enough to conclude that there is a relation between the rating of safety and the behaviour. Therefore the alternative hypothesis could be rejected in this case.

5. Discussion

The results given in chapter 4 show certain trends and relations and these are all significantly tested, but there are some results that still might not be as valid as the tests suggest. Interpretations of the results are given and these are further explained and discussed in this chapter.

The study demonstrates a negative relation between the rating of physical safety and the intensity of cars, so the higher the number of cars on a bicycle boulevard, the lower the rating that is given. The results indicate furthermore that cyclists that behave less to their priority by going to the side of the street, rate a bicycle boulevard on average safer than cyclists that do not. The analysis also supports that the width of a street is a significant influential factor considering the safety. This correlation is positive, so the wider the street, the higher the rating of safety.

Almost all findings are in line with the alternative hypotheses. The rating of safety is namely significantly dependent on the behaviour of a cyclist, the width of the street and the intensity of cars. The pavement of the street is not considered to have a significant impact on the rating of safety, which is in contrast to the alternative hypothesis.

These results support the findings of the other theories that consider the rating of experience on bicycle boulevards. This research adds to the theory that there is also a relation between the rating of physical safety and the way a cyclist behaves towards the priority rules on a bicycle boulevard.

The reliability of the research is limited by distributions based on the demographic data. Mainly the ages of the respondents do not represent the national distribution. The responses of elderly are very limited, so this age group is not well represented. The use of the multiple regression line helps to predict the ratings of elderly, but it is not a certain representation.

Because the survey required approximately 10 minutes to fill in, the respondents might lose their attention to the different situations, which could result in other answers. The graph below shows the number of people that did not tick any of the boxes for the optional question on why they think a specific street is safe/unsafe. This trend shows that as the survey progressed, more people tend to skip this question, which could denote a loss of attention for the questions.

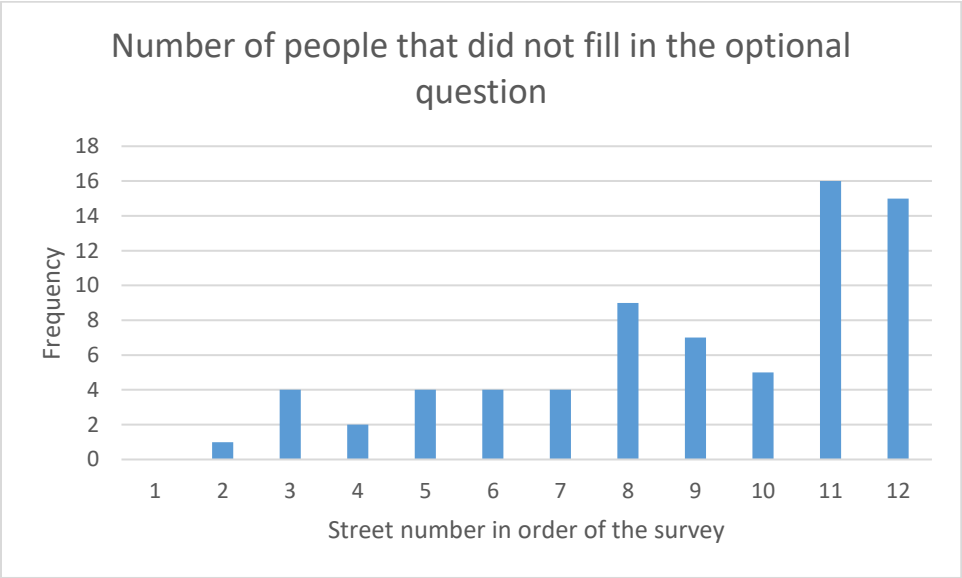

Figure 24: visualisation of the possible loss of attention for the questions

The effect of the last questions being judged differently is attempted to be eliminated. This is for example done by randomising the order of the survey questions, so each street and intensity gets approximately equal amount of attention.

For the questions of the survey to be valid, the circumstances of the streets had to be equal as much as possible. The different intensities of cars thus had to be photoshopped in the figures, so only this influential factor could be tested. This can bring inconveniences for the outcome. An example of this is that the car is not perfectly scaled to the correct size and aligned with the direction of the street. This can negatively influence the credibility of the situation, which then might result in a different rating of the safety.

Another example of the use of only this influential factor, is that the survey might be too suggestive for the respondents. Several personal comments on the survey stated that lower ratings were given, because the photoshop of the extra cars suggested this. This can also clarify why the results of the one way ANOVA test for the intensities was significantly the clearest of all tests. From another point of view, the fact that respondents connect the presence of a car on a bicycle boulevard to a decrease in the safety of the street, suggests that cyclists do feel less safe in these circumstances.

There are more influential factors that can contribute to a different outcome of the investigation. These factors have not all been taken into account in advance of the research. In this discussion, other influential factors have been listed and clarified. Though these discussion points can be of influence for the outcome of the investigation, the results are not expected to be influenced to that extent that the outcomes are insignificant. Thus a conclusion based on the results and statistical tests is considered valid.

6. Conclusion and recommendations

This research aimed to gain knowledge on the safety of cyclists on bicycle boulevards. In this chapter, a conclusion will be drawn from the results and a recommendation for further studies and applications is given.

The main research question of this report is: *How does the presence of the car affect the cyclist's experience of safety and behaviour towards the priority rules on a bicycle boulevard?*

For determining the answer to this question, a survey was set up. This survey asked respondents for their rating of safety, the reasons for their rating and the behaviour they show on bicycle boulevards. The results and significance tests show that the intensity of cars, width of the street and behaviour of cyclists all contribute to the rating of safety, while the pavement of the street does not seem to have a significant influence on the safety. From the multiple linear regression, it can be concluded that the control variables of gender and possession of a driver's licence do not significantly describe the rating of safety. The age of the respondent appeared to be significant in two of the three tests. However, this investigation cannot consider these results as sufficient. In addition, the distribution of age groups confirms that there is too little information on the opinions of people that are older than 65 years.

Based on the results of the survey, it can be concluded that the car negatively influences the experience of physical safety of cyclists. A high intensity of cars results in a lower experience of safety of the cyclists. The car also clearly affects the behaviour towards the priority rules. In both visualised scenarios of one and two cyclists being approached by a car, the respondents more often state that they go to the side instead of staying in the middle of the lane.

This behaviour to the priority rules also appears to have an effect on the rating of safety. A single cyclist that tends to go to the side of the street to let the car pass, rates a street significantly more safe than a cyclist that stays in the middle of the lane. This suggests that the intended priority that cyclists have on bicycle boulevards contradicts the desired safe character towards cyclists. A reason for this could be that the cyclists that stay in the middle of the lane will more often get into conflict with cars, which causes a decrease in the feeling of safety.

Based on these conclusions, it is recommended that the design of bicycle boulevards should stimulate cars to overtake cyclists, but with the speed limit of 30 km/h. As a result the moment of conflict will be reduced. The incentive of overtaking can be achieved by a wide street design, which improves the feeling of physical safety as well.

For a better understanding of the implications of the results, future studies could investigate the cyclists' and drivers' understanding of the priority rules on bicycle boulevards. This is because misinterpretations of the rules on for example overtaking can cause the experience of safety to decrease.

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Appendix A

Below, the personal motivation for writing this report is given.

Personal motivation

On a personal note, I have had a collision as a cyclist with a car about 2 years ago. Ever since that accident, I have a lot of interest in the safety of cyclists with respect to motorised vehicles. Whenever I cycle on a road, I observe the safety measures that have been taken to protect cyclists. In this research, I would like to further develop my knowledge on how cyclists deal with possible dangerous situations and how road design can protect a cyclist both physically and mentally.

Appendix B

Pictures of the bicycle boulevards without cars

Sources:

1. (Google Maps, n.d.)
2. (Eijking, 2016)
3. Photo of Hidde Vincken

Pictures of the bicycle boulevards with cars

Sources:

1. (Google Maps, n.d.)
2. (Eijking, 2016)
3. Photo of Hidde Vincken

Pictures of two situations with cyclists and a car

Sources:

1. (Google Maps, n.d.)
2. (Google Maps, n.d.)

Pictures of all bicycle boulevards with and without cars. In the survey these are placed in a random order.

Appendix C

Tables of SPSS

Table 1

Rating of safety	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	207.836	3	69.279	49.526	.000
Within Groups	576.326	412	1.399		
Total	784.162	415			

Table 2

(I) Intensity	(J) Intensity	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0	1.1	.91667*	.16402	.000	.4819	1.3515
	1.2	.99359*	.16402	.000	.5588	1.4284
	2	1.99679*	.16402	.000	1.5620	2.4316
1.1	0	-.91667*	.16402	.000	-1.3515	-.4819
	1.2	.07692	.16402	1.000	-.3579	.5117
	2	1.08013*	.16402	.000	.6453	1.5149
1.2	0	-.99359*	.16402	.000	-1.4284	-.5588
	1.1	-.07692	.16402	1.000	-.5117	.3579
	2	1.00321*	.16402	.000	.5684	1.4380
2	0	-1.99679*	.16402	.000	-2.4316	-1.5620
	1.1	-1.08013*	.16402	.000	-1.5149	-.6453
	1.2	-1.00321*	.16402	.000	-1.4380	-.5684

* The mean difference is significant at the 0.05 level.

Table 1 determines whether the dataset is significantly relevant. The P value is 0.000 which is lower than the alfa criterion of 0.05, so the test is significantly relevant.

Table 2 validates if there is a significant difference between each intensity. For example, the first row compares the average ratings of streets with zero cars and one car on the opposite side with each other and tests if there is a significant difference. The significance is highlighted in red and as can be seen in almost all cases, there is a significant difference, because the values are lower than the alfa criterion of 0.05. Only the situation where there is an intensity of a car on the cyclists side and on the opposite side, there is no significant difference, indicated with a 1.000.

Asphalt street

Table 3

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.435[a]	.190	.131	1.40407

a. Predictors: (Constant), Age, Gender, Driver's licence, Narrow, Wide, Asphalt, Brick

Table 4

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	44.276	7	6.325	3.208	.004[b]
	Residual	189.257	96	1.971		
	Total	233.533	103			

a. Dependent Variable: Average rating of the street
b. Predictors: (Constant), Age, Gender, Driver's licence, Narrow, Wide, Asphalt, Brick

Table 5

	Unstandardized coefficients		Standardized coefficients			95.0% Confidence interval for B	
Model	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	5.300	.529		10.024	.000	4.250	6.349
Age	-.005	.010	-.050	-.495	.622	-.025	.015
Gender	-.185	.293	-.061	-.634	.528	-.766	.396
Driver's licence	-.047	.387	-.012	-.121	.904	-.816	.722
Narrow	-.058	.117	-.051	-.500	.618	-.290	.173
Wide	.508	.132	.412	3.840	.000	.246	.771
Asphalt	-.012	.112	-.011	-.109	.914	-.235	.210
Brick	.752	1.468	.049	.512	.610	-2.162	3.666

a. Dependent Variable: Average rating of the street

The first important value that SPSS delivers for the multiple regression is the multiple correlation coefficient or R in Table 3. R defines the quality of the prediction ranging from 0 to 1, where 1 is the highest qualitative prediction. The R square is defined as the fraction that the independent variables explain the dependent variable. In this case, only 19 % of the variability of the rating of safety is explained by these factors.

After this, the significance of the residuals (errors) is delivered in Table 4. This significance value is 0.004. This is lower than the alfa criterion of 0.05, so the residuals are sufficiently normally distributed.

Then the actual correlations between the ratings of safety and the different variables is given in Table 5. The B value gives the relation between an independent variable and the rating of safety when all other factors remain constant. For example, the B value of gender is -0.185 which means that if the gender is male (which in this case was a 1) then the average rating goes down by 0.185. However, SPSS shows the significance of this relation, which is in this case 0.528. This is higher than the alfa criterion of 0.05, so the gender is in general not significant enough to have an influence on the average rating.

Only if the street is considered wide, this has a significant impact on the rating of safety, because this significance value is lower than the alfa criterion of 0.05.

Mixed pavement street

Table 6

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.530[a]	.281	.229	1.09460

a. Predictors: (Constant), Age, Gender, Driver's licence, Narrow, Wide, Asphalt, Brick

Table 7

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	44.976	7	6.425	5.363	.000[b]
	Residual	115.023	96	1.198		
	Total	159.999	103			

a. Dependent Variable: Average rating of the street
b. Predictors: (Constant), Age, Gender, Driver's licence, Narrow, Wide, Asphalt, Brick

Table 8

	Unstandardized coefficients		Standardized coefficients			95.0% Confidence interval for B	
Model	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	7.140	.384		18.605	.000	6.378	7.901
Age	-.024	.008	-.286	-3.064	.003	-.039	-.008
Gender	.166	.223	.066	.747	.457	-.276	.609
Driver's licence	.196	.305	.060	.643	.521	-.410	.803
Narrow	-.252	.101	-.233	-2.486	.015	-.453	-.051
Wide	.202	.083	.237	2.445	.016	.038	.366
Asphalt	.111	.086	.119	1.295	.198	-.059	.281
Brick	-.008	.094	-.007	-.081	.936	-.194	.179

a. Dependent Variable: Average rating of the street

The Table 6 shows again the R square and the significance values. In this case, 28.1 % of the variability of the rating of safety is explained by the factors specified as the independent variables. This is slightly higher than the first street, so the factors explain the rating of safety more than with the asphalt street. Table 7 gives the significance of the residuals for the total model which is 0.000. This is lower than the alfa criterion of 0.05, so the residuals are sufficiently normally distributed.

It can be derived from Table 8, that if the street is considered wide or narrow, this has a significant impact on the rating of safety, because these significance values are lower than the alfa criterion of 0.05. Furthermore, the age is a significant predictor of the rating of safety

Brick street

Table 9

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.554[a]	.307	.257	.89962

a. Predictors: (Constant), Age, Gender, Driver's licence, Narrow, Wide, Asphalt, Brick

Table 10

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	34.477	7	4.925	6.086	.000[b]
	Residual	77.695	96	.809		
	Total	112.172	103			

a. Dependent Variable: Average rating of the street
b. Predictors: (Constant), Age, Gender, Driver's licence, Narrow, Wide, Asphalt, Brick

Table 11

	Unstandardized coefficients		Standardized coefficients			95.0% Confidence interval for B	
Model	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	6.858	.313		21.903	.000	6.237	7.480
Age	-.020	.006	-.292	-3.210	.002	-.033	-.008
Gender	.120	.182	.057	.661	.510	-.241	.482
Driver's licence	.141	.249	.051	.565	.573	-.354	.635
Narrow	-.067	.079	-.085	-.842	.402	-.224	.091
Wide	.333	.078	.422	4.278	.000	.178	.487
Asphalt	-.259	.353	-.064	-.734	.465	-.959	.441
Brick	-.083	.061	-.122	-1.358	.178	-.204	.038

a. Dependent Variable: Average rating of the street

The R square and the significance values are given in Table 9 andTable 11. For this street, 30.7 % of the variability of the rating of safety is explained by the factors specified as the independent variables. This is higher than both other streets, so the factors explain the rating of safety more than the streets before. Table 10 gives the significance of the residuals for the total model which is 0.000. This is lower than the alfa criterion of 0.05, so the residuals are sufficiently normally distributed.

It can be derived from Table 11, that if the street is considered wide, this has a significant impact on the rating of safety, because this significance values are lower than the alfa criterion of 0.05. Furthermore, the age is a significant predictor of the rating of safety

Situation one cyclist

Table 12

One cyclist		N	Mean	Std. Deviation	Std. Error Mean
Average total	Middle	21	5.8095	1.31897	.28782
	Side	77	6.4340	.91520	.10430

Table 13

One cyclist		Levene's Test for Equality of Variances		t- test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Average total	Equal variances	3.826	.053	-2.505	96	.014	-.6245	.2493	-1.1193	-.1296
	No equal variances			-2.040	25.482	.052	-.6245	.3061	-1.2544	.0054

The significant 2-tailed test is of importance, because the considered effect has not been stated positive nor negative. From Table 12, it can be seen that the significance is 0.014 which is smaller than the alfa criterion of 0.05, so the test is considered significant. The relation is in this case positive, so the people that tend to go to the side of the street when a car approaches, rate the safety of a street significantly higher than the people that stay more in the middle of the lane.

Situation two cyclists

Table 14

Two cyclists		N	Mean	Std. Deviation	Std. Error Mean
Average total	Middle	43	6.2209	1.06546	.16248
	Side	59	6.3136	1.00993	.13148

Table 15

Two cyclists		Levene's Test for Equality of Variances		t- test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Average total	Equal variances	.003	.957	-.447	100	.656	-.0926	.2073	-.50381	.3186
	No equal variances			-.443	87.763	.659	-.0926	.2090	-.50802	.3228

The significant 2-tailed test is of importance, because the considered effect has not been stated positive nor negative. Table 15 shows that the significance is 0.656 which is higher than the alfa criterion of 0.05, so the test is considered insignificant.

Appendix D

Planning of the bachelor end project

For the planning, the schedule with deadlines is complemented with an estimation of the activities per day.

Table 16: Planning

Wk	Activity	Date	Time
	Registration	7-apr	**Deadline/ meeting time**
1	Kick-off	19-apr	10:15
1	**Submission**: work plan	23-apr	16:00
1	Reviewing work plans of other students	24-apr	
2	Reviewing work plans of other students	25-apr	
2	**Submission** review of other students' work plans in same group	26-apr	16:00
2	Discussion: work plans	*28-apr*	11:00
2	Improve the work plan based on the feedback	28-apr	
2	Improve the work plan based on the feedback and creating design approach & methodology	29-apr	
2	Improve the work plan based on the feedback and creating design approach & methodology	30-apr	
2	**Submission**: methodology & design approach	30-apr	16:00
2	Reviewing methodology & design approach	1-mei	
3	Reviewing methodology & design approach	2-mei	
3	**Submission**: review of 2 other students' methodology & design	3-mei	16:00
3	Discussion: methodology & design approach	4-mei	11:00
3	Improve the survey and share it with as many people	5-mei	
3	Investigating different forms of bicycle boulevards	6-mei	
3	Investigating different forms of bicycle boulevards	7-mei	
3	Preparing the presentation and writing the mid-term report	8-mei	
4	Preparing the presentation and writing the mid-term report	9-mei	
4	Preparing the presentation	10-mei	
4	Mid-term presentation	11-mei	11:00
4	Processing the feedback in the report	12-mei	
4	Processing the feedback in the report	13-mei	
4	**Submission**: mid-term report containing at least Introduction & proposal for contents	**14-mei**	16:00
4	Reviewing mid-term reports and processing the first received data	15-mei	
5	Reviewing mid-term reports and processing the first received data	16-mei	
5	**Submission**: review of 2 other students' mid-term report	17-mei	16:00
5	Discussion: mid-term reports	18-mei	13:30
5	**go/no-go decision**	19-mei	
5	Processing the data in the report	20-mei	
5	**Submission**: preliminary results for report	21-mei	16:00
5	Working on the analysis	22-mei	
6	Discussion: preliminary results for report	25-mei	11:00

6	Combining results in the report, including the results of the survey	26-mei	
6	Combining results in the report and writing a summary	27-mei	
6	**Submission**: draft Summary/report	28-mei	16:00
6	Reviewing summaries/reports of others	29-mei	
7	Reviewing summaries/reports of others	30-mei	
7	**Submission**: review of 2 other students' draft Summary/report	31-mei	16:00
7	Presentation = elevator pitch: conclusions; subsequent discussion	1-jun	11:00
7	Writing the report	2-jun	
		Until	
8	Writing the report	11-jun	
8	Checking for grammatical or contentual errors	12-jun	
9	Checking for grammatical or contentual errors	13-jun	
9	**Submission**: final report (digital version) with plagiarism scan	**14-jun**	16:00
9	**Submission**: self-evaluation (digital version)	17-jun	16:00
9	Preparing the presentation	18-jun	
9	Preparing the presentation	19-jun	
10	Final presentation	21-jun	13:30
11	(if relevant) Addition	28-jun	16:00

Appendix E

The survey is on the next page.

Survey Bicycle Boulevard

This survey contains a few questions on bicycle boulevards and how you, as a cyclist, experience it. The survey will take about 10 minutes to fill in.

*Vereist

1. What is your age? *

_____

2. What is your gender? *

Markeer slechts één ovaal.

- Female
- Male
- Prefer not to say
- Anders: _____

3. Do you have a driver's licence *

Markeer slechts één ovaal.

- Yes
- No
- Prefer not to say

Short explanation: what is a bicycle boulevard

A bicycle boulevard is a street where cyclists have priority over other forms of transport. The car is, as the traffic sign suggests, a 'guest' in this street and it should adjust its own speed to this (maximum of 30 km/h). The bicycle boulevard does not have a legal status in the Netherlands and it can thus be seen as a bicycle path where motorised vehicles are allowed.

Traffic sign bicycle boulevard

Situations

In this part, a few bicycle boulevards will be shown and the request is for you to give a rating considering the safety of the street from the perspective of a cyclist. You are meant to give a rating on the level of safety only based on the figure.
The term 'safety' means in this case: physical safety, or the feeling of a possibility to get injured.

4. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *

A street with mixed pavement and an oncoming car

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

5. Why did you give this rating? [Optional]

Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

6. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *

A street with asphalt pavement

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe											Very safe

7. Why did you give this rating? [Optional]

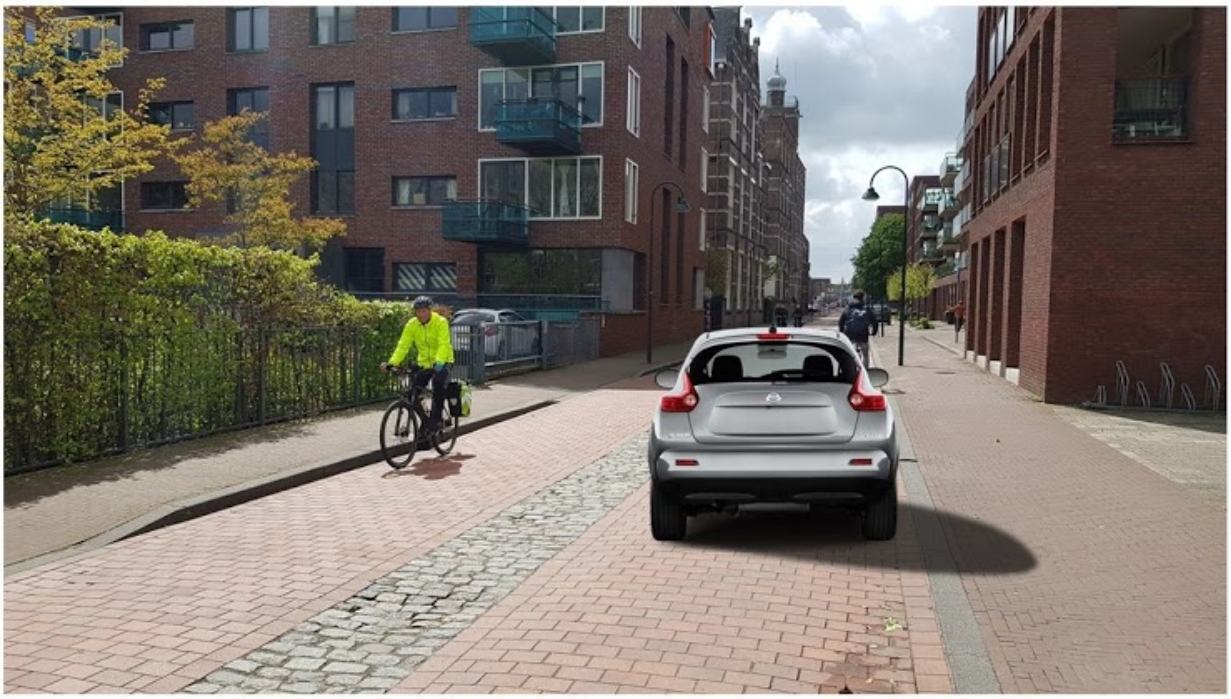
Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

8. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *



A street with brick pavement and a car on your side of the street

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

9. Why did you give this rating? [Optional]

Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

10. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *

A street with asphalt pavement and a car on your side of the street

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

11. Why did you give this rating? [Optional]

Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

12. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *

A street with brick pavement

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe											Very safe

13. Why did you give this rating? [Optional]

Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

14. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *

A street with mixed pavement and two cars going both directions

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

15. Why did you give this rating? [Optional]

Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

16. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *

A street with asphalt pavement and an oncoming car

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

17. Why did you give this rating? [Optional]

Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

18. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *

A street with mixed pavement

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

19. Why did you give this rating? [Optional]

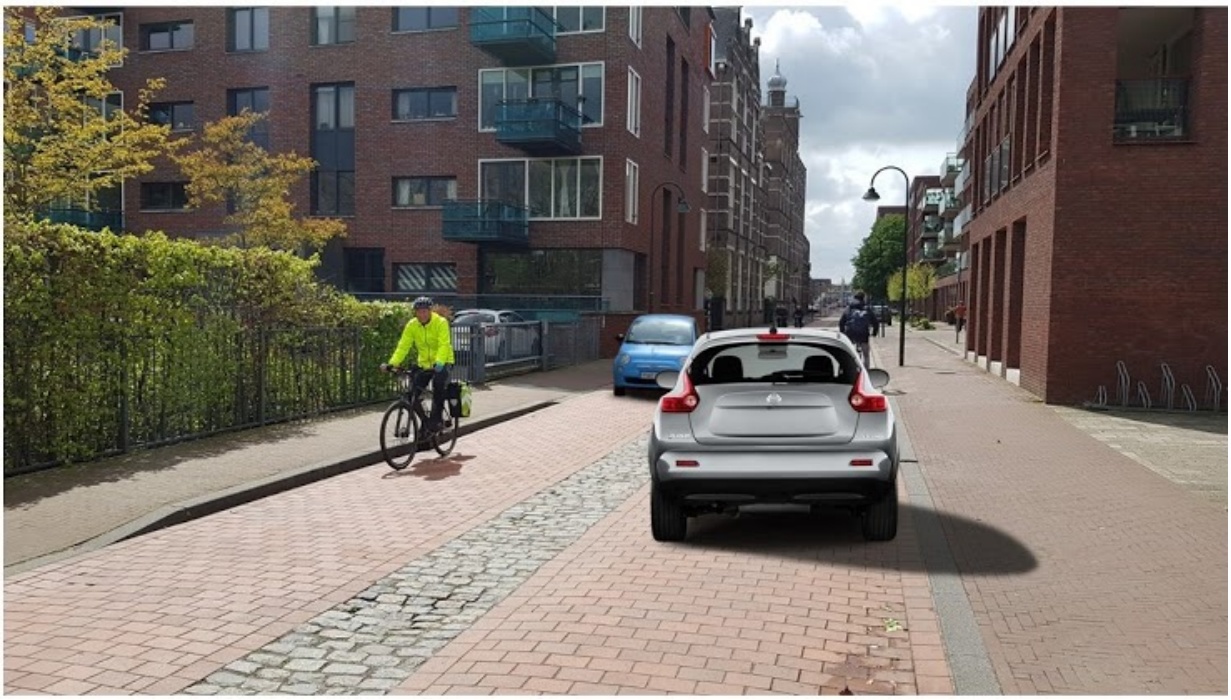
Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

20. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *



A street with brick pavement and two cars going both directions

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

21. Why did you give this rating? [Optional]

Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

22. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *

A street with asphalt pavement and two cars going both directions

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

23. Why did you give this rating? [Optional]

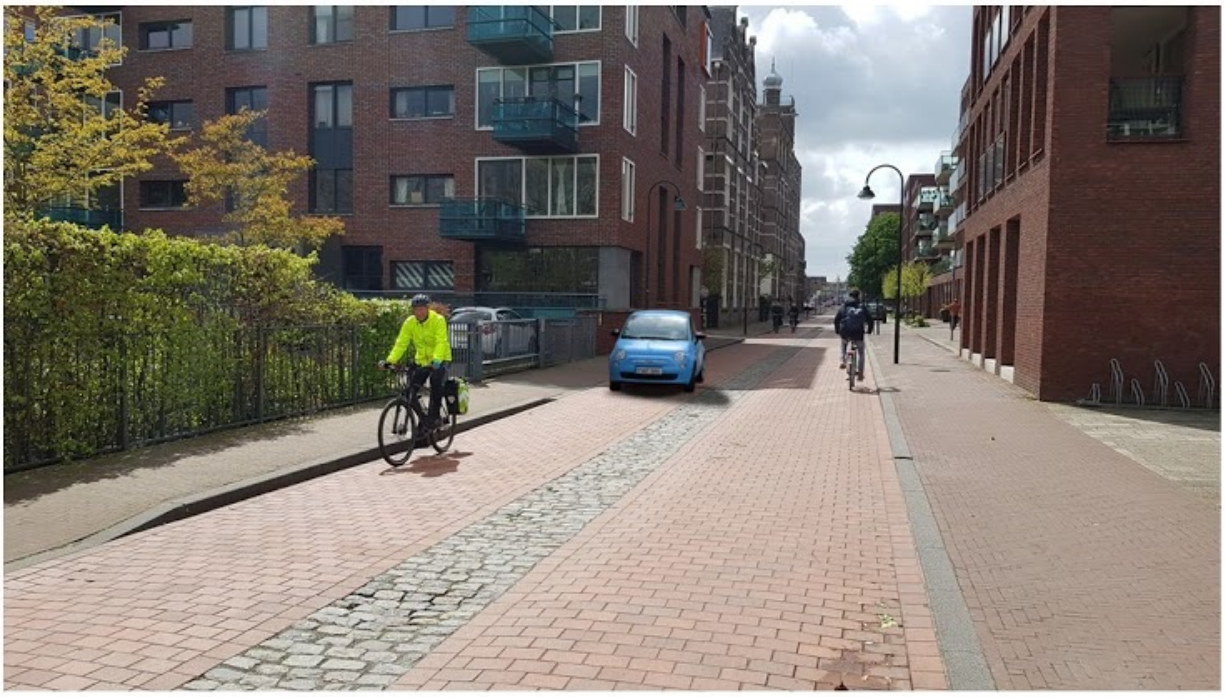
Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

24. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *



A street with brick pavement and an oncoming car

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

25. Why did you give this rating? [Optional]

Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

26. How would you rate the level of safety of this bicycle boulevard as a cyclist? [scale 1 to 10] *

A street with mixed pavement and a car on your side of the street

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	8	9	10	
Very unsafe	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very safe

27. Why did you give this rating? [Optional]

Because the street ...

Vink alle toepasselijke opties aan.

- [ ] is narrow
- [ ] is wide
- [ ] has asphalt pavement
- [ ] has brick pavement
- [ ] has a mix of brick and asphalt
- [ ] has low car intensity
- [ ] has high car intensity
- [ ] has markings
- [ ] has no markings
- [ ] has seperated lanes
- [ ] has no seperated lanes
- [ ] has a positive ambiance
- [ ] has a negative ambiance

Anders: [ ] _____

Bicycle boulevard behaviour

There will be shown two situations where you are asked what you do as a cyclist.

28. A car approaches you as a cyclist from behind on a bicycle boulevard, what do you do? [see figure] *

Markeer slechts één ovaal.

- I will cycle to the side of the street, to make room for the car.
- I stay in the middle of the asphalt lane, because I am on a bicycle boulevard.
- Anders: _____

29. A car approaches you and your friend as a cyclist from behind, what do you do? [see figure] *

Markeer slechts één ovaal.

- We will cycle one after the other, to make room for the car.
- We keep cycling next to each other, because we are on a bicycle boulevard.
- Anders: _____

End of the survey

This was the end of the survey, I thank you for filling in the questions.

30. You can leave possible comments here.

_____

_____

_____

_____

_____