

Cyclist and pedestrian perception in Shared Space

A study on the factors affecting road user safety and satisfaction in shared space, the case of Groningen and Leeuwarden



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Abstract

Many people in Groningen consider the shared space in the Folkingestraat and at Westerhaven the most irritating and dangerous traffic situations in the city. Apparently, perceived safety and satisfaction rates are low in these areas. This is contradictory to the general believe that shared space increases road safety and satisfaction rates among its users. Shared space is a common tool in the toolbox for urban planners and is believed to increase safety and alertness among the users, but there is an important sidenote. If a road is used mainly as traffic throughput and it is no area where people stay for recreation, shared space might be less effective. This research helps planners and academics to broaden their knowledge on Shared space and its implementation in traffic heavy streets with anonymous social relations between its users.

The aim of this research is to find out to what extent and how the characteristics of shared space influence perceived safety and the satisfaction level of cyclists and pedestrians on such streets. The focus of this research is on five different streets in Groningen and Leeuwarden where shared space is represented in different ways.

This is done by comparing these five implementations of shared space. A literature review is done on physical and behavioral characteristics of shared space to compare the cases and highlight the factors that influence perceived safety and satisfaction of pedestrians and cyclists. By conducting interviews among cyclists and pedestrians in Leeuwarden and Groningen with questions about their perceived safety and satisfaction levels and its relationship with different characteristics of the street, data is gathered. The data from this is analyzed qualitatively using Atlas.ti.

The main result from this research is that there is a variety of physical and behavioral factors influencing the perceived safety and satisfaction of cyclists and pedestrians. The most influential factors are a combination of the inattention of pedestrians, comfort, width and presence of the sidewalks, and the presence of pedestrian crossings combined with presence of motorized vehicles. Using the outcome of this study, urban planners can broaden their knowledge of Shared space in areas with high-volume traffic, to prevent a decrease in satisfaction or perceived safety of its users.

Keywords: shared space, perceived safety, satisfaction, high-volume traffic, physical characteristics, behavioral factors

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1. Introduction

Background

Nowhere in the world are people using their bike more than in Groningen. Almost 60 percent of trips are done by bike (Groningen fietsstad, n.d.) and over 25 percent of trips are done walking (CBS, 2020). Cycling and walking are considered forms of active mobility. In Groningen, active mobility is accommodated in various ways. The municipality tries to provide enough parking space for bicycles, give cyclists and pedestrians the right of way on many intersections or road crossings, and employ different separate cycling “highways” to different parts of the city. To accommodate the increase in cyclists and pedestrians in the modal split of the city, adequate and clear policy is needed.

Since the 1970’s, Groningen is continuously trying to reduce the number of motorized vehicles in its city center (Municipality of Groningen, n.d.). One of the projects that was started to give more space to the cyclist and pedestrian is the Astraat. This street was redesigned five years ago, to accommodate the cyclists and pedestrians and to limit motorized vehicles into the city center.

Despite the efforts of the municipality to accommodate modes of active mobility, there are bottlenecks in the flow of traffic through the city. In Groningen, one of the most striking examples of this problem is the Folkingestraat. Before 2017, the street was paved with the yellow stones like the whole inner city of Groningen, with grey blue stones to distinguish the road from the sidewalk. In a news article from the local news website Sikkom (2016), the traffic situation in the Folkingestraat is number two on the list of ten biggest irritations in Groningen. In 2017, the municipality of Groningen responded to the widespread critique on the traffic situation and removed the sidewalks on the first 50 meters on the beginning and the end of the street (Dagblad van Het Noorden, 2017). The argument for this measure is the hope that there will be less incidents between cyclists and pedestrians in this busy narrow shopping street because it eliminates the false feeling of safety created by the sidewalk (Femke Niekerk on RTV Noord, 2017). When people feel less safe, they will be more cautious to their surroundings. This is called a Safety Paradox, where decreasing the clear separation of road and sidewalk to increase the sense of risk will lead to a reduction in the speed of cyclists and increased attention of pedestrians to lower the number of incidents between them.

Another hope the municipality has (expressed by alderman Joost van Keulen (RTV Noord, 2020)) with the creation of shared space in this street is to reduce the number of cyclists, because they hope cyclists will realize this route is not optimal for cyclists (RTV Noord, 2017). By reducing the satisfaction and convenience of cyclists, the municipality hopes that cyclists will take another route into the city center. This stance of the municipality seems contradictory to their promotion of shared spaces in the Astraat and the Folkingestraat. If shared spaces are beneficial for safety and reduction of incidents and this is

the reason the municipality implemented this, why would they also hope the creation of shared space will reduce the number of cyclists in the street? If the number of incidents will decrease (a wish expressed by the municipality), the cyclists will not change routes, even though the municipality aims this as well. Another reason cyclists are not likely to change routes is the fact that the Folkingestraat is one of the main routes into the city center. The Folkingestraat is the main artery from the train station to the Groninger Markten. Just like the Astraat, both locations are shared spaces implemented on an access route into the centre. The stance of the municipality to put the bike first in Groningen (Groningen Fietsstad, 2020) and to create shared spaces as a means to support active mobility and increasing safety and satisfaction does not complement with the measure to discourage bike usage in the Folkingestraat, the main access route to the city center.

As mentioned in the first section, people are disliking some of the shared space streets in Groningen. In addition to the Folkingestraat and the Astraat, there are other locations with shared space implementation which people generally dislike or cause problems. In Groningen, for example the Werkman bridge at the train station. This bridge is used by people that walk from the train station to the inner city. In addition, the number of daily cyclists using this bridge is between 10 and 12.5 thousand cyclists (Gemeente Groningen, 2015). Shared space is not only causing trouble in Groningen. In Friesland, there are reports about the concerns of safety in shared space (Omrop Fryslan, 2019). In Leeuwarden, two main roads from the train station to the inner city are reported to have a high accident rate in the past years. In this list are the Stationsplein and Blokhuisplein in Leeuwarden. Both locations were redeveloped recently from a traditional road with a separate sidewalk and cycling path to a shared space concept. Five years after the implementation of shared space in several parts of Groningen and Leeuwarden, it is interesting to find out if this approach influenced the perceived safety and satisfaction of cyclists and pedestrians, by comparing these cases with each other and find similarities or differences in terms of their physical characteristics, the behavior of the users, and the perceived safety and satisfaction experienced by cyclists and pedestrians.

In addition, are cyclists using alternatives routes instead of the shared space, as the municipality of Groningen hopes, or are main access roads just too important for cyclists and pedestrians to avoid? This research aims to find out if, how, and to what extent the characteristics of shared space influence perceived safety and the satisfaction level of cyclists and pedestrians on the streets in five different locations. It also investigates the willingness of cyclists to use these routes or if they opt different routes.

Societal Relevance

This research has societal relevance because it tries to link the perceived safety and satisfaction rate of users in shared spaces on access roads to physical characteristics and user behavior on the roads. Shared spaces are generally considered places people like to be in and feel safe (Anvari et al., 2015). Because this does not seem to be the case in some of the cases in Groningen and Leeuwarden, the aim of this

research is to find the reasons for this. Groningen tries to stimulate active mobility in the inner city and advocates that they are a city for cyclists and pedestrians, but the case studies might suggest otherwise based on the high reports of incidents or low satisfaction rates. With this research, insight can be gained on the usefulness of shared space and if these implementations of shared space might be counterproductive to the aim of the municipality to promote active mobility. It can give insight to which characteristics lead to increased perceived safety and satisfaction and whether improvements are needed to increase satisfaction and perceived safety. Improved safety and satisfaction in itself are also a benefit to society in general.

Research into shared spaces and the possible downsides attached to it can also be a valuable insight for planners and cities that want to implement shared spaces in busy access roads. With the five cases being busy access roads directly to the inner city provides a good basis for this research. The outcome of this research can help city planners and municipalities in cycling heavy cities to understand what characteristics of shared spaces contribute to increased satisfaction and safety for road users.

Scientific Relevance

In a contribution to the WALK21 conference, Methorst et al. (2007) point out that questions can be asked on whether the shared space approach can be implemented successfully on traffic arteries and if there might be barrier effects arising. The five cases in this research are on main access roads to the city center, for cyclists as well as pedestrians. This makes them suitable for further research into the subject of shared space on access roads as pointed out in previous sections. Methorst et al. (2017) also question the shared space approach in a metropolitan area, where traffic is more hectic and social relations are more anonymous. One might argue this is also the case in the present case studies, traffic heavy streets with an anonymous social relation between the users of the street.

Because shared spaces have become a common tool in the toolbox for planners in many countries (Barr et al., 2021) , but Lutz & Voorthuis (2011) suggest that shared space only works if the area is not primarily used for traffic throughput, it is beneficial to the field to research possible shortcomings and caveats to shared space and under which conditions it might or might not work as expected. This thesis aims to find out what characteristics of shared space influence perceived safety and the satisfaction levels of cyclists and pedestrians on these roads.

Shared spaces have become a common tool in the toolbox for planners in many countries (Barr et al., 2021). City planners are under the impression that shared space is a concept that often works and automatically reduces incidents and increases subjective safety. Literature shows that shared space often increases safety (Lee & Kim, 2019; Luca et al., 2012), so research on the possible limitations of shared space and conditions under which shared space will or will not work can add valuable information for academics.

Research problem

This research aims to find out to what extent and how the characteristics of shared space influence perceived safety and the satisfaction level of cyclists and pedestrians on the streets in five different locations. It also investigates the willingness of cyclists to use these routes or if they opt for different routes.

Considering this research aim, the following main research question is formulated.

- ***Which characteristics of shared space influence road users' perceived safety and satisfaction?***

The main research question is divided into a set of sub-questions. These sub-questions will help to answer the main question.

The first two sub-questions aim to compare the cases that are researched and if there are any differences in satisfaction level and perceived safety of road users on these streets:

- *Is there a difference in satisfaction level between the five case studies?*
- *Is there a difference in perceived safety between these case studies?*

The third and fourth sub-question focus on the road design characteristics and how these influence the satisfaction level and perceived safety of road users:

- *Which physical and behavioral characteristics of shared space, and to what extent influence the satisfaction of road users in shared spaces?*
- *Which physical and behavioral characteristics of shared space, and to what extent, influence the perceived safety of road users in shared spaces?*

Combined, these questions should help answer the main question and to draw conclusions to what characteristics influence the satisfaction and perceived safety of road users. In addition, the final sub-question will answer the willingness of cyclists to use the shared space, or if they rather opt for a different route without shared space.

- *Are users willing to use this shared space, or do they rather travel through other streets?*

The main question, together with the sub-questions, will help fulfil the aim of this research and answer the main research question.

Thesis outline

After this introduction chapter, the rest of this thesis is presented as follows. Chapter 2 starts with the theoretical framework, explaining the main concepts used in the research. This will be followed by the conceptual model and the hypothesis. The methodology, including the interview guide and coding tree for qualitative data collection and analysis, data quality and ethical considerations are covered in the 3rd chapter. In chapter 4, the result of the study is discussed including connection with existing literature. The thesis will end with the conclusion with limitations, policy recommendations and possible options for future research in the final in the 5th chapter.

2. Theoretical framework

To investigate different characteristics and their influence on perceived safety and satisfaction of cyclists and pedestrians in shared spaces, some concepts need to be defined first. The main concepts in this thesis are shared space, cyclist and pedestrian satisfaction and perceived safety. Under these headings, factors will be explained that influence these. After that, the factors that influence the perceived safety and satisfaction will be explained. The factors that influence both satisfaction and perceived safety are in a separate section below both concepts. These factors together will result in the conceptual model.

2.1 Shared space

Shared space is defined as a road where different types of traffic share the same street (Barr et al., 2021). In shared space, users negotiate their way across the street, using a set of unspoken rules (Hamilton-Baillie, 2008). They interact with other street users based on social protocols. According to Beitel et al. (2018), streets that make use of shared space are generally “designed to improve pedestrian movement and comfort by reducing the dominance of motor vehicles and enabling all users to share the space rather than follow the clearly defined rules implied by more conventional designs” (Beitel et al., 2018). In practice, this means shared space are often streets where there is an absence of clear signage, there is no clear distinction between the street, cycling paths and sidewalks and all the users of the street can move freely along the street.

In this thesis we divide road users into 3 categories, pedestrians, cyclists, and motorized vehicles. The focus of the research is on pedestrians and cyclists, but since cars, busses, or fast scooters are allowed in some of the cases that are researched, it is important to take into consideration their existence and the influence they have on perceived safety and satisfaction.

2.2 Cyclist and pedestrian satisfaction and factors affecting it

In this research, the concept of satisfaction is used. This refers to how satisfied cyclists and pedestrians are when using the street. The satisfaction of cyclists and pedestrians is influenced by different factors. The main factors found in different studies are explained below.

Comfort

Comfort is a subjective feeling of pleasure and being relaxed. Research from Calvey et al. (2015) states that comfort influence satisfaction about a route. This suggests that there is also a relationship between the comfort of cyclists and pedestrians and the perceived safety. Comfort is also mentioned by Lee et al. (2021), as a factor that can influence the satisfaction of pedestrians.

Speed of cyclists

In the research by Gkekas et al. (2009), pedestrians reported that the speed of cyclists was a factor that contributed to accidents. These accidents negatively affected the satisfaction for both cyclists and pedestrians. Research of Beitel et al. (2018) and Loukaitou-Sideris et al. (2014) also suggest that the speed of cyclists is a major contributing factor to the number of accidents. This research was done at university campuses, where the speed is low, and the volume of cyclists and pedestrians is high.

Inattention of pedestrians

Research by Gkekas et al. (2009) indicates that there is a high frequency of incidents between pedestrians and cyclists in high-volume non-motorized shared space. These incidents often lack injuries, but they still affect the satisfaction levels of cyclists and pedestrians (Gkekas et al., 2009). Both cyclists and pedestrians agreed that the main factor contributing to these pedestrian-cyclist incidents are the lack of attention pedestrians pay (Gkekas et al., 2009). Loukaitou-Sideris et al. (2014) also found that the inattention of pedestrians was a major factor in incidents between cyclists and pedestrians. In their article, they state that the “survey respondents strongly complained about behavioral characteristics such as inattention and excessive speeding”. That suggests that the fear for these incidents, accompanied by the inattention of road users can influence the satisfaction of both cyclists and pedestrians.

Perceived safety

Research done about the perception of safety of cyclists in Dublin City found that cyclists prefer a street that are perceived as safe (Lawson et al., 2013). In addition, Calvey et al. (2015) also found that the road users' perception of safety can influence their satisfaction. This suggests that there is also a relationship between the satisfaction of cyclists and pedestrians and the perceived safety.

2.3 Perceived safety and factors affecting it

In the literature, different terms are used, but subjective safety and perceived safety are the most common. Perceived safety is a subjective measure of safety defined by the users of the street. It is a personal feeling of safety, that is determined by experiences and observations while using the street (Vlakveld et al., 2008). These experiences and observations consist of contact with other street users, own observations, and information from others. The perceived safety of cyclists and pedestrians is influenced by different factors. The main factors found in different studies are explained below.

Presence of motorized vehicles

Motorized vehicles cause the majority of road accidents, and “More than half of all road traffic deaths are among vulnerable road users: pedestrians, cyclists, and motorcyclists.” (WHO, 2021). The influence of motorized vehicles on cyclists and pedestrians is significant. Research from Broach et al. (2012)

suggests that cyclists are very sensitive to how busy the traffic is, especially when there are no clear cycling paths on the road/street. Cyclists consider cycling on streets with a lot of other traffic dangerous, which indicates that the perceived safety of cyclists is lower in busy streets. In shared space, motorized vehicles are often not present. If they are, their speed is reduced, and they are not the main users. Although presence of motorized vehicles and its effect on perceived safety has been repeatedly studied, the effect of motorized vehicles in shared space with high number of cyclists and pedestrians on perceived safety has not been studied widely.

Width of the street

Interviews assessment in the study of Lee and Kim (2021) found that the width of the street affects perceived safety. A majority of respondents in their research (14 out of 23) indicated that the width of the street influenced their evaluation. Street A was narrower than street B and C, skewing the research to favor street B and C. The respondents indicated that they would have felt safer in street A if the street would have been wider.

Dedicated cycling lanes

Literature about the presence of separated cycling lanes is conflicting. Research from Winters et al. (2012) suggests that cycle paths that are physically separated from the major road are perceived as less safe than bike lanes along major roads. However, research from Sorensen and Mosslemi (2009) found that physically separated tracks increase the subjective safety of cyclists. This is also found by Jensen et al. (2007), found that cyclists safety perception increases when tracks are separated. Research by Baloch (2017) also found that subjective safety of cyclists decreases when there is a lack of dedicated cycling facilities. This research will find whether this is also true for shared space, since shared space often produces calmer and more aware traffic it might result in a higher perceived safety, although dedicated cycling lanes are not present.

Presence of sidewalk

Lee and Kim (2021) conducted a virtual reality study in Pedestrian Priority Streets in Seoul. PPS is a street design that, just like shared space, aims for mutual consideration between pedestrians and drivers. In the study, three types of sidewalks were researched. Type A had uniform asphalt without suggestion lanes for pedestrians (similar to the Werkman bridge in Groningen and the Stationsplein in Leeuwarden), type B had suggested lanes using a different color of asphalt (similar to the other cases). Type C had a clear designated area for pedestrians to walk at, although still on the same height. Lee and Kim (2021) found that people felt safer in street B & C, suggesting the presence of (clearly) suggested pedestrian lanes is preferred.

Coloring of the streets

Tied into the section above, there is also the coloring of the street. In shared space, the coloring of the street is often partially or completely the same color, indicating that pedestrians, cyclists, and motorized vehicles all share the same space. In the research of Lee and Kim (2021), the coloring on road types A and B is similar to the road types presented in the cases in this research. Therefore, it would be interesting to investigate if the coloring of the street influences the satisfaction or perceived safety of users and make comparisons.

2.4 Factors that influence both satisfaction and perceived safety

Width of sidewalks

The presence and size of sidewalks also affect the satisfaction of pedestrians. This was shown in research by Lee et al. (2021). The study shows that the installation of separate sidewalks can improve pedestrian satisfaction. This suggests that the presence of sidewalks influences the satisfaction of pedestrians. This observation is supported by research conducted by Wu et al. (2020). In their research, the width of pedestrian lanes positively correlates with a higher feeling of safety.

High traffic volume

The five different cases that are researched in this thesis are all roads with a high throughput of traffic, either with or without motorized vehicles allowed. The Astraat leads from the west of the city into the city center, the Werkmans bridge is the access road over the water from the train station. The Folkingestraat is also on the same route into the inner city. In Leeuwarden, the Stationsplein is the square in front of the station, leading into the inner city. The Blokhuisplein in Leeuwarden is an access road that leads from the station around the city center. Therefore, it is important to research the effect it has on the perceived safety and satisfaction. Because these access roads all lead into the city center, they are often the busiest routes with a high volume of traffic. Research from Lawson et al. (2013) done on the perception of safety of cyclists demonstrates that cyclists prefer roads that are quieter and less busy. The user feedback suggests that alternative routes should be facilitated when roads become too busy (Lawson et al., 2013).

Presence of pedestrian crossings

The presence of pedestrian crossings can have a big influence on the safety of pedestrians in traffic (Bian et al., 2009). The article found that the perception of safety and comfort are related to the presence of crossing facilities. According to Pascussi et al. (2015), "Pedestrians try to reach their destination according to the principle of the shortest path while avoiding discontinuity points." In shared space, pedestrians can take a shortest path without using pedestrian crossings. This suggests that the presence or absence of dedicated pedestrian crossings may influence perceived safety and/or satisfaction of the

pedestrians. Cyclists are also affected by the presence of crossings because it can create a clear expectation where pedestrians might cross the road.

Traditional traffic rules

Traditionally, road users are guided by signage on the road. The presence of signage gives a clear sign to the road users where they must be on the road, or if they must stop or give right of way. In shared space, signage is often lacking (shared space, 2015). The lack of signage is intentional, to let the road users leverage their way through (Hamilton-Baillie, 2008). Hamilton-Baillie (2008) states that the absence of clear signage in shared space influences traffic, leading to a calmer traffic flow and reduction in serious injuries. This suggests that the absence of signage also may influence the perceived safety and satisfaction.

Gender

Research of Cordellieri (2016), a study on gender effects in road safety in young adults between 18 and 22, suggest that women are more worried than men regarding risk perception in traffic. According to Carrol et al. (2020), research suggest that there are clear gender differences in the relationship between bicycle infrastructure and safety. Safer infrastructure seems to be more important for women than for men. In addition, Garrard (2003) states that safety concerns have different impacts on women, because they have higher levels of risk aversion. This is also supported by further research from Garrard in 2006, that shows that women have lower levels of bicycle confidence (Garrard, 2006). These different papers suggest that there is a gender difference in perceived safety, which might also influence the satisfaction of women in these streets.

2.5 Conceptual model

Based on the factors identified in the previous section, a conceptual model can be constructed. The conceptual model as shown below (see figure 1) is a visual schematic overview of the factors studied in this research and the relationships between them. The identified factors in the theoretical framework are divided between physical characteristics, behavioral factors, and socio-demographic variables. The central concepts in the model are perceived safety and satisfaction. These concepts are both influenced by a variety of things, physical characteristics as well as socio-demographic variables and behavioral factors. Perceived safety can also influence the satisfaction, so there is also a connection from perceived safety to satisfaction.

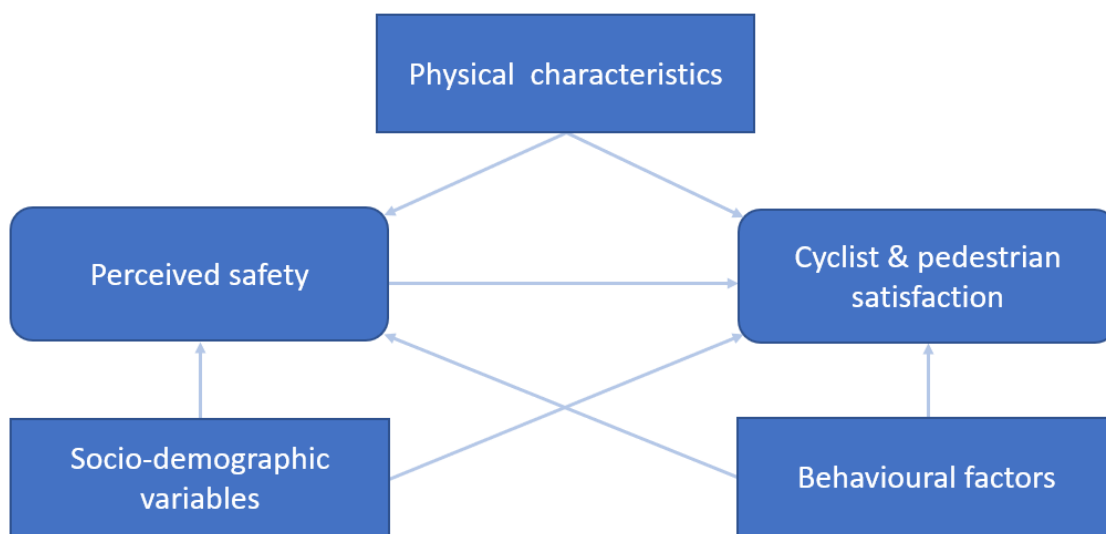


Figure 1: Conceptual model

Expectations

This research is conducted with an open mind to find out what characteristics influence the perceived safety and satisfaction. Since little research has been done regarding the influence of these characteristics on the concept of Shared space, especially on roads with high traffic volumes, it is not easy to formulate specific expectations. The different characteristics discussed in this chapter are proven to influence satisfaction and perceived safety on specifically researched roads. It is expected that these characteristics, physical, socio-demographic, and behavioral, influence the perceived safety and satisfaction levels of cyclists and pedestrians in Groningen and Leeuwarden. In addition, it is also expected that perceived safety itself will influence the satisfaction of both cyclists and pedestrians.

3. Methodology

This chapter will explain how this research has taken place. This section will contain the choice of research methods, the type of data collection, target group, ethical considerations, and the coding tree. After that the case studies will be described.

In this research, qualitative data gathering methods have been used. In order to collect data about the perceived safety and satisfaction, cyclists and pedestrians in the five case locations were asked to answer questions about the streets and their experiences. A semi-structured interview guide was created beforehand, to make sure every interview contained approximately the same output of information to use in the thesis. 20 interviews were conducted with people using the streets described in the case studies. There are five cases, so four interviewees per street were asked to be interviewed. For every street two pedestrians and two cyclists are interviewed. Some interviewees had experience both cycling and walking in the streets, commented on experiences using the other mode of transport as well.

The chosen method of qualitative, semi-structured interviews is applicable, because the perceived safety and satisfaction of pedestrians and cyclists are mostly subjective. A widely used technique to get understanding of the subjective experiences of groups of people is through interviews (Pessoa et al., 2019). There are several types of interviews, structured, semi-structured and unstructured interviews. A structured interview is too strict, because if any interesting new information arises during the interviews, there is limited options to anticipate. Unstructured interviews are not optimal in this research either, because that would prevent the researcher from specifically gathering the needed information to draw conclusions to answer the research questions. After considering all the options, semi-structured interviews were deemed the best option.

Because semi-structured interviews allow for a certain amount of structure, questions can be asked specifically about important elements or concepts. The advantage these types of interviews have is that it also allows for more freedom during the interviews, when interesting points are addressed by the interviewee. This method will also help the use of mixed methods, combining inductive and deductive methods. Because the interviewer cannot fully comprehend the way cyclists and pedestrians perceive the safety and satisfaction beforehand, the interviewer might need to adapt the questions, if different interviewees provide the same interesting information deviating from the predetermined questions. This way, the interviewer keeps the topic of the research in mind, to make sure enough data is gathered for the research but keeps enough space to ask to dig deeper in new information coming forward during the interviews (Clifford et al., 2016).

Appendix 1 contains the interview guide. This is an overview of the questions from the interviews with pedestrians and cyclists. These questions are used as a guidance. It may be possible questions are asked in a different order or in a slightly different way to suit the context of the interview. Follow-up questions

may have been asked about an important aspect that arose during the interviews, these questions are not visible in the interview guide. These are visible however in the transcriptions.

Target group

The respondents for the interviews consisted of students in Groningen and Leeuwarden, within the age group 18-25. Because both Leeuwarden and Groningen are so called student cities, a high number of students are living in these cities. They are likely to travel through the city, as well as through these areas. Because students are generally between 18-25 years old, they are likely to travel through the city either by foot or by bike. In addition, students from urban campus' are likely to use modes of active transportation, such as bicycling and walking (Nordfjærn et al, 2019). Also, students that do not live in the cities are likely to use the areas, because they have to travel from the train station to the university buildings within the city.

Data quality

A total of 20 interviews were conducted, divided evenly between the five different locations. This means there were four interviewees on every location, whereof 2 traveled by bicycle and 2 traveled by foot. Enough different road users were interviewed to draw a general conclusion about their experiences, perceived safety, and satisfaction on these roads. In addition, to get a representative group regarding gender, 12 interviewees were male, while 8 interviewees were female.

The sampling strategies that were employed are a combination of three different non-probability sampling methods: convenience, snowball, and opportunity sampling. For the researcher, this is fast, cheap, and convenient way to gather interviewees for your research from an available pool of respondents. For this research, peers from different university faculties were asked to participate, which is a form of convenience sampling. They were also asked if they know people that want to participate (snowball sampling). Finally, some of the interviewees were recruited by asking people on the street if they want to participate.

Ethical considerations

In research, different ethical considerations must be made. Most of the ethical problems can arise during data collection. As mentioned, this research involves qualitative research methods. In the interviews, participants were be informed about the purpose and intended use of the interviews. They will have the right to withdraw their interview at any time. If there is confidential information involved, this will be respected and not shared with other parties. Also, the participants of the interviews have been sent a consent form through email beforehand or presented a consent form before the interview (see appendix 2). In this way, the participants know about their rights to withdraw and the anonymization the data.

Most of the interviews were recorded. The interviewees were asked if they are opposed to recording the interview. If they did not feel comfortable or did not want their interview to be recorded for other reasons, the interview was done by taking notes on a laptop and discussing questions more structurally. The recordings are saved locally on the computer of the author of this thesis. The recordings are deleted after the coding process is complete. The interviewees were asked to put their (first) name on the consent form, but it was not a prerequisite to take part in the interview, because the name or identification of individual interviewees does not provide additional value for this thesis. All of the interviewees agreed to put their name on the consent form and had no opposition to use their name in the interview. However, names are left out because they do not have additional value to this research. The names are present in the transcriptions, before the transcript of each interview, along with their gender, type of transport and location.

Coding tree

Interview coding

The interviews are recorded, transcribed, and translated to English. The Atlas.ti 22 software is used to code and analyze the interview transcripts (see appendix 3). The interviews are analyzed using a combination of deductive and inductive coding. The coding is based on the coding tree visualized below (see figure 2). The coding tree consist of deductive codes (indicated in blue), a top-down approach with codes that emerged from the literature review. Like in the conceptual model, these codes are divided in three groups of characteristics, socio-demographic, behavioral and physical. The inductive codes (indicated in green) are themes that emerged during the interviews. These are themes that were deemed important to talk about by multiple respondents. For every different type of characteristic, socio-demographic, behavioral and physical, codes were identified. Apart from gender, every code in the coding tree was labeled with a negative and a positive value. Using these values to code the text in Atlas.ti, the perception of cyclists and pedestrians on these different characteristics can be identified.

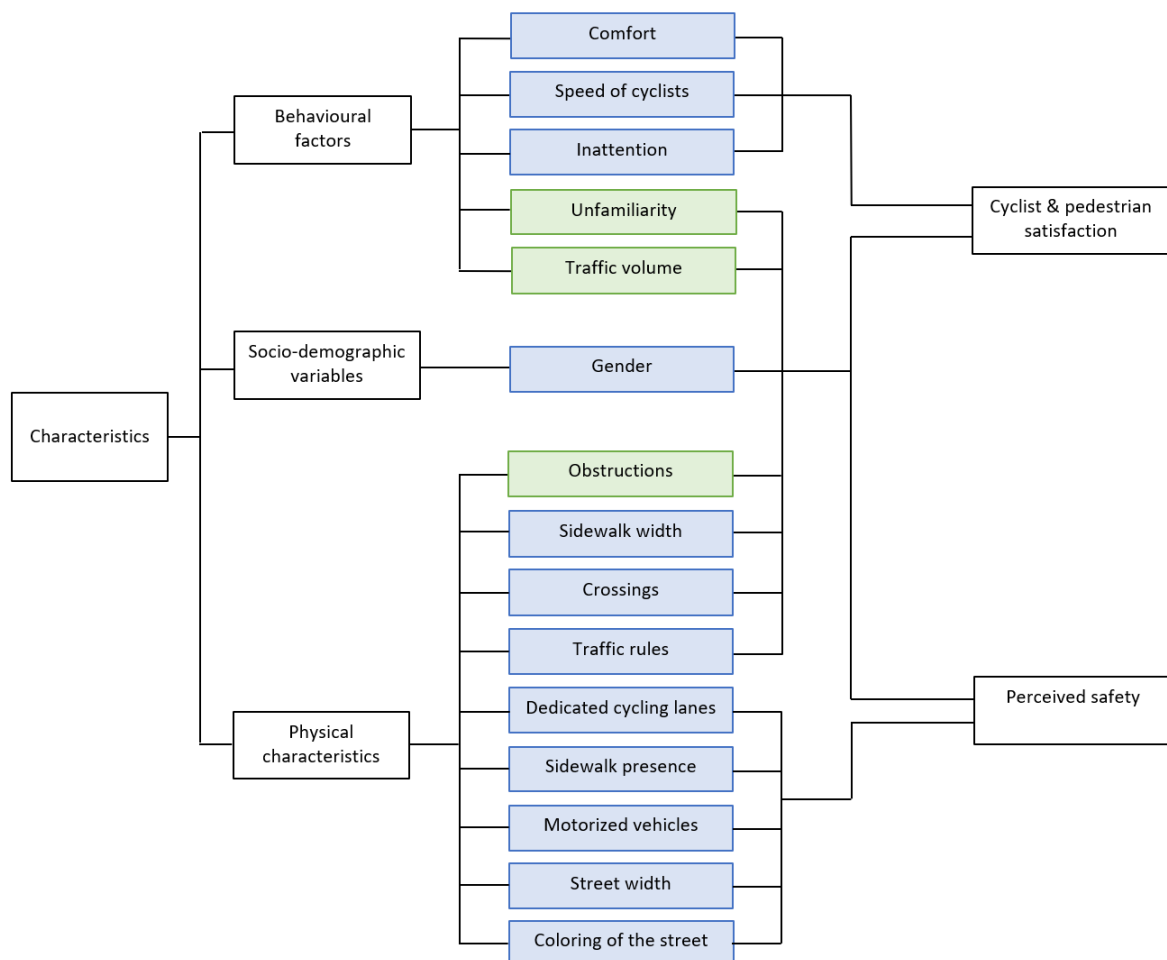


Figure 2: Coding tree

Introducing the case studies

This section will consist of an overview of every case, their characteristics and how they distinguish them from each other, including pictures. For this research, five different streets have been selected that all consists of shared space, but with different characteristics. The expectation is that the perception of safety and satisfaction of the users will differ. The cases are selected by researching shared spaces within the city of Groningen and Leeuwarden.

Folkingestraat Groningen

The Folkingestraat is located in the city center of Groningen. The street leads to the inner city, leading from the train station to the vismarkt. The street is redesigned in 2017 from a normal road to shared space. The outline of the sidewalks is still there but it is a suggestive marking, lowered to the level of the street. The street is designed to be used by both pedestrians and cyclists, so it is legal for pedestrians to walk in the middle area. There are no pedestrian crossings and cars are not allowed in this street, apart from unloading and loading for shops.



Figure 3: Folkingestraat (Google, 2018)

Westerhaven/aweg Groningen

This is the street at the intersection at the Westerhaven shopping area towards the inner city. This area was also transformed by the municipality, the project was completed in 2018. This 2-way street is still accessible for cars, so the allowed users of this street are the same as in every normal street in the city. The pedestrian areas are more explicitly suggested on this street, with big concrete planters for trees. The road for cars and cyclists is visually narrowed by these planters to limit the speed. No pedestrian crossings are present on this street, but cars are allowed.



Figure 4: Westerhaven/Astraat (Google, 2020)

Werkman bridge to train station Groningen

The bridge that connects the train station with the city. This bridge is one of the main routes that pedestrians and cyclists take from the station into the city. Cyclists are often going at a rapid pace here and pedestrians are walking very wide next to each other. There are no markings on the road to suggest the appropriate the place the users have to be moving in. Users are allowed to cycle, walk or use their moped on this bridge. Cars are not allowed and pedestrian crossings are not present.

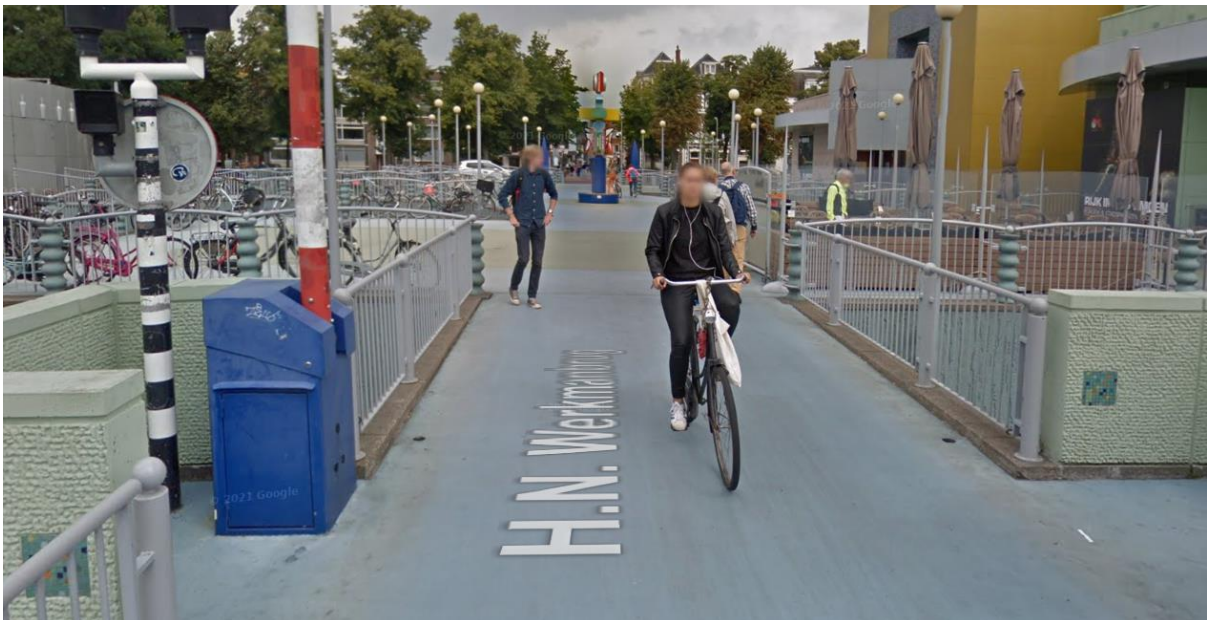


Figure 5: Werkman Bridge (Google, 2017)

Stationsplein Leeuwarden

This location is a square in Leeuwarden in front of the train station. This route leads from the station into the inner city, through a shared space corridor. This area was redeveloped in the last few years, from a road with cars and busses to a shared space square where cars are partially allowed. The square functions as a corridor from the main station to the city center. Cars and busses are still allowed to be in front of the station. Cyclists and pedestrians share the route towards the city center that culminates to this square. There are crossings available to access the station for pedestrians and cyclists. This is a hybrid version, because the square itself is accessible for cyclists and pedestrians, but it ends in a blend between the square and a street for cars and busses.



Figure 6: Stationsplein (Google, 2021a)

Blokhuisplein Leeuwarden

Street located at the south-east of the inner city of Leeuwarden. It leads from the train station around the inner city of Leeuwarden. This street allows pedestrians, cyclists and car traffic. There is no designated cycling path, so the cyclists cycle on the same part as the pedestrians. The road is paved consistently, with a suggestion line for cars. There are two pedestrian crossings available.



Figure 7: Blokhuisplein (Google, 2021b)

As shown in the case descriptions, these five streets are all shared space, but they differ on certain aspects. In two locations cars are allowed (Blokhuysplein and Westerhaven), where one location provides pedestrian crossings, and one does not. In two locations (Folkingestraat & Werkman bridge) are no cars allowed. The Werkman bridge completely lacks markings on the road and both road user types have to figure out how to behave in traffic, without suggestion markings. In the Folkingestraat, the street is completely level but there is a line that suggests the place for pedestrians and cyclists, although it is not prohibited to use the whole road. The final location, Stationsplein Leeuwarden, is a mix of both. It consists of a shared square for pedestrians and cyclists, which ends into a bigger square where traffic is allowed in front of the main station. There are crossings available for pedestrians and cyclists, and the separation of traffic is clearer.

Research Framework

Figure 8 below shows the steps taken in this research.

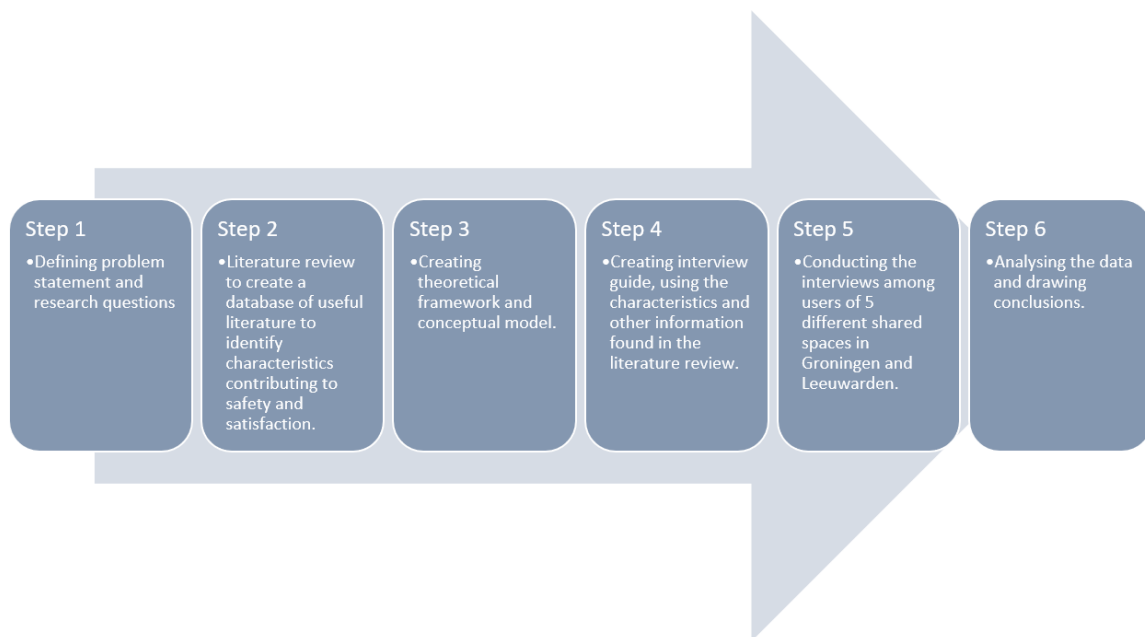


Figure 8: Research framework

4. Results & Discussion

The results of data collection will be discussed in this chapter. The chapter will comprise of the results of the interviews, what factors were talked about and what factors were considered less important for perceived safety and satisfaction. After discussing the results, every section is linked with the literature review or other existing literature. The most surprising outcomes will be discussed and explained more thoroughly. The factors will be weighed against the literature and the factors that were contradictory to the literature will be discussed further using (new) literature to interpret and explain these contradictions.

4.1 Descriptive statistics

In total, there were 20 respondents participating in the interviews. 60% of respondents were male, while 40% of the respondents were female (see figure. 9a). Although age group is not reported, all respondents fell within the age group of 18 to 25 years of age, that was determined earlier. Furthermore, the 50% of the respondents reported as cyclists, the other 50% reported as pedestrian (see figure 9b). Although multiple respondents frequently used the roads both for cycling and walking, the interviewee was assigned the role of either pedestrian or cyclist. All of the respondents had the Dutch nationality.

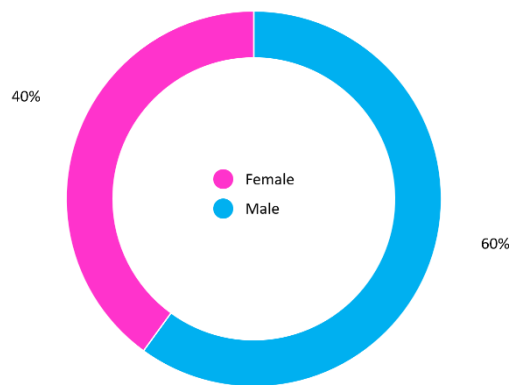


Figure 9a: Gender division of sample

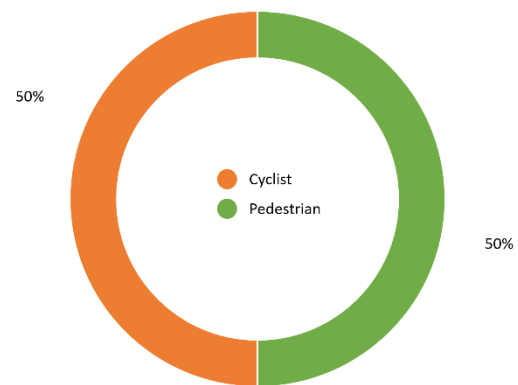


Figure 9b: Mode division of sample

In the table below (table 1), a short overview of each interviewee is presented with the location where they were interviewed, their age, gender, and their mode of transport.

Interviewee	Location	Mode of transport	Gender	Age
Interviewee 1	Astraat	Cyclist	Male	25
Interviewee 2	Astraat	Cyclist	Female	19
Interviewee 3	Astraat	Pedestrian	Female	19
Interviewee 4	Astraat	Pedestrian	Male	24
Interviewee 5	Werkman bridge	Cyclist	Female	20
Interviewee 6	Werkman bridge	Cyclist	Male	24
Interviewee 7	Werkman bridge	Pedestrian	Male	23
Interviewee 8	Werkman bridge	Pedestrian	Female	22
Interviewee 9	Folkingestraat	Cyclist	Male	23
Interviewee 10	Folkingestraat	Cyclist	Male	22
Interviewee 11	Folkingestraat	Pedestrian	Male	24
Interviewee 12	Folkingestraat	Pedestrian	Male	21
Interviewee 13	Blokhuisplein	Cyclist	Male	21
Interviewee 14	Blokhuisplein	Cyclist	Female	18
Interviewee 15	Blokhuisplein	Pedestrian	Male	21
Interviewee 16	Blokhuisplein	Pedestrian	Female	24
Interviewee 17	Stationsplein	Cyclist	Male	23
Interviewee 18	Stationsplein	Cyclist	Male	19
Interviewee 19	Stationsplein	Pedestrian	Female	22
Interviewee 20	Stationsplein	Pedestrian	Female	20

Table 1: General information on participants

4.2 Content analysis

4.2.1 Cyclist and pedestrian satisfaction

While coding, several codes were identified that said something about the general satisfaction. The codes ‘satisfaction with shared space’ and ‘satisfaction with the street’. Combined, these codes were identified 24 times in 14 different interviews. The most satisfied users were the users on the Stationsplein and Blokhuisplein, with 3 out of 4 respondents being satisfied with either the street in general or the shared space in particular. This is illustrated best by interviewee 19 (Stationsplein), who talked about the improvements shared space brought since the renovation of the street: *“Yes, it looks nice. I pass it often [arriving] from the train station and I live near here. It’s a big improvement from*

the old situation and it's a much nicer street now”, and by interviewee 16 (Blokhuisplein), when asked about possible improvements to increase their satisfaction: *“I don't really have any suggestions, it's a nice place to be in. You can walk quietly, and I don't feel rushed. I am satisfied.”*. The respondents in the other 3 locations were generally more negative about their satisfaction. The only positive responses were from interviewee 4 (Astraat) when asked about the comparison with the way the road used to be: *“I do think this is nicer as it is now. The situation does make you think as a cyclist or motorist that you should slow down.”* And interviewee 11 (Folkingestraat): *“I think it is a nice street because there is always something to do”*. The less satisfied interviewees were mainly mentioning that they did not like the lack of traffic rules, they thought the concept shared space was not implemented in the right way or they thought that the situation was perceived unsafe, which lead to the dissatisfaction. This will be discussed more elaborate in the section about perceived safety.

4.2.2 Factors that influence satisfaction

Comfort

The first factor that influences the satisfaction of road users is comfort. In the different cases, there were different levels of comfort. Mainly the cases in Leeuwarden, Blohuisplein and Stationsplein, had high reports of comfort, while the cases in Groningen showed a reduced level of comfort. For example, interviewee 20 said that she felt comfortable because: *“its very spacious, so you can just walk and cycle [freely] there”*. This was also acknowledged by interviewee 19 in the same street: *“I do feel comfortable. It's a wide, open space with plenty of room”*. This higher level of comfort also leads to higher feelings of satisfaction, which were caused by the open and spacious look of the road, with plenty of space to move around. In the cases in Groningen however, the interviewees felt that the streets were less comfortable. In Leeuwarden, the interviewees were very positive on their comfort levels, while in Groningen the interviewees were either neutral or negative. There is no interviewee in Groningen that indicated high levels of comfort, only neutral comments like interviewee 4, who responded with: *“Yeah its fine”*, and interviewee 9, who said that they feel comfortable on their bike, but you still have to stay vigilant to avoid an incident. Other interviewees said they felt elated or disappointed when walking to the street, and the overall busyness affecting their comfort and satisfaction when using the street. Comfort was specifically addressed in the interview guide. Because comfort is a clear indicator for satisfaction in the literature, as stated by Calvey et al. (2015) and Lee et al. (2021), this is one of the most important factors to consider when trying to indicate the influence on satisfaction in these cases.

Speed of cyclists

The speed of cyclists was one of the factors that was not really an issue with most of the interviewees. 16 of the interviewees mentioned the speed, while only 3 had critical remarks on their speed. These remarks were reported by interviewee 12 (folkingestraat): *“Walking on the road is difficult because electric cyclists pass through at a considerable speed”*, interviewee 3: *“except for the delivery people*

who ride their electric bicycles all over the place”, and 19 (stationsplein): *“Sometimes cyclists do go a little fast. It is the route to the station anyway so maybe they are in a hurry”*. One of the interviewees said that the speed is probably high because it is the route to the train station. The other two interviewees stressed the fact that it is mostly electric bikes that go too fast. Apart from these three negative reports on the speed of cyclists, there were only neutral responses, indicating that the speed of cyclists is as expected and did not influence their satisfaction. This is contradictory to the literature. Gkekas et al. (2009) states that pedestrians report that the speed of cyclists was a factor that in general contributes to a higher number of accidents, and the fear of accidents in turn influenced the satisfaction of both cyclists and pedestrians in the study. What does complement with the literature is the reports of the interviewees on E-bikes. Because E-bikes travel at a significantly higher pace than normal bikes. In Groningen and Leeuwarden, the meal deliveries are mostly done on scooter and E-bike. Because the users of these bikes are in a hurry, they pay less attention and have a much higher chance to be involved in incidents (Molloy, 2022). This is in line with research of Beitel et al. (2018) and Loukaitou-Sideris et al. (2014), which suggest that the speed difference between pedestrians and cyclists is a major contributing factor to the number of accidents. However, in the case studies, speed of cyclists appeared to be less of an influencing factor.

Inattention of pedestrians

This factor is the factor almost all the respondents that were asked the question agreed on. 14 out of 20 interviewees mentioned the inattention of pedestrians in some way. Where some interviewees just answered the question with ‘no’, or did not go in depth, others elaborated more. Most respondents stressed the fact that pedestrians are *“really inattentive”* and just walk where they want to, without looking around them. When asked if pedestrians pay enough attention, interviewee 2 said: *“No, pedestrians in my opinion are often the least attentive in places like this.”* Interviewee 3, 5, 7, 8, 9, and 13 all indicated that pedestrians often walk ‘in the middle of the road’, which makes it hard for cyclists to go past. This is probably illustrated the best by interviewee 8, when asked about if pedestrians pay enough attention: *“I don't think so, some pedestrians don't really care about the cyclists and keep walking side by side, for example. As a pedestrian, you don't really see the bicycles coming from behind and many don't have a bell on their bike. That is inconvenient”*.

The interviews also contained a follow-up question about the attention of cyclists, which was indicated to be equal or higher than that of pedestrians in every interview. Only 3 interviews did not mention the attention of cyclists, and the other 17 interviewees all mentioned that cyclists pay more attention. Possible explanations were given by different interviewees. The most mentioned causes were that cyclists had a better overview of the traffic situation or that cyclists are more alert because of their speed. This is illustrated by the following quotes by interviewee 4 (Astraat): *“Yes they are actually paying better attention. They have to be careful not to drive into pedestrians”*, interviewee 8 (Werkman

bridge): *“I think the cyclists pay the most attention, they also come from behind the people so they can oversee everything”*, and interviewee 18 (stationsplein): *“Yes they do, the cyclists go faster and are therefore often more alert. This is never true of everyone, but in my opinion it is true of the vast majority”*. These findings are in line with the literature. Loukaitou-Sideris et al. (2014) found that the inattention of pedestrians is a major factor in incidents between cyclists and pedestrians. The respondents in their study complained the most about the inattention of pedestrians, together with speeding of cyclists (Loukaitou-Sideris et al., 2014). High frequency of incidents between pedestrians and cyclists are present in high-volume non-motorized shared spaces (Gkekas et al, 2009). These incidents often lack severe injuries, but are caused by inattention of pedestrians, as acknowledged by both cyclists and pedestrians in this study (Gkekas et al., 2009).

4.2.3 Perceived safety

In this study, perceived safety is used as a concept that can be influenced, as well as a concept that can influence the satisfaction of pedestrians and cyclists. For perceived safety, several values were used. In the interviews, the code that referred specifically to perceived safety had 3 values, ‘low perceived safety’, ‘neutral perceived safety’, ‘high perceived safety’. Interestingly, the reports on low perceived safety were exclusive to the locations in Groningen, where the interviewees indicated that their perceived safety was lower because the streets, they traveled through were chaotic, with an unclear separation of functions and higher fear of incidents because people were in the way of their route. They indicated that their lower feeling of safety was mainly aimed at pedestrians. Because the pedestrians were not paying enough attention, they felt not safe in fear of collisions. This led to low satisfaction levels on these routes. Because they were less satisfied on these routes, several interviewees said that they would take a different route if the alternative route had a more conventional road design, increasing the separation between modes and increasing their satisfaction of the streets. The positive feelings of safety were often contributed to the streets in Leeuwarden. As indicated before, this was mainly because of the open and spacious nature of these streets, with enough room for pedestrians and cyclists to pass each other and pedestrian crossings present to cross the street safely without conflicts with cars. This is illustrated best by interviewee 16, who said: *“Yes as I said earlier the sidewalks are wide enough. Therefore, there is enough space for both pedestrians and cyclists. It ensures that there are few conflicts. So, this does contribute to the feeling of safety”*. In the literature, this is also confirmed. Research by Lawson et al. (2013) found that cyclists are more likely to use a street that is perceived as safe. They prefer streets that are quieter and therefore lead to less conflicts (Lawson et al., 2013). This higher feeling of safety leads to an increase in comfort and satisfaction (Calvey et al, 2015).

4.2.4 Factors that influence perceived safety

Presence of motorized vehicles

When talking about the presence of cars, most respondents agreed that reducing the number of cars would increase their perceived safety and satisfaction. Out of 20 interviews, 12 talked about the presence of motorized vehicles. Mainly the interviewees on the locations where cars are already allowed had strong opinions about the presence of them. Interviewee 1 (Folkingestraat) mentioned that it can be tricky with the lack of space when cars are driving by. Later in the interview, he also said the following when talking about the number of cars: *“they can limit that. It often causes dangerous situations now. If you really want to make it safer, remove the cars. That would make a big difference and make it a lot safer and more pleasant”*. In the same street, multiple interviewees also explicitly mentioned that cars make it more dangerous, or that the removal of cars will be better for safety. In the Folkingestraat, a street where vehicles are only allowed for loading and unloading, it was also reported to decrease safety when cars would be allowed. Interviewee 9 mentioned: *“It helps that there are no cars here, which makes it safe in that respect”*. In the streets in Leeuwarden, where motorized vehicles were present and pedestrian crossings were used to cross the road safely, the interviewees indicated that they are happy that there are crosswalks. They reported that cars in the street had a habit to drive too fast, but the pedestrian crossings made sure they could cross the street safely. The result of this study matches with the research from Broach et al. (2012). This research suggests that cyclists are very sensitive to how busy traffic is. Cyclists consider cycling on the streets with lots of cars dangerous, which was also reported by the cyclists in the Astraat. The street was too narrow to accommodate for both cyclists and cars, thus reducing their perceived safety when traveling through the street with cars present.

Presence of sidewalk

The presence of sidewalk was harder to explicitly extract from the interviews. There were little respondents that talked about the presence of sidewalk in general. What was mentioned multiple times however was the separation between the cycle path and the sidewalk. The code ‘clarity of separation’ was found 18 times, which reported on how clear people found the division between the cycling path and sidewalks. The code ‘separate lanes’ was used 10 times, which indicates people talking about the separation of sidewalk and cycling path. Finally, also 7 different interviewees indicated that their perceived safety would increase if there was more separation between cycling path and sidewalks. These reports were mainly from streets where there is no clear distinction between the cycling path and sidewalk. In particular the respondents on the Werkman bridge. All 4 of the respondents in that location mentioned that their perceived safety. Interviewee 5 mentioned she thinks that: *“if it would be indicated that it could increase safety”* and interviewee 8 said that it would both be nice to have a clear separation and it could make it safer. She said: *“I think a separation between pedestrians and cyclists would be nice [...] I think something like that would definitely make it safer indeed, yes”*. In the other locations,

respondents indicated that it would be safer if the pedestrians are separated (interviewee 11), or that clear guidelines on where to walk would increase their safety (interviewee 18). This is also the result of the study by Lee et al. (2021). The study found that installation of separate sidewalks is positively correlated with pedestrian satisfaction. In addition, research by Wu et al. (2020) also found a positive correlation between the width of the sidewalk and the feelings of safety by their users. The most positive correlation was measured at wider sidewalks, wider than 3 meters (Wu et al., 2020). On the Blokhuisplein, the sidewalks are very wide compared to other streets, which could explain the higher levels of satisfaction.

Width of the street

The width of the street had some overlap with the width of the sidewalks, because in 3 of the 5 areas the street and sidewalk are merged into one street. Still, width of the street was mentioned 13 times in the interviews. The main location where the width of the street was deemed influential was the Werkman bridge. All 4 of the respondents mentioned that the street is too narrow, which cause problems. When asked if an increase in width of the street could solve the issues, interviewee 5 said: 5: *"you still have a lot of pedestrians who get in the way so I don't know if that would be a solution. Maybe on the ends, because it is narrow there"*, indicating that a wider street could solve the bottleneck on the street. This was also acknowledged by interviewee 8, when asked how safe she felt in this street compared to other streets in the city: *"It's tricky in traffic on many streets but I think the bridge makes it feel a little more unsafe than other streets, especially because it's so narrow"*. Indicating that the width of the street influences her perceived safety. These results are supported by the research of Lee and Kim (2021). Their research focused on three types of streets. The majority of respondents in their research named width of the street as an influential factor in their evaluation of perceived safety. They also indicated that they would have felt safer in the streets if they would have been wider.

Dedicated cycling lanes

Just as with the presence of a sidewalk, the dedicated cycling lanes were also harder to explicitly extract from the interviews. This does not mean there are no results for this. There seems to be a connection between the presence of a separate sidewalk and the presence of a dedicated cycling lane. The interviewees indicated that perceived safety is increased when they are separated. When asked about the lack of a dedicated cycling lane and if their perceived safety would increase when there would be a dedicated lane, interviewee 8 responded: *"Yes, I would find that safer myself, too bad they are not there"*. Also, interviewee 2 gave an in depth answer about dedicated cycling lanes and the effect on perceived safety: *"[dedicated cycling lanes would] definitely enlarge it. Then cyclists just have free space to cycle to where they need to go and don't have to keep paying attention and brake abruptly because there is suddenly a pedestrian in front of their wheels. The pedestrians can then also just go their way if there are separate bike lanes, because then they don't have to worry about being hit"*

themselves". This is also the general opinion of the respondents. A separation of the cycling path will give clarity on where people should walk and cycle, which leads to less conflicts and increase the perceived safety. This is stressed by interviewee 12, who said: *"Yes, it is a street that is just too vague to be completely sure as a cyclist and pedestrian"*, indicating that a separation will make it clearer, and people can use the street with more confidence. The view of the interviewees on dedicated cycling lanes is also supported by the literature. Research from Sorensen and Mosslemi (2019) found that physically separated tracks increase the subjective safety of cyclists. This is also indicated in research from Jensen et al. (2007), which also found the positive correlation between the perception of safety and the separation of cycling tracks. Also the other way around is true, Balock (2017) reports that the subjective safety also negatively correlates with the lack of dedicated cycling facilities, meaning that a decrease in dedicated cycling lanes will also decrease the subjective safety of its users.

Coloring of the streets

The interviewees were divided in their opinion about the coloring of the streets. The question was aimed to show if the respondents felt like the coloring of the road contributed to the perceived safety. When the interview was about the concept of shared space when this question was asked, many of the interviewees answered this question positively, because they felt that the change in coloring indicated that this was a shared space where you should be more careful. Interviewee 4 said: *"the color of the road makes it [look like] a different situation so people pay more attention"*. However, the people that indicated that the coloring of the street was detrimental to the perceived safety suggested that there should be a clearer separation between the cycling and the pedestrian lane. Opposed to the interviews that found the color helps recognizing the presence of shared space, the interviewees that had a negative opinion on the coloring of the street indicated that they did not like the fact that there is shared space present. They said different coloring would improve their perceived safety because then the different people (cyclists & pedestrians) would know where they are supposed to go on the road, which would prevent accidents.

This difference in opinions is illustrated best by interviewee 3, who said that the color adds to the perceived safety: *"the color is good now because it indicates that the situation is different"*. However, the same interviewee also said that *"it would have been more convenient here to have some sort of marking between the sidewalk and the street and maybe even a bike lane"*. So, the main reason why people were positive on the coloring is the relation with shared space, where the reason people were negative was the negative feeling towards shared space. What is interesting here is that the cyclists in general were more negative about the coloring of the road and liked to see a change to a more traditional road, while the pedestrians were generally more positive about the current coloring, where the distinction between cycling lane and sidewalk is vaguer. In the research from Lee and Kim (2019) it is stated that the specific coloring of the street is intended to create visual impacts that cause deceleration.

Also, the difference in texture and color of the surface was used to visually distinguish the street from any other street in the city (Lee & Kim, 2019). This matches perfectly with the observations of the first group of interviewees, that observed that the change in color would also lead to a change in behavior, because people were introduced to a different type of road, making them go slower and be more careful. The group of interviewees that were less satisfied with the coloring of the street also acknowledged that the coloring was a visual distinction to the other streets, but they disliked the shared space concept in general, which shaped their negative opinion.

4.2.5 Factors influencing both satisfaction and perceived safety

Width of sidewalks

The width of the sidewalks is also very different per situation. In the Astraat, respondents 1 and 3 reported that the sidewalk was too wide, where respondent 2 said the sidewalk is too narrow. They did not report it as influential on the perceived safety or satisfaction. In the folkingerstraat however, every respondent mentioned the width of the street. Respondent 9, 10, 11 and 12 found that it had not per se anything to do with the actual width of the sidewalk, but because of obstructions present on the sidewalks. This is also explained further under the code ‘obstructions’. This was linked to the perceived safety, as indicated by respondent 10: *“You can hardly widen them [the sidewalks]. What is mainly the problem here is that when the stores are open there is all the stuff outside. As a pedestrian you then have to walk around it. If a cyclist approaches, it becomes unsafe. I would then remove the obstructions”*. That it is not explicitly the width of the sidewalk but the obstructions is also further clarified by respondent 12, who says the street is much better after the restaurants and shops are closed, and therefore the obstructions are removed: *“The restaurants and stores all put stuff on the sidewalk. When the stores are closed the street is much nicer”*. Another increase of perceived safety is presented by respondent 19 (Stationsplein), who reported that the sidewalk is wide enough as it is, but it could reduce the conflicts between cyclists and pedestrians if it were wider: *“If it were wider, it could reduce conflicts between cyclists and pedestrians, so maybe also the perceived safety”*. On the Blokhuisplein, interviewee 14 and 16 also reported that the width of the sidewalk is contributing to their satisfaction and safety. Especially interviewee 14 (Blokhuisplein), who mentions that the sidewalks are much wider than normal sidewalks, which increases safety: *“It [the sidewalk] is much wider than normal sidewalks and this allows you to overtake everyone safely without hitting anyone. I think this is really ideal and extra safe for pedestrians and cyclists”*. As already indicated under the factor “presence of sidewalks”, the most positive correlation with perceived safety was measured at wider sidewalks, wider than 3 meters (Wu et al., 2020). On the Blokhuisplein, the sidewalks are very wide compared to other streets, which could explain the higher levels of satisfaction of interviewee 14 and 16. This is also supported by the fact that respondent 19 states that the perceived safety may be increased when the street would be wider. In the cases in Groningen, the streets are narrower than in Groningen. This also led to a

decrease in satisfaction, because the narrower streets lead to more incidents with pedestrians walking on the street, and cyclists that have to navigate through the traffic. Wider sidewalks also lead to more headroom to navigate around the pedestrians, and for pedestrians to evade cyclists, according to the interviewees on the Blokhuisplein.

Presence of pedestrian crossings

There were 2 cases that had crosswalks that were used to cross a street with motorized traffic. In these cases, 8 people were interviewed. There were 9 mentions on the safety of crosswalks, divided over 6 interviews. Mainly interviewee 14 argued that the crosswalks contributed to the perceived safety. When asked about the attention of pedestrians, she said: *“Yes, pedestrians pay close attention on this street. There is also a crosswalk which I think gives pedestrians the feeling of an extra bit of safety anyway”*. In addition, she mentioned that: *“having a pedestrian crossing is definitely important and also definitely contributes to pedestrian safety and mainly the perceived safety”*, adding later that: *“In order to cross here safely, it is useful that there is a pedestrian crossing”*. This was acknowledged by interviewee 15 and 16 in the same street, indicating that the crossings are useful because cars slow down when people are crossing and that it is safer to cross the street using the crosswalks. Interviewee 15 mentioned: *“I definitely feel safe when I have to cross the street. This is mainly because there is a pedestrian crossing on both sides of the curve. As a result, you know that the cars are waiting for you”*, and that *“without a crosswalk it would be much more unsafe”*. The presence of these pedestrian crossings also leads to an increased satisfaction among the interviewees because they did not have to watch out for vehicles when crossing the road. The presence of pedestrian crossings provided a peace of mind and comfort because cars are obliged to stop at pedestrian crossings. Interviewee 20 indicated that she felt more comfortable, because the crosswalk reduces the chaos with cars. The peace of mind is illustrated best by interviewee 16, who said that *“because there is a pedestrian crossing on both sides of the curve ... you know that the cars are waiting for you”*. The presence of pedestrian crossings are reported by Bian et al. (2009) as influential on perceptions of safety and comfort. In addition, Pascucci et al. (2015) states that pedestrians will try to reach their destination using the shortest possible path. In the cases in Groningen, this was exactly how pedestrians behaved, while in the cases in Leeuwarden, pedestrians used the pedestrian crossings, because they provide a safe alternative to crossing the road and waiting for cars to pass.

Traditional traffic rules

There were different codes used to indicate interviewees talking about signage or traditional traffic rules. For signs, there was one code with a positive and a negative value assigned to them. On traffic rules, the codes were, ‘clear traffic rules’ and ‘unclear traffic rules’. The main conclusion most interviewees drew regarding traditional roads is that the traffic rules are clearer than in shared space. Interviewee 1 said the following about traditional roads: *“there the rules are clearer [...] there are no*

surprises that someone might cross the street". When asked about possible alternatives, interviewee 9 said that he preferred a parallel road to the inner city, because: "*in the Oosterstraat you know what to do, it is more clear*". This is also supported by interviewee 10, who said the following when asked if he would use the space more often when it would have traditional rules: "*Yes, then I go for the traditional road. There it is clear what the intention is*". In addition, multiple interviewees indicated that the placement of signs can make things safer. When asked for additional factors that could influence the perceived safety and satisfaction, interviewee 2 said: "*Just clear rules or clearly marked signs with 'cyclists here' 'pedestrians there' 'cars here' would perhaps make a difference to safety, as a first step towards improvement. But I would rather see this just as a normal road*", and when asked about if signs would improve safety, interviewee 5 indicated: "*Yes, I think so. Then they start thinking more about where to walk to avoid colliding*". Interviewee 19 said that signs could increase safety, because then pedestrians know where they can walk without coming into conflict with cyclists. Some of the interviewees were more skeptical about the placement of signs. They either feel signs would not influence the actual behavior of people or that it would not change anything in their own behavior. Although there are no specific reports in the interviews of signs influencing the satisfaction of cyclists or pedestrians, signs are often a way to indicate the traditional traffic rules. That is also why signage and traffic rules are discussed in one section. The question about traditional traffic rules was asked to find if the interviewees found that it changed their perceived safety, but multiple respondents also reported that the absence of clear traffic rules made the streets confusing and vague, which lowered their satisfaction. As indicated in previous sections, the presence of sidewalks (Lee et al., 2021); Wu et al., 2020) and pedestrian crossings (Bian et al., 2009), the separation between cyclists and pedestrians (Balock, 2017; Mosslemi, 2019; Jensen et al, 2007) and the behavior of pedestrians in areas (Loukaitou-Sideris et al., 2014; Gkekakos et al, 2009) without a clear sidewalk all negatively correlated with the perceived safety and satisfaction of road users. The presence of these elements would create a more traditional road, with clearer traffic rules. This was indicated by most interviewees as a positive change to the areas in Groningen, because in the current state the traffic rules are not clear enough.

4.2.6 Inductive factors

In this section, the factors are explained that arose during the interviews. During the interviews, several factors were mentioned by several interviewees, which indicated that they also have an effect on the satisfaction or perceived safety of cyclists and pedestrians.

Unfamiliarity

The code 'Unfamiliarity' is divided into different sub-categories, being: 'international students', 'tourists', and general unfamiliarity. The interviewees that mentioned unfamiliarity as an influencing factor said that they were familiar with the street themselves, so they knew when to watch out and what to look out for. However, they mentioned that there are several instances where people did not know

the space had a harder time understanding what to do. International students for example, who have trouble to “*act intuitively because they are not used to it*” (interviewee 1). Also, tourists were mentioned as a group of people that were unfamiliar with the space, mainly on the route from the station to the city center, they do not travel through the city as much as inhabitants, which leads to unfamiliarity with the streets, which can lead to situations where there are more conflicts or people feel more unsafe. They often walk in the middle of the road because they do not know the streets, or they are not used to high traffic volumes in the narrow streets. Because Leeuwarden and Groningen are both cities with universities and a lot of tourism, this can explain the reports by the interviewees. Universities try to attract international students to their universities, and the cities try to get tourists into the city. The reports of unfamiliarity might be explained by the fact that drivers that are familiar in an area are driving habitual (Intini et al, 2019). Because they assume everyone pays attention and make way for cyclists, conflicts can arise when unfamiliar road users are present. This is also supported by the fact that the most interviewees indicated that the influence of unfamiliarity was the biggest in the weekends, when most tourists or non-residents enter the city.

Obstructions

One clear characteristic that arose during the interviews was the presence of obstructions on the sidewalks. This was mentioned in 3 different locations, but the Folkingestraat stood out. All four of the respondents in this street reported that they were unsatisfied with the width of the sidewalk, mainly because the obstructions that were present on them. For the pedestrians, this was negatively affecting their satisfaction because they have to go around these obstructions and thereby step on the middle of the road where the cyclists are riding. Research from Minami et al. (2006) states that street environment should be accessible and comfortable, and that they should be safe for pedestrians, such as commuters, tourists and elderly. They measured the trajectories of pedestrians when approaching an obstruction. The study indicates that obstructions on the sidewalk effectively decrease the width of the sidewalk. Not only stationary obstructions can influence the trajectories of pedestrians, also interruptions with slower or standing pedestrians can influence the trajectories. This correlates with the reports of the interviewees, that indicate that many pedestrians swerve over the road as a consequence of the obstructions present on the sidewalks. More on this is reported under the section of the Folkingestraat.

Alternative routes

More than half of the interviewees indicated that they would opt for an alternative road, would the other road be a traditional road with clear traffic rules. Most of these respondents were cyclists, because they are hindered the most by the pedestrians blocking the road. Some of the interviewees gave the high volumes of traffic of the street or the time advantage another street has as the reason, but most respondents indicated that the fact that on another road the rules are clearer. They would be more satisfied on the other roads, because on a traditional road the rules are clear, they know where they can

walk without getting hit or having to be very focused to go through the traffic on their bikes. While this factor seems to influence the satisfaction more than the perceived safety, interviewee 5 said she would avoid the street: *“really because of safety. It is pretty tense to cycle in this situation to avoid crashing into people”*. That means the assumption can be made it can also impact the perceived safety of cyclists. So, the desire of the interviewees to use a different route is mainly because the high traffic volume, time advantage and lack of traditional traffic rules.

Traffic volume

There was no question about traffic volume in the interview guide, but after the first interview where it came up, everyone was asked about this. Traffic volume is added to the theoretical framework as a characteristic that might influence the functioning of shared space, so it is interesting this came up during the first interview where it was not implemented in the interview guide yet. Several interviews indicated that the street they were interviewed about were access roads from the train station to the city center with high traffic volumes. The interviewees indicated that because it is an access road, it is a very busy street. The code busyness was reported 21 times in 13 different interviews. Their satisfaction on the street was reduced because it could get very busy during daytime, especially in the weekends. This was mainly reported in the interviews about the Folkingestraat and the Werkman Bridge. This seems logical because those roads also have the biggest throughput of people traveling to the city center from the train station. Interviewee 11 said that he was not satisfied with the concept of shared space in the location, when asked to elaborate he said: *“It's busy here now because everyone is going to the city or to the station. I understand that they try it here particularly because it's busy, but I think it [concept of shared space] works better when it's quieter”*. Research by Gkekas et al. (2009) indicates that there is a high frequency of incidents between pedestrians and cyclists in high-volume non-motorized shared space. These incidents often lack injuries, but they still affect the satisfaction and perceived safety levels of cyclists and pedestrians (Gkekas et al., 2009). In addition, the reports of high traffic volume are also complementary to the view of Lutz & Voorthuis (2011), who suggested that shared space is a good concept, but it only works if the area is not primarily used for traffic throughput.

4.2.7 Locations

Some codes that arose during coding were surprising or specific to one location. This section discusses the most remarkable results per location, that were different from other locations or drew to the attention of the researcher.

Folkingestraat

The most remarkable results in the Folkingestraat were the reports of obstructions. From the 12 mentions of obstructions in the interviews, 9 were reported in the Folkingestraat. These reports were done by all the 4 respondents, both cyclists and both pedestrians. Interviewee is indicating the main problem in this street: *“you can't actually walk on the sidewalk comfortably because it's completely filled with all kinds of things. All those stores have terraces etc.”* The respondents all said the sidewalks were too cluttered with terraces and store signs, which prevented pedestrians from walking purely on the sidewalk. As interviewee 10 said: *“as a pedestrian, you then have to walk around it”*. This causes situations where cyclists have to be extra careful not to hit any pedestrians. Interviewee 12 said the following about it: *“It is almost impossible for a pedestrian to walk on the sidewalk because of all the obstructions”*. The interviewee further adds: *“When the stores are closed the street is much nicer”*, indicating the obstructions in the Folkingestraat are the main culprit. The study of Minami et al. (2006) indicated that the reason for the pedestrians to chance trajectory to the middle of the road is that pedestrians are chancing directory significantly when they are interrupted by obstructions on the sidewalk. These interruptions consist of both stationary objects, as well as other pedestrians that are walking slowly or standing still. In Addition, research from Coppola & Marshall (2021) indicates that obstructions on sidewalks effectively narrow the sidewalks with an average of 22%. Since the sidewalks in the Folkingestraat are already reported as narrow, this is a likely contribution of the behavior of pedestrians using the middle road.

Astraat

In the Astraat, the interviewees were the most divided. The most factors that were asked about were identified by some of the interviewees as a positive, and some as a negative factor, so no clear distinction or influencing factors could be found in this street. The only thing that almost every interviewee in this street mentioned was the theme ‘unfamiliarity’. When asked about the cause of potentially dangerous situations, interviewee 1 said: *“Especially by international students who cannot act intuitively because they are not used to it”*. Interviewee 4 identified tourists walk on the road because they are unfamiliar with the roads and interviewee 3 indicated: *“I often see people riding the OV bike there who are coming there for the first time and all of a sudden, a car drives next to them, and they are startled”*. This unfamiliarity could lead to increased conflicts because the people that know the road are not expecting people to behave erratic or unpredictable (Intini et al, 2019).

Werkman bridge

On the Werkman bridge, both cyclists reported a high chance at potential conflict, mainly the fear of crashing into pedestrians that are not paying attention, or the chance to crash into people that are also trying to dodge pedestrians. This is illustrated by interviewee 5 (Werkman bridge), after asked if the inattention of pedestrians influenced the perceived safety: *“Yes, especially safety. Just like that you have a collision with a pedestrian or someone who is also dodging a pedestrian”*, and by interviewee 8 (Werkman bridge), when asked about the attention of cyclists: *“Sometimes they want to overtake pedestrians, while on the other side another cyclist wants to overtake. Not everyone can assess that equally well”*. This can be connected to the reports of all four interviewees on the Werkman bridge that the street is too narrow in some sections, which makes it harder for cyclists to overtake pedestrians without causing a conflict. This also influenced the comfort of the interviewees. All of the interviewees on the Werkman bridge said that they did not feel very comfortable when using this bridge. Interviewee 7 indicated that he feels elated, every time he has to cross the bridge, while interviewee 6 said that using the bridge was: *“pretty disappointing to use the bridge at busy times”*. This led to a lower feeling of satisfaction for the users of this bridge. This also complements with the articles of Calvey et al. (2015) and Lee et al. (2021), which both indicated that when users feel more comfortable, their satisfaction will increase, and when they feel less comfortable, their satisfaction levels decrease, both for pedestrians and cyclists. This was also the case on the Werkman Bridge, because both cyclists and pedestrians reported lower amounts of comfort.

Stationsplein

The code ‘cozy’ was identified in 4 different interviews. 3 of these interviews were from the Stationsplein in Leeuwarden. Cozy is a positive term to express satisfaction, so cozy can be used as an expression of satisfaction by the interviewees. The road is generally seen as cozy because of the terraces (interviewee 19), the amount of people (interviewee 18) and the coloring of the road, as illustrated by interviewee 20 when asked why she likes the street more than other streets in the city: *“I do think it looks cozy. It's not really a different color road that cars race on, so it does look cozy and peaceful. The atmosphere is nice”*. All the interviewees also indicated that they were satisfied with the street in general and that they felt comfortable walking or cycling through this street. In addition, the interviewees indicated that the higher comfort led to higher satisfaction. This is supported by the articles of Calvey et al. (2015) and Lee et al. (2021), which indicate that higher levels of comfort is a factor that positively correlates with higher levels of satisfaction.

Blokhuisplein

The most remarkable result from the Blokhuisplein is the positivity on perceived safety the interviewees expressed. From the interviews, explicit positive feelings towards the perceived safety were expressed 6 times, from which 3 were from respondents interviewed on the Blokhuisplein. This is illustrated by

interviewee 16. After being asked a question on the width of the sidewalks, she continued: *“Yes as I said earlier the sidewalks are wide enough. Therefore, there is enough space for both pedestrians and cyclists. It ensures that there are few conflicts. So, this does contribute to the feeling of safety”*. In this street, the sidewalk is shared between cyclists and pedestrians and is therefore wider. The positive feeling about the sidewalk is also expressed by interviewee 19: *“I do feel safe here, especially on the stretch without cars”*. These high levels of satisfaction and perceived safety that are reported on the Blokhuisplein can be linked to the open, spacious look of the street. The sidewalks are very wide, with enough space for cyclists and pedestrians to cross each other without conflict. The presence of crossings was also influential on the perceived safety of the pedestrians because they felt safe knowing that cars would stop when they cross the street. This is also supported by the articles of Wu et al. (2020), which found a positive correlation between sidewalk width and satisfaction, and the article of Bian et al. (2009), which found that the presence of pedestrian crossings increases the perceived safety of pedestrians.

4.2.8 Gender & mode of transport

This final section consists of the analysis of gender and mode of transport. Because the research was conducted under 12 male and 8 female interviewees, and the mode of transport was evenly divided with 10 respondents by bike and 10 respondents on foot, valuable information can be extracted from the interviews regarding these differences in the sample. In this section, the most notable results regarding gender and mode of transport are discussed.

Gender

In general, there was not much difference between male and female respondents regarding the factors that influence perceived safety and satisfaction. One factor that stood out however was the feeling of safety in the streets in Groningen, especially regarding the high volume of traffic and potential conflicts that it results in. Male respondents did acknowledge that the high volume of traffic can lead to higher conflicts, female respondents had stronger feelings of decreased perceived safety. This effect was most notable in the Astraat and the Werkman bridge in Groningen. Both female respondents in the Astraat indicated that they were afraid that potential conflicts can arise when cyclists have to go around pedestrians. Interviewee 2 indicated that when she has to cycle around a pedestrian, she was afraid she: *“might bump into the pedestrian who is walking here in the middle of the road”*, indicating that that is: *“definitely not a nice feeling”*. She indicated that because of these potential conflicts in this street, she would avoid this street if possible. This sentiment was shared by interviewee 3 in the same street, she states that: *“notice when I walk there that I get almost hit by cyclists”*. On the Werkman bridge, similar responses were observed. Interviewee 5 said she should avoid the bridge if there would be alternative routes available, mainly because: *“of safety. It is pretty tense to cycle in this situation to avoid crashing into people”*. This was also acknowledged by interviewee 8, a pedestrian on the same bridge, who

indicated that she would be more satisfied with this street if the layout was more like a traditional road, because then: *“you have less fear of being run off your feet”*. Most female respondents mentioned that they would feel safer when there would be clearer traffic rules, and that the main reason for their fear of potential conflict was because of the high volume of traffic. The phenomenon that women feel less safe in traffic is also present in the literature. According to DeJoy (1990), who performed a study among college students to find out differences between male and female users in traffic, young males are often excessively optimistic about their skills in traffic, where female drivers were less confident about their own skills. Also, female drivers are also less likely to take risks, and their risk assessment is more conservative than male respondents (DeJoy, 1990). This means that female drivers are perceiving the same situation as more risky, and will be less confident they can go through the traffic without being involved in an incident. This can also explain the findings that the female interviewees found the risk of potential conflict higher, and were more inclined to avoid the route when possible.

Mode of transport

The difference between pedestrians and cyclists were less pronounced than expected before conducting the research. They felt about the same on many different factors. Of course, the pedestrian respondents mentioned the presence of crosswalks more than cyclists, but that is explained by the fact that pedestrians are the group that use these crosswalks. One factor that was expected to be very different between cyclists and pedestrians is the speed of cyclists and the inattention of road users. However, both cyclists and pedestrians agreed that the cyclists often had an acceptable pace and are the group that pays the most attention, while pedestrians are the group that are generally inattentive to their surroundings. This might be explained by the fact that cyclists indicated that they often use the route to go from A to B, while pedestrians indicated that they might use the streets to go shopping or socialize with other people. This was also mentioned by interviewee 12, who said: *“I do feel that cyclists are more observant by default. Pedestrians are more likely to be socializing with family or with a partner, so they're not as likely to realize that they are in the way”*. This also clearly illustrates that pedestrians were also reported to be most often in the way of cyclists, swerving to the middle of the road, creating dangerous situations, instead of the other way around.

The one factor where they deviated the most is the opinion of each other. Pedestrians did not complain about the cyclists, but cyclists did complain about pedestrians. This seems to be related to the previous factor. Cyclists generally have more speed and need to go from A to B, so they are more attentive and reactive when potential conflict comes up. Cyclists reported that pedestrians were often swerving, walking from one side to the other side of the street. This influenced their satisfaction because they constantly have to adjust speed and evade pedestrians. This could tie in with the fact that cyclists in general were more negative about the coloring of the road and liked to see a change to a more traditional road, while the pedestrians were generally more positive about the current coloring, where the

distinction between cycling lane and sidewalk is vaguer. Cyclists want to change to a more traditional road because it reduces conflicts between modes of transport, while pedestrians like the coloring of the road, because it gives them more space to walk around.

Conclusion

In this chapter, a short summary of the research, including answers to sub- and main questions are provided in paragraph 5.1. Paragraph 5.2 reflects on the strengths and limitations of this research, followed by policy recommendations that can help shape shared spaces in traffic heavy areas, to provide higher satisfaction and perceived safety levels in paragraph 5.3. Finally, the recommendations for future research are addressed in paragraph 5.4.

5.1 Summary and answers to research questions

Many urban planners consider Shared space to be an effective part of urban design, which minimizes the segregation between modes of the road users. By designing a space that lacks certain features, like kerbs, surface markings, signs, or height differences, it is expected that general safety and satisfaction will increase among road users. Because the lack of separation or safety features forces people to pay more attention, general safety and satisfaction improves. In Groningen and Leeuwarden, not all cases of Shared spaces are received as positive. The cases researched in this study are either considered annoying or unsatisfactory (Folkingestraat, Astraat and Werkman Bridge), or perceived unsafe (Stationsplein and Blokhuisplein). Therefore, it is interesting and valuable to find out which characteristics of shared space influence the perceived safety and satisfaction levels of cyclists and pedestrians in these streets. In addition, it will also investigate the willingness of cyclists to use these routes.

The main research question in this research is as follows: *“Which characteristics of shared space influence road users’ perceived safety and satisfaction?”*. The sub-questions, which are formulated to help answer the main question, are the following: (1) *“Is there a difference in satisfaction level between the five case studies?”*, (2) *“Is there a difference in perceived safety between these case studies?”*, (3) *“Which physical and behavioral characteristics of shared space influence the satisfaction of road users in shared spaces, and to what extent?”* (4) *“Which physical and behavioural characteristics of shared space influence the perceived safety of road users in shared spaces, and to what extent?”*, and (5) *“Are users willing to use this shared space, or do they rather travel through other streets?”*.

Is there a difference in satisfaction level between the five case studies?

The findings on sub-question 1 show that there are differences in satisfaction from case to case. There were three cases that stood out, one with a relatively high satisfaction levels and two with relatively low satisfaction levels. The satisfaction on the Folkingestraat and the Werkman bridge were considerably lower than the rest of the cases. On the Folkingestraat, this was mostly because of the obstructions on the street, combined with the high numbers of users. The high number of users on this street makes that the street is busier. When pedestrians have to evade obstructions that are placed on the sidewalks, they

wander off onto the middle section of the road, hindering the cyclists in the process. On the Werkman bridge, this difference was mainly caused by the combination of busyness and low levels of comfort. The interviewees indicated that their comfort levels were lower, due to the high volume of traffic at busy times of the day. They felt elated and tense when they had to use the street. The interviewees in both cases also indicated that the inattention of pedestrians lead to these kinds of situations. Pedestrians were believed to pay less attention to traffic than cyclists, leading to these dangerous situations where cyclists have to evade or slow down, in order to prevent a collision.

On the contrary, the Stationsplein had higher satisfaction levels than the rest of the cases. This was the only case where all the interviewees indicated that they are very satisfied with the street in general. They felt comfortable walking and cycling through the street, and thought the street looked very cozy. This was mostly related to the comfort and their higher levels of satisfaction while using this area.

Is there a difference in perceived safety between these case studies?

Sub-question 2 refers to the difference in perceived safety in the case studies. While the answer to this question was a little harder to extract from the interviews, there were still deviations in the feelings of safety in the different case studies. The main finding is that the cases in Leeuwarden are generally rated higher on perceived safety, and the cases in Groningen are rated lower on perceived safety. The main differentiator of these streets is the presence of pedestrian crossings. In all the interviews in both streets, interviewees mentioned that the pedestrian crossings added to their perceived safety. Although multiple interviewees indicated that cars are often speeding, they felt comfortable crossing the streets using the pedestrian crossings, because they assume cars will stop for them. On the Blokhuisplein in Leeuwarden, the interviewees indicated that the width of the sidewalk contributed to their perceived safety. The sidewalk in this location is shared between cyclists and pedestrians, but because the sidewalk is very wide, it gives enough space to use both modes of transport at the same time without affecting perceived safety. In Groningen, there was no clear location that rated higher or lower in perceived safety. The general consensus among respondents in Groningen is that the shared space concept decreases the perceived safety, because the streets are not fit for high volumes of traffic. The interviewees on the Astraat, Werkman bridge and Folkingestraat indicated that a separation of modes of traffic would increase their perceived safety, because it makes for clearer guidelines and less mixed traffic. The pedestrians are too often using the middle of the road, hindering the cyclists. By creating a clearer separation between the modes of transport, conflicts can be reduced, and perceived safety will increase.

Which physical and behavioral characteristics of shared space influence the satisfaction of road users in shared spaces, and to what extent?

For sub-question 3, the influence of different characteristics on satisfaction of road users in all the different cases is addressed. The main characteristics that influenced the satisfaction of road users in shared spaces in this study are the inattention of pedestrians, comfort, and the width of the sidewalks.

All interviewees agreed that pedestrians were paying too little attention to the surroundings. They often swerved unexpectedly and walked in the middle of the road. This led to undesirable situations, where cyclists had to take avoiding action or slow down to prevent collisions. Comfort was the second most influential factor that influenced the satisfaction of cyclists and pedestrians. This study showed a positive correlation between the feeling of comfort and the overall satisfaction with the street. In Leeuwarden, the respondents felt comfortable, and therefore they were very satisfied with the street, where the respondents in Groningen often felt discomfort, because of the busy and narrow streets. This decreased their level of satisfaction. The width of the sidewalk is the third most influential factor that influenced satisfaction. The wider the sidewalks, the more satisfied users were with the street. The wider sidewalks provided enough space for pedestrians and cyclists to go around each other and to avoid potential conflict. The wider sidewalks also gave a more open look to the street, giving a better overview for road users to predict each other's movements.

Which physical and behavioral characteristics of shared space influence the perceived safety of road users in shared spaces, and to what extent?

This question related to the influence of different characteristics on the perceived safety. The most reported factors that influenced the perceived safety are the presence of pedestrian crossings, the presence of motorized vehicles and the width and presence of sidewalks (obstructions). One of the most influential factors on perceived safety was the presence of motorized vehicles. In the *Astraat*, the street in Groningen where motorized vehicles are allowed, the perceived safety relatively low. The street was too narrow, and the presence of cars could lead to dangerous situations. The main reason pedestrians did not feel safe is that there is no clear place where pedestrians can cross the street, without having to conflict with cars or cyclists. In the cases in Leeuwarden however, pedestrian crossings were present. Although the streets in Leeuwarden also involved a lot of motorized traffic, the interviewees felt very safe. The pedestrian crossing on both ends of the streets ensured a safe passage for pedestrians to cross the street, with the peace of mind that cars will stop for them. In addition, the width of the sidewalks in these streets provided a clear overview of the street, so both pedestrians and cyclists can easily see each other and anticipate their movements. Because they were able to navigate through the streets without conflict, their perceived safety increased. In the cases in Groningen, sidewalks were also present, but they were narrow or obstructed with objects. This led to pedestrians that had to step onto the road to pass or avoid each other, creating dangerous situations where the users felt unsafe.

Are users willing to use this shared space, or do they rather travel through other streets?

The final sub-question is aimed to answer the willingness of users to use these shared spaces, or if they rather travel through other streets. There is clear division between respondents. Respondents from Leeuwarden only wanted to use another street if the route is faster, not if the actual street was set

up differently. The respondents in Groningen however almost unanimously said they would prefer to use another route. They perceived the streets as too busy and too narrow. They were only willing to use the shared spaces if they had to go through there because it was significantly faster, or if their destination is in these streets. They felt elated, tense, or uncomfortable going through these streets and were not using the shared space as often as they would like to. The respondents in Leeuwarden however would gladly use the street because they provide quick access to their destination, together with the openness and peace of mind they have in the streets.

The answers to the sub-questions combined lead to the answers on the main question:

Which characteristics of shared space influence road users' perceived safety and satisfaction?

Combining the answers to the sub-questions, it is clear that the main characteristics that influence the perceived safety and satisfaction of road users are the inattention of pedestrians, comfort, width and presence of the sidewalks, and the presence of pedestrian crossings combined with presence of motorized vehicles. The case studies in Groningen showed that the combination of narrow sidewalks with little room to avoid potential conflicts. The inattention of pedestrians, combined with the narrow sidewalks had a negative effect on perceived safety and satisfaction. The case studies in Leeuwarden clearly showed that the increased width of sidewalks increased the perceived safety and satisfaction, because it creates enough room for pedestrians and cyclists to navigate the streets, avoiding conflicts. Users felt significantly more comfortable in these streets, and therefore more satisfied with the implementation of shared space. In addition, the presence of pedestrian crossings significantly increased the perceived safety of users, because it creates a safe space to cross the street, where pedestrians can cross without the fear of getting hit by motorized traffic.

5.2 Implications for planning and policymakers

Because shared space is often considered as a common tool in the toolbox for planners in many countries (Barr et al, 2021), it is important to research its effect on different types of streets. As indicated by Lutz and Voorthuis (2011), shared space is a great concept, but generally is most effective in areas where there is not much traffic. In streets where the traffic volumes are high, the concept of shared space can have limited effects on perceived safety and satisfaction. This study found that there are several factors that contribute to the decrease in perceived safety and satisfaction. These lessons can be used in planning to improve the implementation of shared space on roads with high traffic volumes across different cities.

The positive characteristic of shared space that is most important in future implementations is the width of the sidewalks. This study clearly found a correlation between higher levels of satisfaction and perceived safety when the sidewalks were wider. Urban planners should take the width of the street into

consideration when implementing shared space on roads with high traffic volume. This gives pedestrians and cyclists enough room to avoid colliding and it prevents chaos, by keeping the motorized vehicles more separated. In addition, pedestrian should be present when motorized traffic is allowed on the streets. The case without a pedestrian crossing was rated significantly lower in terms of perceived safety because they had no safe place to cross the street. The interviewees in cases with pedestrian crossings positively rated the streets because there was a safe way to cross the street. The difference in satisfaction and perceived safety levels between the open streets of Leeuwarden and the busy narrow streets in Groningen shows the clear preference for wide sidewalks with clear and easily comprehensible streets.

The things urban planners should avoid when implementing shared space is to implement it on roads with high traffic volumes, that are too narrow to accommodate the traffic. The high traffic volume itself is not an issue in the cases where there was enough space to accommodate cars, cyclists, and pedestrians by creating enough space to navigate through. Because the inattentive nature of pedestrians, they are likely to swerve and step on the middle of the road. By creating enough space to accommodate for these changes in trajectories and small mistakes, satisfaction and perceived safety of both cyclists and pedestrians will increase.

5.3 Strengths and limitations

The strength of this research is that it investigates Shared space on streets with high traffic levels. Shared space in general is researched extensively, mainly regarding the reduction in traffic accidents, increase in road safety and reduction of traffic speed. The area of shared space that is not researched as much is the effect of shared space when implemented on streets with high-volume traffic. This research bridges that gap and can give urban planners a clearer view on the effectiveness of Shared space in these areas.

This research also has some limitations. One of the limitations of this research might be the representativeness and generalization of the sample. When a sample is not representative, it is harder to confidently generalize the results of the research to the population.

The target group of this research was the age group of 18 to 25 years old. This age was used because a large portion of cyclists and pedestrians in the city of Groningen and Leeuwarden are students, who have to travel through the city on a regular basis. Either from their homes to the universities, or from the train stations to the universities if they live outside of the city. However, the choice of this specific age group limits generalization to the population, because other age groups were not part of the sample. For example, elderly, who are less agile and slower, or children, who pay less attention to their surroundings, may experience different satisfaction levels or perceived safety than students between 18 and 25.

In addition, this research is limited to the Dutch inhabitants of Groningen and Leeuwarden. Several interviewees indicated that international students are one of the groups that might feel unsafe or unsatisfied when cycling or walking to these streets. Because there were no international students present in the sample, it is hard to draw conclusions on this group. This is also true for non-residents. Tourists or visitors were repeatedly named as a group that influence the satisfaction of the interviewees, because their unfamiliarity or general inattention. The interviewees of this research were all residents of their respective cities, which makes it unable to draw general conclusions about the feelings of safety or satisfaction of people outside of this group.

A final limitation of this research is that it focused mainly on physical and behavioral factors. Interviewees suggested that the presence of internationals and tourists can influence the satisfaction and perceived safety, as well as people from different age groups. These and other socio-demographic variables were not extensively included in this research, apart from the gender of the respondents, but could provide valuable lessons for future research.

5.4 Future research directions

To get a more generalizable understanding of shared space in high traffic areas across all age groups, future research could expand the age of respondents. This study only focused on students, because they are the major users of active mobility in Groningen and Leeuwarden. To get a better understanding about the perceived safety and satisfaction in general, children and older age groups can be addressed. Further research into this can be valuable for implementation of shared spaces in cities with less students.

Another direction for future research can be to consider other socio-demographic factors. This research focused on Dutch students. With the increasing globalization and increasing number of inhabitants from abroad, research about their perceptions of safety and satisfaction from this group can be a valuable lesson for urban planners in the future.

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Appendix 1: Interview guide

Introduction

The interviewer introduces himself and thanks the participant for the interview. Asking if it is okay to record the interview and telling it will take around 20 minutes. After starting the recording, confirmation of permission will be asked. When started, explaining that the interview is about perceived safety and satisfaction of cyclists regarding shared space. The intent is to find the main factors that influence perceived safety and satisfaction in these streets.

Questions

1. Are you familiar with the concept of shared space?

Yes: nothing

No: explain the concept of shared space and ask if they understand what it means

2. How comfortable do you feel traveling through this street?

2. Do you enjoy cycling through this street?

3. How safe do you feel in this street compared to other streets in the city?

4. Do you think the absence of signage influences the perceived safety or satisfaction in this street?

5a. Do you feel like pedestrians are paying enough attention to traffic?

5b. Do you feel like cyclists are paying enough attention to traffic?

6. Do you feel like cyclists are cycling at an appropriate speed?

7. Do you feel safe crossing the street? (When crossing is available, ask preference)

8. Are you satisfied with the width of the sidewalks (if present)?

9. How do you feel about the lack of a dedicated sidewalk (if not present)?

10. How do you feel about the lack of/existence of pedestrian crossing?

11. Is it clear where you are supposed to cycle/walk?

12a. Do you avoid this street if possible?

12b. Would you use this street more if there is a more traditional road?

13. Overall, how satisfied are you with the implementation of shared space in this particular street (1 to 10)? IF NOT: suggestions for improvement?

14. How do you feel about the coloring of the street?

15. How do you feel about the lack/presence of motorized traffic in this street?

16. How do you feel about the lack of dedicated cycling lanes?

17. How do you feel about the lack of signs and traditional traffic rules?

Finalizing

18. If you look around the street, what other factors do you feel could influence road user satisfaction / perceived safety?

19. Do you want to add something (un)related about the perceived safety and satisfaction of using this route?

Thank you for the interview! If you have some other questions (un)related to the research, please contact me.

Appendix 2: Informed Consent form



university of
 groningen

faculty of spatial sciences

Informed Consent

I:

(name interviewee)

agree to participating in this research, conducted by

Matthias Jaimy Post / 0644260502 / m.j.post.2@student.rug.nl

am aware that participating in this research with the title

Cyclist and pedestrian perception in shared space

is completely voluntary. I can withdraw my cooperation at any time and the data that has been gathered from this research can be deleted at my request. The researcher will make sure the data is saved securely and (possible) audio recordings will not be shared with 3rd parties.

I understand that:

the goal of the research is

to find out to what extent and how the characteristics of shared space influence perceived safety and the satisfaction level of cyclists and pedestrians

the interview will take around 15-20 minutes. Before the interview, the interviewer will explain what the research is about and how the interview is structured.

any data that has been gathered during the interview will be confidential. If requested, the data can be reported anonymously. The personalised data will only be available for the researcher and supervisor and will be deleted after the completion of the research.


the researcher will only make recordings of the interview if there has been consent given beforehand. Without consent, the interview will be in written form.

I give consent for recording the interview: YES / NO

The researcher will answer any questions regarding the interview or research in general, either before, during or after the interviews.

Date:

Signature researcher:



Matthias Jaimy Post

Date:

Signature participant:

Appendix 3: Transcripts

1. Menno male cyclist Astraat

Interview started with a small explanation of the research, and decision to interview as cyclist or pedestrian. We opted for cyclist because he knew the street better as a cyclist.

You know what shared space is?

Yes a shared space for different forms of traffic, pedestrians, cyclists, cars. It is not clearly delineated what is bike lane and what is the road or walkway.

Yes it often is 1 big space, few signs and mainly suggestive marking.

How comfortable do you feel as a cyclist going down this street?

Nowadays it feels good to cycle through this street, also because I know what can and cannot be done and what the rules are. In the beginning it was uncomfortable because a few years ago it was a normal road. Then the rules were a bit clearer. Now the rules are less clear with pedestrians walking in the way, so I have to decide how to get around them. That does lead to awkward moments. Nowadays, it is safe, but in the beginning, it was not safe or easy [because I didn't know the place].

Do you think it's a nice street to cycle through? Would you avoid it?

Of course, it is true that this was the fastest route. Now that I'm used to it, I think it's fine. Not great, but not not great either. But is it ideal? No. If I had to choose between this or a traditional route, I would go for the traditional route. There the rules are clearer, there are no surprises that someone might cross the street. I cycle on my part and those are the rules.

You don't have any signs here, do you think that's better for the perceived safety in this situation? Or should there be more signs?

That's always the question, for me it wouldn't make a difference. It doesn't detract from the way shared space works. Nice if there was a sign, but the situation remains the same. A sign would be nice though if the situation were different. But it isn't.

Do you feel that pedestrians are paying attention?

I think everyone feels they have a right to the road. A pedestrian thinks he is allowed to walk somewhere, a cyclist thinks he is allowed to cycle somewhere, and a motorist thinks "go out of the way" because I am allowed to drive here. Everyone thinks they have a right to the road. As a result, I don't think everyone pays attention. Everyone does his own thing. They only pay attention to their own situation.

Would a crosswalk make the situation safer?

If there were a crosswalk the cars would know to stop. But in shared space I don't know. Shared space is focused on sharing the road so it would detract from the concept of shared space. It's basically just the wild west. You don't feel like there are rules.

Is it clearly suggested on this street where to bike and walk?

Yes in terms of how it is laid out I do think it is suggested. Like here with the planters and in the middle of the road. And next to that a footpath. Because of the width of the road, you do see that ideally the pedestrians walk on the far side because that's the narrower side. That's where you can walk as a

pedestrian. Then in the middle can be the cyclists and cars. The way it's laid out it does suggest, and most people do adhere to it.

Do you think the sidewalks should be wider?

As far as I'm concerned, the footpath could be narrower. Here in Westerhaven there is very little space left for cars and cyclists. I've often seen lorries having to pass, and they really don't have much room. Cyclists then have to manoeuvre around it, which makes it tricky. They could cut back on the pedestrian space to make it more comfortable for cyclists.

Here everything is 1 colour and further on the delineation is better, do you feel that the situation here is good or do you prefer like further on the blue lines.

It's tricky, both seem to have the same effect. It does become clearer where you should actually be. The lines are nice though. Even though the planters are larger objects, the lines give you more room to swerve. That does make it feel nicer and safer to cycle. When cars are around, it can sometimes be tricky with too little space [due to the planters]. In the other situation [down the road] you can just take the footpath.

Suggestion for improvement?

I would continue the lines like further down. Give space so people feel they have room, and you can move out. The planters reduce the space for movement.

Suppose this were completely 1 color, would that be better?

Then it would be even more chaotic. The only thing that separates the road now and indicates some sort of separation are now the planters. If you take that away and the trees too then it really becomes a kind of free-for-all where everyone goes through each other.

The presence of cars, what do you think about that?

From me, they can limit that. It often causes dangerous situations now. If you really want to make it safer, remove the cars. That would make a big difference and make it a lot safer and more pleasant.

When you look at it that way, do you have any factors of your own that influence the feeling of safety?

You see cyclists parked on the edge of the road here. Please designate a specific space where cyclists are allowed to park, because it is very unclear now where cyclists are allowed to park. I could put my bike here in the middle of the road. Then a defined space is better for that. Now people just do whatever and do leave the road clear, but it's still in the way.

If you have grown up as a Dutchman who has had traffic exams and you know what you can and cannot do as a cyclist, this road is still reasonable to navigate. I do notice with new international students who are not used to cycling here. If the bridge has been open and a large group of cyclists passes through this space, it can lead to super dangerous situations. Especially by international students who cannot act intuitively because they are not used to it. This does need to be considered, especially with the growing number of students in the city.

Do you have any other things you want to tell?

Get rid of the shared space. It works in theory, but in practice it's not desirable. I would go back to the traditional model. I'm sure there are ways to make it safer.

It is a access road though..

Yes that does create a choking point. The folkingestraat is even worse, and also at the bridge near the museum. Really bizarre that more accidents don't happen there.

End of interview

2. Lisanne female cyclist Astraat

The interview questions are answered in the exact order because it is better to make notes that way. Before the interview the concept of shared space was explained. The thesis was explained and the goal of the interviews.

How comfortable do you feel cycling/walking down this street? Why?

If I have to be honest, not very comfortable. I usually cycle through this street so I'm talking from that 'point of view' so to speak, but yes, not very. It's mainly because of the chaos that is constantly here with all kinds of cyclists, pedestrians and even cars that all have to pass here. You constantly have to pay attention, which makes it hard to relax on your bike.

Do you enjoy biking/walking down this street? What is the reason for that?

Actually no. That's because of what I just said. The fact that you constantly have to watch out that you don't accidentally hit someone with your bike or that you get hit yourself makes it a lot less fun for me.

How safe do you feel on this street compared to other streets in the city?

Definitely a lot less safe. I feel less safe in places like this anyway when it's such chaos and everyone is just cycling around or walking around without really paying attention. In places like this, I'm actually always thinking: Can I go around that pedestrian? The person in front of me is actually cycling too slowly, but if I go around him I might bump into the pedestrian who is walking here in the middle of the road.... No, definitely not a nice feeling.

Do you think the lack of road signs affects feelings of safety or satisfaction? And in what ways?

Yes, of course, I don't know how the situation would change if there were suddenly traffic signs tomorrow, but now, without traffic signs, I think everyone has the idea that they can just do whatever they want. Everyone thinks they can cycle or walk or drive anywhere, which I think causes chaos on this road.

Do you feel that pedestrians pay enough attention on this street? Explain.

No, pedestrians in my opinion are often the least attentive in places like this. I don't know what it is, but in my opinion, they always think that because they are "only" a small person they can't get in the way or something, but it's definitely different in my opinion. They often just walk in the middle of the road.

Do you feel that cyclists pay enough attention on this street? Explain.

Tricky, I think so, or at least more than the pedestrians. Cyclists usually keep to the right, but yes, if they have to go around someone or avoid a pedestrian, they sometimes have to twist in crazy turns. Yes, I think that's a tricky one.

Do you feel that cyclists are traveling at a good speed? Or too fast/slow?

I think it depends. I certainly don't think they go too fast but they don't really get the opportunity to do so in this crowd. I think in general they drive normally and sometimes slowly, but I think that's not really their fault but more the fault of the crowds in general and the fault of others who do not pay attention.

Do you feel safe when you have to cross the road on this street? What is the reason for that?

I really wouldn't cross the street if I were walking here myself. I'd rather wait just as long until I'm sure that in the next five seconds no one is going to bump into me. So, I wouldn't feel safe doing that and I wouldn't do that lightly.

If there is a crosswalk, does it add to the feeling of safety? If there is NO pedestrian crossing, would installing a pedestrian crossing increase the feeling of safety?

I don't see a crosswalk, but I don't know if it would help here either. I often notice, anyway, that cyclists often ignore a pedestrian crossing and just ride straight on, even if a pedestrian wants to cross the pedestrian crossing. So no, here I think it would hardly make sense. Cars usually stop at pedestrian crossings, but I don't know if they would do that here. They already have to be so careful not to hit anyone, so I don't know if they would even think about stopping for the pedestrian crossing.

Are you satisfied with the width of the sidewalk? Could it be wider/smaller? Would it contribute to the feeling of safety?

I even find it hard to see the separation between the sidewalk and the "normal" road, so yes, I think it's way too narrow. It could definitely be wider, or at least clearer.

What do you think about this street not having a clear separation between bike path and walking path? Would a clearer difference make the situation safer? And more pleasant to use?

Yes, I don't actually see the separation. I think this is a big cause for the chaos and maybe accidents. I would certainly like to see this improved. On a 'normal' road, i.e. no shared space, the pedestrians also use the sidewalk and the cyclists the bicycle path, so that would probably also happen here.

Is it clearly suggested where to bike/walk? Explain.

From the looks of it, no. It's also probably because of that not-so-clear separation between the sidewalk and the part where you're allowed to cycle. Everyone is just doing something.

Would you avoid this street if there is another option that is just as fast?

Yes, I would then want to bike on a "normal" road with a clear bike section and a clearly marked sidewalk where it's not so crowded and where you don't have to sit on your bike so frenetically.

Would you use this street more or less if it were a traditional road with raised sidewalk and separate bike lane?

Then definitely more. It's just a convenient way to get into the inner city, but the way it is now makes it a lot more awkward.

Are you satisfied with the concept of shared space in this particular situation? Do you have any suggestions for improvement? Explain.

Well, not really satisfied. I get that cars, cyclists and pedestrians need to come to the inner city this way, but this way. I don't think it's really safe. And for improvement, actually what has been said above, a clear separation between bike section and the sidewalk would be the best solution in my opinion.

What do you think of the colour of the street? Is it good, or would you rather see the street more clearly divided? Or would you prefer everything to be one colour so that it is even clearer that the street is divided?

Yes, I would like to see a clear split. Then it's still a question of whether people listen to that of course, but the way it is now doesn't work. Everyone thinks they are allowed to use the full road, maybe a 1-color road contributes to that. Maybe they could make a red section on the sides for cyclists just like a normal road.

How do you feel about the presence/no presence of motorized traffic on this street? Explain.

Actually, it's even more dangerous. Those people in the car are probably paying a lot of attention because they have a greater chance of hitting someone, if there are indeed people walking or cycling in the road. Makes it quite scary and unsafe. I would not dare to drive a car here, I would break out in a cold sweat.

How do you feel about there being no separate bike lanes on this street? Would that increase your sense of safety or satisfaction?

Definitely enlarge it. Then cyclists just have free space to cycle to where they need to go and don't have to keep paying attention and brake abruptly because there is suddenly a pedestrian in front of their wheels. The pedestrians can then also just go their way if there are separate bike lanes, because then they don't have to worry about being hit themselves.

This road is an access road from the station to the centre with many users. In your opinion, does this affect the implementation of shared space? Could this work better if it were quieter?

Yes, since so many people have to go through this road in one way or another so yes walking, biking or driving is busy here anyway. And then when there are no real rules about who can walk, bike or drive where... that certainly doesn't help. If it were indeed quieter it could work, but I'm still not a fan of shared space, and prefer a normal road with clear rules and a clear cycle path where I can be sure that I can cycle normally.

Finalizing

Do you have any other factors besides the above that you think might affect feelings of safety or satisfaction?

Just clear rules or clearly marked signs with 'cyclists here' 'pedestrians there' 'cars here' would perhaps make a difference to safety, as a first step towards improvement. But I would rather see this just as a normal road.

Do you have any other comments (un)related to this study?

No.

Thanks for answering the questions!

End of interview.

3. Julia female pedestrian Astraat

Shared space was already explained before recording.

Do you find this a comfortable street to pass through?

Not really.

And where would that come from?

I notice when I walk there that I get almost hit by cyclists. It is always very unclear anyway. People walk in the place where I feel you should be cycling and vice versa. The trees are nice there, but it's not very convenient. It's very chaotic, everything is mixed up. Suddenly there is a car coming and that makes it tricky.

And do you feel safe on this street?

I don't necessarily feel unsafe. It's not very convenient because cars go right past you. It's not optimal but I don't feel unsafe. Cars always go slowly there.

Do you feel that pedestrians pay attention on this street?

No, in the whole street actually not. Pedestrians really walk in the middle of the street and don't really look back. In my opinion, you should walk left and right of the trees and bushes [planters], but they always walk in the middle of the road. I get the idea of shared space, but I think it would have been more convenient here to have some sort of marking between the sidewalk and the street and maybe even a bike lane. The lines further down do make it a little clearer. I do feel like if I were to walk there, I would walk on the right side of the lines.

Do you feel like cyclists are paying a little attention?

Well more than the pedestrians. If there are large groups passing by then they do pay less attention.

And do you feel like they are cycling at normal speeds?

Yes, except for the delivery people who ride their electric bicycles all over the place.

Suppose you have to cross here, is it safe and comfortable?

I think you can cross here. If you look carefully to make sure there's nothing coming, you can cross here just fine.

And the width of the sidewalks, is that good here?

Yeah I think that's pretty good. It's pretty wide for pedestrians.

You don't really have signs here that indicate what the situation is like, do you think your sense of safety or comfort increases with signs?

I think so. I myself have a shared space at home with my parents. There is a sign there that it is shared space. That does make it clear what the situation is. I always see cars here looking confused when pedestrians are crossing. If everyone knows it's a shared space and that you have to watch out for each other it works better. The sign at home also says that cyclists are guests, which gives you a better indication that you should pay attention.

Of course, it's a busy access road here, do you feel like that has any impact?

I don't feel like people are paying better attention here anyway. It just gets more chaotic here because it's not clear. In my opinion it doesn't quite work here, but that could also be because of the street. You come from the ring, there are cars and so on. It could work but not here.

Suppose there should be no motorized traffic, would that work better?

Yes I think that would be better.

Do you feel that a separate sidewalk and separated bike lane would be better?

Yes I think so. The biggest annoyance is the pedestrians walking on the street. If you keep that separated, I do think that works best in terms of cyclists and cars [in the middle].

The colour here is all yellow across the board, what do you think of that?

I think the colour is pretty good. You kind of have a plaza now with no signs, so when you drive out of the street you do drive more careful automatically.

Suppose you have to go somewhere where you can choose this or another street, would you avoid it?

No, it really varies. I sometimes go via the other road parallel to this one because it's nicer to cycle there. But there are traffic lights there, so then I'd like to take this one again. It is a pleasant street. I take no other streets because it is inconvenient.

Other comments?

I do think it looks really nice, but I would rather do it near the grote markt. That's tricky with all the buses, but then they should do it somewhere quieter.

Other things you notice that would improve safety?

For pedestrians a better section, so lines or a different colour. It doesn't have to be much. And a sign to indicate that it is shared space is also very useful. I often see people riding the OV bike there who are coming there for the first time and all of a sudden a car drives next to them and they are startled. They don't know that's where it's supposed to be. The colour is good now because it indicates that the situation is different. I don't pay more attention because it's not as well arranged.

End of interview

4. Frank male pedestrian Astraat

Brief explanation of shared space, cars and cyclists share the road. Pedestrians often do too but it is still somewhat separated here.

Do you feel comfortable on this street?

Yeah its fine. Reasonable separation between the road and the footpath. The bit further along here it's different though because there it looks like you're easily being hit.

How nice is it to walk down this street?

I'd rather be on my bike through this street than having to walk.

Do you feel safe on the street?

Yes, you should mostly just walk the way other road users expect you to walk. So not in the middle of the road.

Often you have a clear sidewalk and a clear bike section and signs. What do you think about the lack of signs? Can that contribute to safety?

I don't think signs would add anything to safety. I think cars and cyclists here are kind of doing what they think is expected of them. If they then also have to take signs into account, it's not helpful. On this street it wouldn't make any difference. If you pass it for the first time I can imagine that people say oh can I drive here. Also, the colour of the road makes it a different situation so people pay more attention. It is just sometimes not clear whether you can drive somewhere, also with the car.

Do you feel that pedestrians are paying attention here?

It does depend on whether people know the place here. Like tourists often walk in the middle of the road here because they don't know the situation that well. Then they walk in the middle. If people are used to it, you can see them look carefully when crossing for example.

In terms of cyclists, are they paying attention?

Yes they are actually paying better attention. They have to be careful not to drive into pedestrians.

Do you also feel that cyclists here cycle normal speed?

I always cycle through here quickly myself when I cycle here because I have to be somewhere. The part from downtown to outside you just want to cycle fast.

This is an access road though, does shared space work less here because of that? Does that affect the feeling of safety?

I don't think it matters that much. I think precisely because Groningen is a cycling city that people are used to it being unsightly.

And as for cars, does that make it more unsafe?

I think it can. Especially with larger traffic like vans and cabs then traffic stagnates. Then cars have to turn and have to wait for the cyclists. So, it may well be that it is often jammed by cars.

If you were to cross here, would you be comfortable doing so?

I usually do look around carefully. I do assume that people just stop in front of me.

Would a crosswalk contribute to the feeling of safety?

I don't know. Maybe it works for some people if they feel it's very busy, but not for me. If it's really busy I understand that for pedestrians it can be nice, now they tend to let everyone go in front but then they can just cross.

Is it clearly suggested where you can bike and walk?

Yes you do have clear separation with those planters and terraces.

Suppose you have to go to the city centre and there is also an alternative route, would you take it?

I would consider it more because there is a bridge here than really because of the road itself. But if it really didn't matter in terms of distance, I would avoid this one. Then you as a cyclist just have more right of way and you can go faster. But I have to pass it I just pass it.

And the colour of the street, what do you think about that? Here it's 1 colour with separation with planters and further down is really a marker of the sidewalk.

If there is room, it is better, as here with the planters, because people do tend to walk in the middle and on the lines. As a cyclist, you sometimes have to swerve to the wrong side, which can lead to dangerous situations. I don't have the feeling that I bump into people here, whereas I do have that feeling further on [with blue stripes].

Do you feel that a traditional way works better, as it was?

I do think this is nicer as it is now. The situation does make you think as a cyclist or motorist that you should slow down. Pedestrians can just cross. Before this it was that everyone had the right of way and so they went faster.

The colour of the road is used throughout the inner city, so you also have the feeling of entering the city here. That works as well.

So a different colour road would not make it safer?

I think it's just better this way.

Do you have any things beyond the factors discussed that might increase safety? Or the feeling of comfort?

Signs would make it clearer for cars though. So not for pedestrians or cyclists.

End of interview

5. Anouk female cyclist Werkman bridge

Do you know what shared space is?

Yes, I think you can walk and bike anywhere in the same area.

Yes and sometimes so with cars included.

As in the folkinge?

Yes, do you feel comfortable on this bridge?

To be honest, I don't. It is always very busy here and if you have to go through them [pedestrians] with your bike, it is difficult. People always walk through the middle and across the road and then you have to slalom all the way through.

Do you then feel that pedestrians are not paying attention and are not looking around carefully?

Yes, indeed. I have the idea that they think they can just walk there and the cyclists have to somehow see how they get past.

And do you feel like the cyclists are paying attention?

I feel that cyclists do pay more attention to how they are going to pass and how they are going to get across the bridge. Sometimes they have to do whatever because it's hard for them to pass.

Do you feel that it also affects safety?

Yes, especially safety. Just like that you have a collision with a pedestrian or someone who is also dodging a pedestrian. That then also causes congestion.

Do you feel that it is also less safe compared to other roads in the city?

Yes, and I find, for example, the Folkingestraat even scarier. There it is also narrow and it is even worse [the busyness].

Do you feel that cyclists cycle too fast?

No, they do go at normal speed.

Could it be a solution if it was broader here?

I don't think it's very narrow, it's wide in the middle. But you still have a lot of pedestrians who get in the way so I don't know if that would be a solution. Maybe on the ends, because it is narrow there.

What do you think about the fact that it is not clearly suggested where to walk or cycle?

I think if it would be indicated that it could increase safety. But I don't know if people would listen to that. People just do whatever, so it would have to be very clearly indicated.

And if there were signs signalling that it was shared space?

Yes I think so. Then they start thinking more about where to walk to avoid colliding.

The fact that it's an access road creates busyness, could it be better if there weren't so many people passing by?

Yeah, that's tricky. People have to go the inner city anyway so I don't know about that.

Would you avoid this road when it is just as quick to take another route?

Yes, I would. If it's miles around I wouldn't, but if it's the same distance I would choose the other road.

Because of congestion or safety?

Well really because of safety. It is pretty tense to cycle in this situation, because you have to avoid crashing into people.

If they designed this road a little more traditionally with a bike lane and a raised sidewalk, would you use it more?

Yes, if it were really raised. If it's the same height, then it wouldn't make much difference because then people still don't really listen. With a raised sidewalk people just walk on it. On a normal road you don't have to deal with pedestrians.

In general, what do you think of the implementation of shared space here?

What we have already mentioned would be that raising of the sidewalk can be a solution. The clashes and conflicts that normally happen here cannot be the intention.

End of interview

6. Simon male cyclist Werkman bridge

You already know what shared space is?

Yep, we had that in my bachelors. Anyone can use the street and it is not pre-designated where you can walk or ride a bike.

[Another bit of explanation about the study, locations, etc.]

How comfortable do you feel on this bridge?

It's pretty disappointing at the busy times. I don't feel like pedestrians are expecting you. And a lot of these people are tourists, so they don't know it very well.

Does that make it less fun to cycle here?

I actually only cycle past here if I really have to. I don't really cycle here for fun.

Suppose you could take this route or another route, would you avoid it?

I basically take the fastest route. Suppose you have another route a little further on and I know it's busy here I would cycle around, but it's not that I really avoid it now.

Do you also feel unsafe?

Not necessarily unsafe. Maybe in the respect that it is slippery, but not because it is shared space.

So you don't feel more unsafe here compared to other streets?

No I don't.

And you have no signs or markings here, do you feel that signs would contribute anything?

I think the problem is that it's a little bit narrow in some places. It might add to the awareness of the pedestrians so that they're not taking up the whole width of the bridge. But I wonder if a sign is really going to contribute very much. It's pretty clear that you're sharing the road here. Marking on the road itself with lines and colours might help though.

Do you feel that pedestrians are paying attention here?

No.

And cyclists?

Cyclists do, they know they have to pay attention and most people do cycle over this a lot. Then you see immediately that you have to slow down.

How do you feel about there being no separate sidewalk?

I think it's better to put a lane for pedestrians. Not so people will actually walk on it, but that they know the road is shared. Now they mostly think it's all for pedestrians.

Is it clearly suggested where to walk?

Not really, everyone knows that in the Netherlands you have to walk on the right most of the time. But as now it is quiet and then you as a pedestrian tend to walk with his 3 or 4 next to each other.

Suppose this were more of a traditional road, would you use it more or less?

No that doesn't have any effect.

In general, how satisfied are you with the use of shared space here?

I don't think it contributes that much to this place. I also don't feel it promotes Groningen as a bicycle city.

And the colour of the streets? Do you feel it affects the perceived safety?

Cheerful colours are used, though. I don't feel that the colour here adds anything to the safety of the road.

Do you have any other factors that might contribute to the feeling of safety or comfort?

We have already mentioned that the lines can be different. Other than that, I don't really think so. It's a bridge, of course, so you don't really have room to change things. There's not much else you can do in terms of safety.

Do you have any other things we haven't discussed?

Not actually.

End of interview.

7. Leon male pedestrian Werkman bridge

Small explanation of shared space, interviewee already knew what it was.

Do you feel comfortable walking on this bridge?

It's always a bit of an elated feeling. You go over this bridge with a lot of people because it's the connection to the train station. Some parts of the bridge are wider than others so it always feels like a bit crowded.

Does that also affect enjoyment?

You have to look around all the time to see if there is a cyclist coming, so you are less careless. It doesn't necessarily detract from the fun, but you do have to consider everything.

Does that affect the perceived safety?

Yes definitely.

Would you compare it to other streets, is this a point where you feel less safe?

Yes, I think so. Here there is absolutely no separation between footpath and cycle path. Cyclists sometimes cycle on the left when they should cycle on the right and scooters shoot past you without warning. If the bridge has been closed then everyone else will be passing you quickly. In other streets where you don't have shared space, but a clear footpath and cycle path where cars also drive, that's just nicer in my opinion. Then people just walk left and right of the road that's nicer.

Here you don't see any signs, do you think that could contribute to the feeling of safety?

Signs I don't know. Maybe signals on the floor so you can see where to walk. But signs themselves I don't think would work.

So rather the colour of the road than signs?

Yes.

They have now done green and blue as colours, which has no meaning. So, would it increase the feeling of safety if you make it either 1 colour or a suggestion strip?

Yes, of course they have done these colours in connection with the museum and for a terrace. If it were up to me, I would make colours here that make the traffic situation a little clearer.

Do you feel that hikers are paying close attention here?

No, I don't actually do that myself either. I'm always in a rush to get to the station so you're walking for yourself as fast as possible. If people walk slowly then I go around them then I don't look to see if there are cyclists coming. Then sometimes I do get people ringing behind me from a cyclist that is coming. But of course, if you don't make a clear distinction you can just walk where you want.

And cyclists, are they paying attention?

Yes, they do pay attention, I don't often see a cyclist crash into someone. They are often obstructed to the point of annoyance by the pedestrians on the bridge. Pedestrians really pay less attention.

And how do you feel about there not being a separate walking lane?

I think as a pedestrian you can just walk here. If there were a bicycle lane you wouldn't be so quick to walk on it. If there is a freeway I don't go and walk on it either.

Suppose there is an option that was about as fast?

If so, I would consider it. It's that this bridge is built right to the main station, but it's just too narrow for the amount of people. If you have an easy tunnel under it, then I would definitely use that.

Suppose you also have a traditional road further on, would you rather use that?

Yes, because it is just not well executed, I think here. What I can add here is that it is wide in some parts and narrow in some parts. That means that if you walk four people wide here and then on the narrow bits it becomes extra narrow. Then you have to accommodate [for cyclists] and that makes it difficult. Especially if the bridge has been open. Then there are so many people on the bridge who have to walk in both ways.

In addition, do you have any things to add?

If this bridge was as wide throughout as it is at the widest sections, it would already be much better. It's just not a convenient design.

And other factors beyond physical factors?

Maybe if you didn't have it end right at the station it might work better. Almost everybody takes this bridge. If there were 2 bridges you would already distribute it much better. I get it because you want the fastest connection to downtown, but if it's so busy then you have to do something else, I think.

End of interview

8. Maaike female pedestrian Werkman bridge

The interview questions are answered in the exact order because it is better to make notes that way. Before the interview the concept of shared space was explained. The thesis was explained and the goal of the interviews.

How comfortable do you feel cycling/walking down this street? Why?

Not super comfortable. If you walk on this, sometimes the cyclists aren't too bad and then it's okay but sometimes with the traffic lights mean that there are a lot of cyclists behind you at once and then I don't feel very comfortable.

Do you enjoy biking/walking down this street? What is the reason for that?

On the one hand, it is nice to walk along the water and along the museum, I like that. But actually, I like it less because of all the cyclists behind you and I'd rather just walk along a sidewalk.

How safe do you feel on this street compared to other streets in the city?

It's tricky in traffic on many streets but I think the bridge makes it feel a little more unsafe than other streets, especially because it's so narrow. So, I think I do feel a little bit more unsafe than other streets.

Do you think the lack of road signs affects feelings of safety or satisfaction? And in what ways?

I don't think a sign will help much and influence the behaviour of cyclists and pedestrians.

Do you feel that pedestrians pay enough attention on this street? Explain.

I don't think so, some pedestrians don't really care about the cyclists and keep walking side by side, for example. As a pedestrian, you don't really see the bicycles coming from behind and many don't have a bell on their bike. That is inconvenient.

Do you feel that cyclists pay enough attention on this street? Explain.

I think the cyclists pay the most attention, they also come from behind the people so they can oversee everything. Sometimes they want to overtake pedestrians, while on the other side another cyclist wants to overtake. Not everyone can assess that equally well.

Do you feel that cyclists ride at a normal speed? Or too fast/slow?

I think they do go at a normal speed, there is also often a whole procession behind you as a cyclist so slower is not useful for the safety of the pedestrians, I think. Faster is certainly not necessary either.

Do you feel safe when you have to cross the road on this street? What is the reason for that?

Not applicable.

If there IS a pedestrian crossing, does it add to the feeling of safety? If there is NO pedestrian crossing, would installing a pedestrian crossing increase the feeling of safety?

Not applicable.

Are you satisfied with the width of the road? Could it be wider/smaller? Would it contribute to the feeling of safety?

In some places it could be wider. I myself feel most safe on the widest parts of the bridge like there in front of the museum. If the narrower parts were also as wide, I would not have to be so wary I think when I walk there.

What do you think about this street not having a clear separation between bike path and walking path? Would a clearer difference make the situation safer? And nicer to use?

I think a separation between pedestrians and cyclists would be nice yes, I just wouldn't know how they could do that here. I think something like that would definitely make it safer indeed, yes.

Is it clearly suggested where to bike/walk? Explain.

Yes mainly following other people and walking on the right side, the same side where you would walk if you were walking on the sidewalk. Something could be placed though that would make the pedestrians walk behind each other instead of side by side. This could also on a sign for example, like your previous question. Maybe this could help.

Would you avoid this street if there is another option that is just as fast?

I like it along the water so I think I would still take this road. If it were a similar road along the waterfront without the cyclists or regulated in some other way, I would take another option.

Would you use this street more or less if it were a traditional road with raised sidewalk and separate bike lane?

I think more so because you have less fear of being run off your feet.

Are you satisfied with the concept of shared space in this particular situation? Do you have any suggestions for improvement? Explain.

I'm not very satisfied, it's fine but personally I would find it better if I had to worry less about the cyclists when I walk here. As a cyclist I find it not super either, all slow people who walk in front of your bike that is also irritating. Maybe you can think of something so that the pedestrians and cyclists are less in each other's way by, for example, separating them?

What do you think of the colour of the street? Is it good, or would you rather see the street more clearly divided? Or would you prefer everything to be one colour so that it is even clearer that the street is divided?

All in one colour I think is good because you are sharing the street anyway, it does make it clear. But if you were to split it, of course 2 colours is better.

How do you feel about the presence/no presence of motorized traffic on this street? Explain.

I like that there is no motorized traffic crossing the bridge, that would only make it more unsafe, I think. The bridge is not wide enough for that, for this traffic to be safe as well.

How do you feel about there being no separate bike lanes on this street? Would that increase your sense of safety or satisfaction?

Yes, I would find that safer myself, too bad they are not there.

This road is an access road from the station to the centre with many users. In your opinion, does this affect the implementation of shared space? Could this work better if it were quieter?

Yes when it is quiet, the road is also just easier to use. Then there are fewer people on the street so you don't get in the way of the cyclists and the cyclists don't want to overtake in such a hurry which sometimes makes me worry that something might go wrong. I think the crowds are one of the biggest reasons I feel unsafe there as a pedestrian.

Finalizing

Do you have any other factors besides the above that you think might affect the perceived safety or satisfaction?

Perhaps the traffic light could turn green more often when cycling from the station towards the inner city. Then the cyclists would accumulate less, which would also reduce the number of large groups of cyclists passing each other behind the pedestrians.

Do you have any other comments (un)related to this research?

Goodluck with your thesis Jaimy!

Thank you and thanks for answering the questions!

9. Sam male cyclist Folkingestraat

Interviewee already knew what shared space is.

I have a list of questions, 19 questions and some more option questions and they are pretty quick questions in themselves. The survey is about Shared space. Folkingestraat I think you cycled through that a lot?

Yes definitely!

Maybe walked too.

I do too!

So, I need to interview 2 cyclists and 2 pedestrians per street. Do you have any preferences?

I have no preference; I just cycle more often.

Then we do it as cyclist, almost everyone who lives in Groningen has cycled and walked through these streets.

Yes, I have all my life.

Shall we walk that way? Or stand somewhere that's better. (followed by unrelated stuff about studying)

I guess you are familiar with shared space, right?

I am familiar with shared space yes.

Then I don't have to explain it either. When you cycle here like this, do you feel comfortable or are you like, it's pretty...?

I do cycle here often, but my main fear is for the safety of the pedestrians who walk here. It seems like there are sidewalks here and people just cross. I am comfortable on the bike but you have to stay sharp. I don't feel unsafe.

Do you enjoy cycling down this street?

It is a nice street to see and it is cozy, but if I go to the centre I prefer to cycle through the Oosterstraat. Then I'd rather not pass here, it mainly costs you time because you always have to slow down and be careful, in the Oosterstraat you know what to do, it is more clear.

So you feel relatively safe? Is it then the inconvenience that you don't cycle through nicely?

As a cyclist I feel reasonably safe, it's just not convenient indeed. It helps that there are no cars here, which makes it safe in that respect.

The pedestrians you just mentioned, do you think they are not paying attention and that they could pay better attention?

Well, it looks like there are sidewalks on the side here, so then you think why don't these pedestrians walk on the sidewalk then I can just cycle through. But if it's a shared space you can walk everywhere.

(Some more explanation about the municipality and their intentions)

I would say, remove the sidewalks [the marking], now it looks like there is a road but actually it is one [big space]. Make it 1 surface without the coloured curb. By the way, you can't actually walk on the

sidewalk comfortably because it's completely filled with all kinds of things. All those stores have terraces etc.

In shared space you often have no traffic signs, do you think that's good or bad?

I think it's good to have signs in certain places. At this intersection, for example. Such a danger sign could be valuable. But of course, the idea is that you pay attention yourself and that does work.

I explain that I have taken some access roads, versus some situations where it is just a square.

It's pretty tight here and it's pretty busy still because it's a road from the station to the centre. And it is a shopping street so that is a difficult combination. At [shopping center] Westerhaven you have the same but there it is much wider.

Yes and then when you cycle from westerhaven towards the inner city you also have the same stripes on the road as here.

Yes yes indeed.

You just said that pedestrians pay less attention, do you have that idea for cyclists as well?

I don't have that for cyclists. Because the pedestrians are walking everywhere, you have to pay more attention as a cyclist.

And do you think cyclists cycle too fast?

Well I'm also a fast cyclist so I don't think that easily. You just want to keep on pedalling and this is a road you travel through. A bit of fast cycling is part of the deal.

Suppose you were to cross here, would you be comfortable doing so?

Yes it does, I do feel comfortable as a pedestrian because traffic does watch out.

What do you think about the width of the sidewalks here? The restaurants do make the sidewalk narrower here.

There isn't much room at all. I think you might have to make a choice. Give restaurants the space and take away the cyclists so you only have pedestrians. Like you have on Herestraat. Or do all the terraces smaller and make some more space for cyclists and pedestrians.

Suppose you come from the station as a cyclist, you then would have to take a detour. The municipality wants to discourage this by means of shared space.

That does work, I take a different route faster. It is annoying that you can only go one way in the Gelkingestraat [parallel] to this one. If you could go both ways that would be a better alternative. Now you have to cycle far to avoid this street. This is just the quickest route from the station.

No cars are allowed here, how about that? (Excluding loading and unloading)

Yes you shouldn't do that at all, it's already so narrow and hectic. It's also really kind of a shopping street where a lot of people come to enjoy.

What were just talking about those markings too, whether it's clear where you're walking/biking mg as a pedestrian or cyclist. In shared space, of course, it doesn't really matter.

So I don't think that's clear indeed. The lines make it look like there are sidewalks for the pedestrians. I would make it all the same colour then.

So would that also contribute to the sense of security?

Yes then at least you know better as a cyclist that people walk everywhere. They already do, but the road doesn't look like they can walk anywhere. If you don't know it's shared space, you really wonder why people just step out onto the road.

Picking up on that, we already talked about the colour. Do you think it should be distinctive or just 1 color.

I would indeed make it 1 color, yellow or red. I think that works best, then everyone is aware that the road is for everyone.

And then the terraces would also be better.

Yes exactly. I think you'll automatically cycle slower because it's more of a square and not a main road. Make it a whole and then it feels more like a shopping street and less like a place you can just rush through.

Looking around here, what factors could you think of yourself where it could become safer or make me cycle more pleasantly down the street.

What we've already discussed, of course, if you look at where there are conflict points at such an intersection, it's better to indicate that with signs. It's an intersection where cars pass at speed, so it's better to indicate that with signs so you know that traffic can pass.

Do you have anything else to add as general comments?

For pedestrians, it's a really nice street. There's real atmosphere. For cyclists, it's a necessary street because it's inner city-station. When I go shopping or have to have gifts I walk through here myself, it's a nice street. That's the double thing, and it's an important street for traffic and it's a shopping street where you just want to be able to walk. That sometimes goes awkwardly together.

End of interview.

10. Nathan male cyclist Folkingestraat

Before recording we already chatted about the street. Interviewee is from the faculty of spatial sciences so he didn't need an explanation on shared space.

How comfortable do you feel on this street?

Not, it's a really annoying street. Always when you walk here you think all the cyclists are driving into me and when you bike here all the pedestrians are in the way. I really don't like this street.

And in terms of perceived safety?

Yes a little, when you walk here especially from behind you can't see very well if someone comes cycling into your back.

Do you feel that pedestrians are paying attention here?

No.

And cyclists?

Yes they do. Cyclists pay more attention than pedestrians otherwise they cycle into people.

Do cyclists ride too fast here?

No, for a bicycle they are not going too fast. As a pedestrian, you may think that the cyclists are going very fast. Then it's more the speed difference between the 2.

You don't really have any signs or markings here, do you feel that additional signs could contribute to the feeling of safety?

No, I don't think people pay attention to that at all. Even if it is indicated everyone is going to behave the same way. You know you have to pay attention to this. Only tourists may not know the situation.

If you have to cross here, do you feel safe?

Yes, but I would pay extra attention.

Do you think a crosswalk could help?

No, it's a shared space so you're supposed to walk here.

The width of the sidewalk, is that right?

You can hardly widen them. What is mainly the problem here is that when the stores are open there is all the stuff outside. As a pedestrian you then have to walk around it. If a cyclist approaches, it becomes unsafe. I would then remove the obstructions.

Is it clearly insinuated where to walk and bike?

Yes, that is clearly marked with the blue stripes.

Suppose you could go via this street or via a street that is equally fast but traditional, would you prefer one over the other and why?

Yes, then I go for the traditional road. There it is clear what the intention is. Here with shared space you do pay more attention, but if there are separate sidewalks, cyclists and cars are not invited to use the sidewalk. So, then you're safer.

You can also change the colour of the road, so you either make everything 1 colour or you make a clear distinction?

I would rather go for an elevation of the sidewalk. Now, as a cyclist, you quickly cross the sidewalk and as a pedestrian, you quickly enter the road.

And it's an access route, does that make any difference? Suppose less traffic would come through here?

Yes, then it could work better.

Beyond what we've already discussed, do you want to highlight any things that might increase or decrease safety?

No, we have discussed everything. Except you have for example foreigners who do not understand, on Saturday you notice immediately that it is more difficult because then there are more people who also do not know the street.

11. Maarten male cyclist Folkingestraat

Are you familiar with shared space?

Yes from the studies.

You are a cyclist down this street. How comfortable do you feel here as a cyclist?

If I'm in a hurry then it's not very comfortable. Then you just want to go to town. I think it is a nice street because there is always something to do.

And your perceived safety?

That one is just fine during the day. At night it might be a little grim. A little crowded during the day, though.

And compared to other streets?

You are a bit more observant here than a place with a normal bike path. A lot of pedestrians and there is loading and unloading.

Do you feel that pedestrians are paying attention on this street?

People do look at the stores a lot and then they may not pay attention.

And cyclists?

Yes, they do pay attention. When I cycle here, I have the feeling that people see me.

And the speed of cyclists?

That one is just fine.

Suppose you had to cross here, would that be comfortable?

You have to be very careful here. You can't cross blindly.

And the width of the road, is that good?

A lot of stores do have a lot of stuff parked on the sidewalk. That does cause people to walk on the road.

So, the sidewalk can be wider?

Yes, it is inconvenient that there are houses on both sides, but a wider sidewalk would help.

Is it clearly suggested where to walk or bike?

I do find that disappointing. Especially at the beginning and end of the street you can see it unclearly [because of the colour of the street].

Suppose there is an alternative route, would you take it?

From the station this is the shortest way though so then I go through here. If you have another route that is just as fast and it is busy then it is better to take that one.

Suppose it is busy in the city and you can choose this or a traditional road, would you choose the other road?

I think I would choose the other one then.

And the colour of the street, you have a suggestion line here. What would be better?

I think this is okay in terms of distribution. It shows that you have to pay close attention.

It is an access route to the station though, could the concept work better in a quieter street?

Yes I think so. It's busy here now because everyone is going to the city or to the station. I understand that they try it here particularly because it's busy, but I think it works better when it's quieter.

And the combination with the stores?

They might have done better [stores] in a quieter street.

And the lack of signs and indication, do you think signs can make it clearer?

You could put up a sign saying it's shared space. Then people would know what the situation is. Now there is no sign and that can cause accidents.

Do you feel it would be safer if there was a clear separation from bike lane?

I think that's a difficult question, but I would feel safer as a pedestrian with a separation. This of course ensures that everyone is paying attention, but as a pedestrian you do feel safer if you know where you are allowed to walk.

Do you have any other things we haven't discussed that could help with safety?

As discussed, I would put up a sign. You might also make it clearer that it is shared space.

And unrelated things you want to get rid of?

I am curious about the results.

Me too!

End of interview

12. Maarten male pedestrian folkingerstraat

Interview begins with an explanation of shared space and explanation of the research.

When you walk down this street as a pedestrian, do you feel comfortable?

Comfortable, no. This is because of the way the street is constructed. It is almost impossible for a pedestrian to walk on the sidewalk because of all the obstructions. Walking on the road is also difficult because electric cyclists pass through at a considerable speed. Because the road is between the inner city and the station. It is not comfortable.

What about perceived safety? How about that?

It also depends on how safe you make it yourself. I've walked and biked down this street often enough to know that you have to look around carefully and not walk blindly through it. If you haven't been there before I can imagine that you find it terrifying. There are sometimes big terraces on the sidewalk, so that makes it more difficult for pedestrians.

This street has no signs, what do you think about that? That should make it safer in shared space, does that work here?

It would have been nicer if there was clearer indication of where you can and cannot walk. Also, at the intersection, there is no mirror or anything on which you can clearly see what kind of traffic is coming.

Do you feel like pedestrians are paying attention?

No not at all.

And cyclists?

More, but that's also because cyclists are often blamed in collisions. But I do feel that cyclists are more observant by default. Pedestrians are more likely to be socializing with family or with a partner, so they're not as likely to realize that they are in the way.

And the speed of cyclists, is that ok?

It depends a little bit. Cyclists do want to just cycle through, there are cyclists who go through at a breakneck speed.

You do have a kind of suggestive sidewalk, do you think it should be wider or narrower?

If it had just been a street with residential houses and no stores it would have been fine. But the fact that there are only stores and restaurants on the street does disappoint. The restaurants and stores all put stuff on the sidewalk. When the stores are closed the street is much nicer.

What do you think about the lack of pedestrian crossing points?

I don't think that really applies here. Normally it is busy, but it has been made artificially narrower by all the obstructions. If that hadn't been there, there would have been a lot more space and you could cross the street more easily.

Is it clearly suggested to the pedestrian where they should walk?

Yes in that respect I think it's a good street. You do see clearly that there is some sort of intended sidewalk so you know there can be faster traffic in between. Anyone who is used to being outside you can clearly see where you can walk and where you need to look out more.

As a pedestrian, would you avoid this street if you had to go through it?

I personally prefer to go through Herestraat. Only pedestrians are allowed there. Then I walk the last bit through the zuiderdiep. I'd rather walk that extra bit.

Suppose there were a traditional road with no obstructions and a higher sidewalk, would you use it more?

Sure, I would walk through it more often. At night and in the evening, I also like to go by there because it's quieter.

Overall, do you think this is a good or bad implementation of shared space?

The concept is good, but the location is wrong. It could be a good blueprint where it is not so extremely crowded.

So, what would be the suggestion to make it better?

I would prohibit being allowed to have such a wide terrace, as some stores do [not having a terrace].

What do you think of the colour of the street? Everything is yellow with a suggestive strip in blue. Should it be clearer, or just 1 colour?

I don't think you should make it a big space. That would actually make it even more dangerous. It is good that there is a different pattern on the road so that people do have the separation subconsciously. The same colour is good as it is, but it is good that there is a different pattern, so people see that they have to pay attention.

No cars are allowed here, other than destination traffic, is that the right way to do it?

When cars are in between here, no one can pass. The street is already far too full for motorized traffic. So, yes.

Otherwise, do you notice any things we haven't discussed that might increase satisfaction or sense of security?

Hang a mirror at the intersection as we discussed. Start and end of the street should be the same as the middle of the street. Now people enter the street without clear markings and then later it is separated. That makes it even more unclear for people and they keep walking in the middle of the street.

There is also quite a lot of traffic coming through this street.

Yes and there is no good alternative route either. You can go via the side roads, but that's also all one-way so that doesn't make an alternative attractive either.

Anything else you want to say?

Yes, it is a street that is just too vague to be completely sure as a cyclist and pedestrian. Because the stores use the sidewalk it does make it more awkward. It certainly doesn't add to the walkability of the road.

End of interview.

13. Mannes male cyclist Blokhuisplein

Thanks for participating in the interview. Also, some explanation about the interviews and that it is about shared space etc. Explaining what it means.

Do you feel comfortable on this street?

Depends on where you come up to the street. If you come from the druiptreek you can cycle straight into the shared section with the coloured tiles. People do conflict with each other there sometimes.

And if you come from the other side?

Then you have to start looking carefully. People coming from the side street don't look carefully to the left and sometimes suddenly turn into the street.

Is it even a nice street to cycle through?

I don't like it very much because it does get crowded all the time.

Would you also avoid it if another street was just as fast?

Yes indeed, I often go faster through the city centre, 1 street away.

Do you feel that this street is also more unsafe?

It's not too bad, it's mostly unpredictable. It doesn't really affect the perceived safety.

You don't really see signs; do you feel that signs would make it clearer?

It would be clearer if they indicated the bike lane with a colour. Pedestrians and cyclists now mix up a bit at this point.

So, it does make it better if there is a separation?

Yes, indeed I think so.

You also see a crosswalk here; do you feel it helps pedestrians?

That crosswalk is very handy. The street is very busy so it's nice when people just stop so you can cross. It's nice to have a pedestrian crossing so people know clearly that they have to stop.

Do you feel that cyclists and pedestrians are paying attention?

Yes it does.

Do you think the sidewalk/bike lane is wide enough?

Yes. It is meant for both of course. It would be nicer especially if it is a clear separation. Then of course it must be a little wider.

Suppose this road were more traditional with a raised sidewalk and a bike lane, would you use it more often?

Yes, I would find it easier.

And car traffic, does that make it less safe and comfortable?

It's mostly cars, who also often stop in the middle of the intersection. If you make a higher sidewalk there and a clearer entrance for cars it does make it safer.

Do you have any things yourself that you say could make it safer?

I have also used this street in the car many times and it is often a lot of paying attention. 2 pedestrian crossings and no clear markings. People sometimes just cross over.

End of interview

14. Florentine female cyclist Blokhuisplein

The interview questions are answered in the exact order because it is better to make notes that way. Before the interview the concept of shared space was explained. The thesis was explained and the goal of the interviews.

How comfortable do you feel cycling/walking down this street? Why?

I actually almost always feel safe. I notice that everyone pays attention and thinks about each other even for cyclists and people who walk. You notice very well that everyone looks and makes clear to each other where she / he wants to go.

Do you enjoy biking/walking down this street? What is the reason for that?

I don't find it very special any more because I cycle there regularly, so the "wow" factor has fallen away a bit. I do remember that when I first cycled there I thought "wow this is very different from a normal tarmac road with traffic lights etc." and I actually liked that. The stones they used there I found especially funny and it feels very open.

How safe do you feel on this street compared to other streets in the city?

I must admit that I always pay a little more attention here than on other streets in Leeuwarden. Sometimes it is very busy with cars waiting to turn so it is always a bit tense. I feel safe but I have to pay more attention.

Do you think the lack of road signs affects feelings of safety or satisfaction? And in what ways?

I think the lack of road signs does indeed have an influence on the feeling of safety. Everyone has to think about each other and pay a little more attention than in the other streets, but in general this goes pretty well (I haven't had an accident yet!) I notice this mainly by the fact that cars actually stop for pedestrians and cyclists instead of passing quickly.

Do you feel that pedestrians pay enough attention on this street? Explain.

Yes, pedestrians pay close attention on this street. There is also a crosswalk which I think gives pedestrians the feeling of an extra bit of safety anyway.

Do you feel that cyclists pay enough attention on this street? Explain.

Yes, I think cyclists pay extra attention because cars tend to pass quickly in front of a cyclist. It also strikes me that cyclists here often indicate where they are going.

Do you feel that cyclists ride at a good speed? Or too fast/slow?

In my opinion, cyclists don't ride too fast or too slow. In any case, I don't notice any difference when I cycle there that I think "you are cycling very fast". Everyone has their own pace.

Do you feel safe when you have to cross the road on this street? What is the reason for that?

Yes, I feel safe when I have to cross in this street. There is a stretch where cyclists have the right of way and that is also the place to cross. Actually, every car stops for cyclists here too.

If there is a crosswalk, does it add to the feeling of safety? If there is NO pedestrian crossing, would installing a pedestrian crossing increase the feeling of safety?

I think having a pedestrian crossing here is definitely important and also definitely contributes to pedestrian safety and mainly the perceived safety. This is quite a busy street, with cars, trucks and buses. In order to cross here safely, it is useful that there is a pedestrian crossing, otherwise I think you have to wait a long time.

Are you satisfied with the width of the sidewalk? Could it be wider/smaller? Would this contribute to the feeling of safety?

I find the sidewalk here perfect. It is much wider than normal sidewalks and this allows you to overtake everyone safely without hitting anyone. I think this is really ideal and extra safe for pedestrians and cyclists.

What do you think about this street not having a clear separation between bike path and walking path? Would a clearer difference make the situation safer? And more pleasant to use?

On the one hand, I think a separate bike path would have been more convenient because sometimes it can be a little unclear who is allowed where. But then again, the sidewalk is so wide that it doesn't really matter because it's big enough for everyone. Also, cars drive pretty fast here, and I don't know if I would like to have a bicycle path 'on the road'.

Is it clearly suggested where to bike/walk? Explain.

Yes definitely. It is very clear that there is a car road and a sidewalk. This is because there is also a kind of separation made by means of the gutter so you really do see that there is a car road and sidewalk.

Would you avoid this street if there is another option that is just as fast?

No, I feel safe enough to bike/walk here. I do this so often that it's really not a problem for me to use that road.

Would you use this street more or less if it were a traditional road with raised sidewalk and separate bike lane?

I don't think that would matter much to me. As I had already mentioned I come here so often that it has just become habitual with me. I would still use this street just as often even if adjustments were made.

Are you satisfied with the concept of shared space in this particular situation? Do you have any suggestions for improvement? Explain.

Yes I am at peace with the concept though. I think it works, everyone thinks about each other and it's made so that everyone has space too. I can't really think of a suggestion for improvement. Only that maybe they could have made the end of the cycle path from the bridge a little longer to make it a little clearer for some people.

What do you think of the colour of the street? Is it good, or would you rather see the street more clearly divided? Or would you prefer everything to be one colour so that it is even clearer that the street is divided?

I think this is actually perfect, it is clear that the street is shared but it is also clear who is supposed to be where. I would leave the street as it is.

How do you feel about the presence/no presence of motorized traffic on this street? Explain.

I'm actually never that bothered by this. They can sometimes drive a little fast, but not disruptive to the operation of the road.

How do you feel about there being no separate bike lanes on this street? Would that increase your perceived safety or satisfaction?

No, as I said earlier, I think it's actually fine as it is. There is enough space for everyone [cyclists and pedestrians] and because cars and the like can drive pretty fast in this street I myself would not find it very pleasant to ride my bike on that street.

This road is a road with many users. In your opinion, does this affect the implementation of shared space? Could this work better if it were quieter?

I think the concept is still very relevant here despite the fact that it is busier. It is indeed a busy road but everyone thinks of each other and pays more attention than on other roads.

Finalizing

Do you have any other factors besides the above that you think might affect the perceived safety or satisfaction?

The druifstreek (street that leads to blokhuisplein) are sometimes cars that want to get in/out of there and that does sometimes cause a bit of a commotion because this is not really indicated anywhere that this street continues. Despite the fact that there are shark teeth.

Do you have any other comments (un)related to this research?

No I have no further comments!

Thanks for answering the questions!

End of interview.

15. Daan male pedestrian blokhuisplein

Explaining what shared space is, what the study is about etc etc.

Do you feel comfortable on this street?

As a cyclist, it takes a lot of getting used to when you first pass it. It is not clear where the bike path is. As a pedestrian you share the road with the cyclists. Once you understand how it works it works fine. As a car, it does make it difficult to merge in.

Does it also affect the perceived safety?

No it's not that intense.

Do you feel that pedestrians and cyclists are paying attention on this street?

Pedestrians not really, but cyclists always pay attention.

And the speed of cyclists?

That's normal.

There are 2 pedestrian crossings, do you feel these contribute anything?

I think these are useful. Cars do pay more attention to their speed when someone is walking on the pedestrian crossing. It is an easy and clear crossing point. It's best to take the pedestrian crossings, you often end up there organically as well.

Would you avoid this street if another street is just as fast?

I think it's fine, it's a nice street too. It looks nice and I wouldn't take a different route for the sake of safety.

The colour of the road is all the same now, does this add to the feeling of safety?

I think it would help for the overview to give it a different colour. The sidewalks are okay in colour, but you could change the road. That would make it clearer.

Do cars also have a negative effect?

No, the cars just have their own stretch. If it's busy, as a pedestrian you just wait a little or take the crosswalk.

The fact that there are no separate bike lanes, does that have any impact?

No, it's quite wide, so you walk past it very easily. The cyclists just cycle next to it [the pedestrians]. If it is busy and you need to pay attention it regulates itself, cyclists automatically go more towards the road and the pedestrians more towards the side.

Apart from what we've already mentioned, do you have anything that might increase the perceived safety?

No not really.

I don't see any signs at all to see what to do. Do you feel like that's a good thing?

It's fine. You do have the shark teeth signs so the cars are more careful anyway. The shark teeth do work.

16. Frances female pedestrian blokhuisplein

The interview questions are answered in the exact order because it is better to make notes that way. Before the interview the concept of shared space was explained. The thesis was explained and the goal of the interviews.

How comfortable do you feel cycling/walking down this street? Why?

As a pedestrian, this street is comfortable. The sidewalks are very wide and there is plenty of visibility.

Do you enjoy biking/walking down this street? What is the reason for that?

Enjoying is tricky to say, I think it's a nice street. As I said, the sidewalks are very wide so that does make it nice. As a result, there is plenty of room for both cyclists and pedestrians.

How safe do you feel on this street compared to other streets in the city?

I actually feel safe everywhere. The only thing that might affect safety here are the cars because they drive pretty fast, but the pedestrian crossings are respected.

Do you think the lack of road signs affects feelings of safety or satisfaction? And in what ways?

Indeed, I see very few road signs. I never really thought about that. It could perhaps create clarity for cyclists because from both sides the bike path suddenly stops. Then a sign that you are sharing the road might contribute to safety and especially clarity.

Do you feel that pedestrians pay enough attention on this street? Explain.

Yes, it's a big clear turn with lots of space. The pedestrians just go their way and can take the crosswalk. Sometimes you do have that you almost run into a cyclist, but because of the space it doesn't happen that often.

Do you feel that cyclists pay enough attention on this street? Explain.

Yes, they pay extra attention. That's mainly because the bike lanes end at the beginning of the street. It turns from a bike path into a kind of sidewalk/cycling path combination. This does ensure that cyclists pay extra attention instead of mindlessly cycling on.

Do you feel that cyclists are traveling at a good speed? Or too fast/slow?

Yes, that's not a problem, cyclists often slow down on this stretch because the road is shared so that's nice.

Do you feel safe when you have to cross the road on this street? What is the reason for that?

I definitely feel safe when I have to cross the street. This is mainly because there is a pedestrian crossing on both sides of the curve. As a result, you know that the cars are waiting for you.

If there IS a pedestrian crossing, does it add to the feeling of safety? If there is NO pedestrian crossing, would installing a pedestrian crossing increase the feeling of safety?

Certainly, without a crosswalk it would be much more unsafe. Cars go pretty fast through this turn, so without a crosswalk it's harder to judge when you can cross and whether you'll be seen.

Are you satisfied with the width of the sidewalk? Could it be wider/smaller? Would this contribute to the feeling of safety?

Yes as I said earlier the sidewalks are wide enough. Therefore, there is enough space for both pedestrians and cyclists. It ensures that there are few conflicts. So this does contribute to the feeling of safety. Only in places where you have to cross can it sometimes be a bit awkward [with cyclists].

What do you think about this street not having a clear separation between bike path and walking path? Would a clearer difference make the situation safer? And nicer to use?

I don't think it would matter in this street. You mentioned the train station, I think it would matter more there.

Is it clearly suggested where to bike/walk? Explain.

Not quite. You have the bike path on both sides that just stops and turns into the sidewalk. That takes a lot of getting used to, especially when you first get there, but once you've been there a few times it's fine. But it's not very clearly marked, it goes naturally.

Would you avoid this street if there is another option that is just as fast?

No, not at all. This street is fine and if I have to go through it I go through it.

Would you use this street more or less if it were a traditional road with raised sidewalk and separate bike lane?

Makes no difference. If I have to pass it, I pass it as I said. A different layout would make no difference in this.

Are you satisfied with the concept of shared space in this particular situation? Do you have any suggestions for improvement? Explain.

I don't really have any suggestions, it's a nice place to be in. You can walk quietly, and I don't feel rushed. I am satisfied.

What do you think of the colour of the street? Is it good, or would you rather see the street more clearly divided? Or would you prefer everything to be one colour so that it is even clearer that the street is divided?

The colour of the street is good, the tiles give it a nice look. It is clear that it is a big, shared place where everyone has to look out for each other.

How do you feel about the presence/no presence of motorized traffic on this street? Explain.

That's fine, it's a through road so it makes sense. The cars do go very fast sometimes, but that's not a problem for a pedestrian because of the pedestrian crossings.

How do you feel about there being no separate bike lanes on this street? Would that increase your perceived safety or satisfaction?

That's not a bad thing because it's wide enough. I don't think the perceived safety would change because of it.

This road is a road with many users. In your opinion, does this affect the implementation of shared space? Could this work better if it were quieter?

I can imagine it working especially in places where it's quiet and people can pay a lot of attention to their surroundings. But it's just implemented well in this situation. I don't see any problems.

Finalizing

Do you have any other factors besides the above that you think might affect the perceived safety or satisfaction?

Not really, I'm satisfied with this road, I couldn't think of anything like that.

Do you have any other comments (un)related to this research?

No.

Thanks for answering the questions!

17. Casper male cyclist Stationsplein

Begins with an explanation of the study. Explanation of the traffic situation.

How comfortable do you feel on this street?

Yes, walking is fine, there is a lot of space. As a cyclist it's more difficult because you're kind of slaloming between people. There's not really a clear path so you feel like you're cycling on the sidewalk. But it is also fine to cycle here.

Does it affect the perceived safety?

As a pedestrian you do pay more attention, as a cyclist you also have to be more alert.

Do you feel that pedestrians are paying attention?

Yes, I have that idea, pedestrians do pay attention to whether cyclists are approaching.

And cyclists?

Yes, they do pay more attention, of course they go a lot faster and have to be careful not to bump into people.

Do you feel like they are cycling too fast?

No that is not the issue.

I see some signs here that say you share the road; do you think that contributes anything?

The signs don't really stand out right now. You can think of that as something that contributes only little [because they are not clearly visible].

Is it fine to cross here towards the station?

It helps that there is a crosswalk, which does make it easy.

Are you satisfied with the width of the road?

I think in terms of width it's fine. Because it's not clearly marked which part is for cyclists and pedestrians, everything does get mixed up. But there is plenty of room.

So, it would be nicer if it was more clearly indicated?

Yes.

Would you avoid this street?

Yes, you can walk a little to the left past that building and then you'll walk a little more quietly without cyclists, I do that often.

How do you feel about the presence of cars?

It is very busy, especially around office hours when there is a real traffic jam of cars. Then it is disturbing that there are cars present. Then it is hectic.

Do you have any other things that you say could be better?

Perhaps indicate which part is bike path and which part is for pedestrians. That would make a big difference because sometimes you have people who just waltz through with their bikes and that's not nice for a pedestrian at all.

End of interview.

18. Franke male cyclist Stationsplein

The interview questions are answered in the exact order because it is better to make notes that way. Before the interview the concept of shared space was explained. The thesis was explained and the goal of the interviews.

How comfortable do you feel cycling/walking down this street? Why?

I definitely feel comfortable walking there. I should add that I have lived in this area all my life so I am used to it. Of course, I am also young and can anticipate traffic a little faster than some older people. Traffic does move very fast in this place, so I can understand that it can be difficult or intimidating for others.

Do you enjoy biking/walking down this street? What is the reason for that?

I think it's fine to bike or walk here. It's a cosy part of the city, because I like a bit of hustle and bustle myself.

How safe do you feel on this street compared to other streets in the city?

As I said earlier, I don't feel any more unsafe in this bit than in other parts of the city because I'm so used to it.

Do you think the lack of road signs affects feelings of safety or satisfaction? And in what ways?

Yes I think it does for sure. It's a bit tricky to decide on how to cycle at times. Who you let in front and who you don't. When this is new to you, or when you're generally not confident in traffic, this is bound to be tricky.

Do you feel that pedestrians pay enough attention on this street? Explain.

No definitely not. I feel like these people assume that the cyclists will pay attention to them. They don't walk on one side but spread out, it becomes a kind of slalom when it is busy for the cyclists.

Do you feel that cyclists pay enough attention on this street? Explain.

Yes they do, the cyclists go faster and are therefore often more alert. This is never true of everyone, but in my opinion it is true of the vast majority.

Do you feel that cyclists ride at a good speed? Or too fast/slow?

Yes in my opinion the cyclists are riding at a good speed. Compared with pedestrians, it is always 3 times faster. So you have to adjust your speed a little bit to the crowds.

Do you feel safe when you have to cross the road on this street? What is the reason for that?

Yes on the crosswalk, but less so when crossing by bicycle. Sometimes people overlook the shark teeth or motorists do not pay attention and this can create dangerous situations.

If there IS a pedestrian crossing, does it add to the feeling of safety? If there is NO pedestrian crossing, would installing a pedestrian crossing increase the feeling of safety?

In my opinion, a pedestrian crossing will always produce higher perceived safety.

Are you satisfied with the width of the sidewalk? Could it be wider/smaller? Would it contribute to the feeling of safety?

In terms of width, the sidewalk is good. However, it will be helpful to give guidelines to pedestrians where it is safest to walk.

What do you think about this street not having a clear separation between bike path and walking path? Would a clearer difference make the situation safer? And nicer to use?

Yes, this also ties in with my previous answer. Guidelines will make it a lot safer.

Is it clearly suggested where to bike/walk? Explain.

No not at all. There are no instructions on where you can walk.

Would you avoid this street if there is another option that is just as fast?

No, I don't feel unsafe, so that doesn't matter to me.

Would you use this street more or less if it were a traditional road with raised sidewalk and separate bike lane?

Also not applicable, I think it's fine. I do think others use this route more quickly.

Are you satisfied with the concept of shared space in this particular situation? Do you have any suggestions for improvement? Explain.

I think it's an unnecessary initiative. I don't see why you don't make clear guidelines directly.

What do you think of the color of the street? Is it good, or would you rather see the street more clearly divided? Or would you prefer everything to be one color so that it is even clearer that the street is divided?

I'd rather see it split up more clearly.

How do you feel about the presence/absence of motorized traffic on this street? Explain.

Yes I get that there is no traffic anymore, there is plenty of room for motorized vehicles in the rest of the city.

How do you feel about there being no separate bike lanes on this street? Would that increase your sense of safety or satisfaction?

Yes, it doesn't make me unsafe, but I just don't understand the point of it.

This road is an access road from the station to the inner city, with many users. In your opinion, does this affect the implementation of shared space? Could this work better if it were quieter?

It would probably work better, but I don't think it's possible because it's just supposed to be a busy place.

Do you have any other factors besides the above that you think might affect the perceived safety or satisfaction?

No.

Do you have any other comments (un)related to this research?

No.

End of interview

19. Sophie female pedestrian Stationsplein

The interview questions are answered in the exact order because it is better to make notes that way. Before the interview the concept of shared space was explained. The thesis was explained and the goal of the interviews.

How comfortable do you feel cycling/walking down this street? Why?

I do feel comfortable. It's a wide, open space with plenty of room to walk and cycle. It is sometimes a bit tricky not to bump into cyclists, especially on the stretch where cars are also allowed.

Do you enjoy biking/walking down this street? What is the reason for that?

Yes, it looks nice. I pass it often from the train station and I live near here. It's a big improvement from the old situation and it's a much nicer street now.

How safe do you feel on this street compared to other streets in the city?

I do feel safe here, especially on the stretch without cars. Here with the cars, it can sometimes get a little awkward when there's a cyclist and a car coming at the same time. But overall, I feel pretty safe.

Do you think the lack of road signs affects feelings of safety or satisfaction? And in what ways?

I don't think the perceived is affected very much. It is sometimes necessary to pay more attention, because some drivers are here for the first time. Lesson cars also have more trouble here because the rules are not so clear.

Do you feel that pedestrians pay enough attention on this street? Explain.

Yes, but sometimes you do see that cyclists have to swerve. But generally speaking, there are not many conflicts.

Do you feel that cyclists pay enough attention on this street? Explain.

Yes, they pay better attention than the pedestrians, but that makes sense. They go faster and they come from behind, so they have a better overview.

Do you feel that cyclists are traveling at a good speed? Or too fast/slow?

Sometimes cyclists do go a little fast. It is the route to the station anyway so maybe they are in a hurry.

Do you feel safe when you have to cross the road on this street? What is the reason for that?

At the crosswalk it is. Here [other side of the grass] without pedestrian crossings it is more difficult, you have to be more careful. But at the crosswalks it's certainly safe, cars always stop.

If there IS a pedestrian crossing, does it add to the feeling of safety? If there is NO pedestrian crossing, would installing a pedestrian crossing increase the feeling of safety?

Yes, it certainly adds to the feeling of safety. The pedestrian crossings at the station work well and cars always stop. The stretch without pedestrian crossings is much quieter than the one with pedestrian crossings, so I don't think it will be necessary.

Are you satisfied with the width of the sidewalk? Could it be wider/smaller? Would it contribute to the feeling of safety?

Yes, the sidewalk is wide enough. If it were wider, it could reduce conflicts between cyclists and pedestrians, so maybe also the perceived safety.

What do you think about this street not having a clear separation between bike path and walking path? Would a clearer difference make the situation safer? And nicer to use?

I think it would provide clarity though. From both sides you actually arrive a little bit ambiguous. On the station side the bike path suddenly stops and on the other side it was already not quite clear where you should cycle. If you're familiar it's okay, but it can feel unsafe for strangers if you don't know what to do.

Is it clearly suggested where to bike/walk? Explain.

No that's not clearly marked, it's like a square with the same tiles, so you can't see any difference.

Would you avoid this street if there is another option that is just as fast?

No, it is a good street to go through. As a pedestrian, this is also the quickest route to the station and is not disruptive.

Would you use this street more or less if it were a traditional road with raised sidewalk and separate bike lane?

I think less. There are also terraces here where you can sit nicely. When this road was still the old road it was a much less nice place. Now you take it easy whereas before you went through the street in a rush/hurry.

Are you satisfied with the concept of shared space in this particular situation? Do you have any suggestions for improvement? Explain.

An improvement would perhaps be to make it clearer at certain points where cycling is allowed. But overall, I am satisfied, the old situation was worse, so this is definitely an improvement.

What do you think of the colour of the street? Is it good, or would you rather see the street more clearly divided? Or would you prefer everything to be one colour so that it is even clearer that the street is divided?

That's a good thing. Maybe you could change the colour of the road where cars are allowed, so it's a little easier for cars to see. But for pedestrians, it's good as it is.

How do you feel about the presence/no presence of motorized traffic on this street? Explain.

The traffic in front of the station does drive by quickly sometimes, but there are pedestrian crossings so it's not a big deal. Because of that, as a pedestrian, you don't feel like it is dangerous.

How do you feel about there being no separate bike lanes on this street? Would that increase your sense of safety or satisfaction?

It can increase safety, because then pedestrians know where they can walk without coming into conflict with cyclists.

This road is an access road from the station to the inner centre with many users. In your opinion, does this affect the implementation of shared space? Could this work better if it were quieter?

I don't think the crowds matter very much. If there are day-trippers coming by it can get a little crowded and then it does make it harder for cyclists to get through. But I don't think it makes a big difference to shared space.

Finalizing

Do you have any other factors besides the above that you think might affect the perceived safety or satisfaction?

If I really have to name something, the narrowest part could be a bit wider. There are now lampposts there which makes it look narrower than it really is. This can make it tricky for cyclists.

Do you have any other comments (un)related to this research?

That it's a nice street since the renovation. Before it was a normal road with a roundabout and bike path and separate sidewalk. This makes it a lot cosier with the terraces too.

Thanks for answering the questions!

End of interview.

20. Juleke female pedestrian Stationsplein

Brief conversation about how long she has lived in Leeuwarden etc. And brief explanation of the research, what shared space is etc.

Do you feel comfortable on this street?

Yes, in a way. It's very spacious so you can just walk and cycle there. Because it's so spacious it doesn't really bother you. The part where you can cross is more difficult, there is no clear distinction from the road. Then you come running and then you see cars, then it's chaotic. You do have a crosswalk, of course, so that does work.

Do you think the crosswalk here contributes to the perceived safety?

Yes, that very much, you have buses, cars etc. Like I said, you don't really have a different colour road or anything so then it's nice that there's a pedestrian crossing.

Do you feel otherwise safe on this street?

I feel safe otherwise.

Compared to other streets in the city, do you like this more or less?

I do think it looks cosy. It's not really a different colour road that cars race on, so it does look cosy and peaceful. The atmosphere is nice.

There are also terraces, is that disturbing?

No that adds to the cosiness. You walk past it and it's convivial. And the area where you can walk and cycle is big enough.

Do you feel like the pedestrians are paying attention?

Yes, it does. But how observant do you have to be, no cars are allowed there. It is also very wide so you can walk there very relaxed.

And cyclists?

Yes, they pay better attention, you have to go a little bit between walking people and there is no specific bike lane though. But of course, it's very wide so it's fine.

And do cyclists cycle too fast?

No that's at a normal pace. When it's quiet you can cycle there pretty fast, but they just cycle normally.

Is it positive that it is wide?

Yes.

Is it clearly suggested where you can cycle and walk?

In the part near the station everything is grey so there is no clear distinction between bike path and footpath. Further on it is clearer with a road where cars drive [towards the city].

Suppose there was a clear bike lane, would that increase safety?

Then it would be more ordered. Now everything gets mixed up because there is no real and clear distinction. But it is wide, and no cars are allowed, so it is not unsafe. As soon as cars are added, a separate bicycle lane would make it less chaotic.

The colour of the street is all 1 colour, do you think that's good?

Since there is just a crosswalk though I think it's fine. It looks very convivial and cosy. I don't think it's necessary to change the colour. It would make it more orderly though, but never had a weird situation because of it.

It is a busy road to the inner city with a lot of people though, does that affect it here?

Leeuwarden is a lot quieter than Groningen, but when it's busy and people walk in groups in the city you notice that it is confusing. Because there is no sidewalk and people suddenly see cars as well, it can be chaotic.

There are signs here as well, do you feel like that contributes anything?

No, I've never seen those signs to be honest. If you're new and you want to know what the situation is, one might find it helpful, but I never noticed it.

Do you have anything else you'd like to say about street safety or other issues?

Leeuwarden was the cultural capital of the year and a while ago it was filled with trees. That makes it difficult to cycle between them. It was chaotic, so they shouldn't do it again.

End of interview