The experience of traffic safety in the shared space behind Amsterdam Central Station: a comparison between tourists and locals

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The experience of traffic safety in the shared space behind Amsterdam Central Station: a comparison between tourists and locals

Bachelor Thesis

By

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Preface

This thesis is written for the completion of the bachelor's degree Civil Engineering at Delft University of Technology. The subject of this research is chosen within the department of Transport & Planning. The research has been conducted from September to October 2021.

I would like to thank my supervisors, Yufei Yuan and Alexandra Gavriilidou, and fellow students who supported me with their meaningful guidance, help and feedback. I would also like to thank Ruwan Aluvihare for taking the time to conduct the interview and provide me with useful information. Lastly, I would like to thank the respondents of the survey, because their input made it possible to conduct this research.

Sarah Quta

Amsterdam, October 2021

Summary

The focus of this research is to investigate how international inbound tourists experience the traffic safety compared to locals in the shared space behind Amsterdam Central Station. This means a subjective study on traffic safety is conducted. The type of road users that is focused on are pedestrians and cyclists as they are the most vulnerable road users (European Commission, 2016).

For this research a literature study was conducted to obtain more information on the concept of a shared space and the different factors that influence the traffic safety. To provide a good overview of these factors a conceptual framework was created. Only the traffic safety factors that are relevant for the research at the shared space were selected and based on these factors a survey was created.

The first part of the survey consisted of multiple choice questions about personal data. The second part of the survey consisted of questions about the feeling of traffic safety in relation to the design of the shared space. The respondents had to rate these questions from 1 to 6, where 1 indicated a very unsafe feeling or a strong disagreement and 6 indicated a very safe feeling or strong agreement. The last part of the survey consisted of questions about the feeling of traffic safety in relation to the traffic conditions at the shared space and contained some questions about the overall experience. The data of the survey was analyzed by performing the Mann-Whitney U test and the Kruskal-Wallis test, which are statistical significance tests.

Regarding the analysis of the results, it was concluded that a slight majority of the international inbound tourists and locals feel safe in the shared space. This means there is no difference in experience in the overall traffic safety between these groups. However, when zooming in on the design factors, international inbound tourists feel more unsafe compared to locals regarding the absence of traffic lights, kerbs and a sidewalk/bike path.

As a result of this research, the municipality of Amsterdam is advised to evaluate the shared space more often and to include the experience of all road users, including tourists. In addition, more studies should be conducted on the experience of tourists as well as on the possible relation of different safety factors in order to make a more reliable assessment.

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1. Introduction

In the last 20 years, several locations in the Netherlands have been designed according to an urban design approach called “shared space” (CROW, 2011). The founder of this concept, Hans Monderman, wanted to encourage road users to become more alert, interact with each other and slow down their speed to create a safer traffic environment (Project for Public Spaces, 2008). He thought this could be accomplished by redesigning several major streets in such a way that the layout “clearly indicates the primary function is residential” and the “traffic is a guest” (Project for Public Spaces, 2017). To express this function in the design, in most of the shared spaces a reduced speed limit is applied and traditional street elements such as traffic signs, kerbs and road surface markings are minimized or removed (Project for Public Spaces, 2008).

One of the shared spaces is located behind the Central Station of Amsterdam (highlighted in green on the map in figure 2). In this area only mopeds, cyclists and pedestrians are permitted (with the exception of certain vehicles such as an ambulance or working purpose vehicles). They enter the shared space from different directions: the bicycle tunnel, the city ferry lines, adjacent bike paths and sidewalks and the Central Station. As there are no traffic lights and no separate road sections in this area, the road users have to rely on and interact with each other when crossing this area.

Figure 1: Shared space behind Amsterdam Central Station

The surrounding of this shared space is an important aspect as it is located behind the station and next to the river ‘t IJ. People walk along this river enjoying their view, while others are waiting on the city ferry line to cross this river. The central station is also an important contribution to this shared space as this station is not only the biggest spot for public transport in Amsterdam, but it is also a place where there are shops and restaurants. Therefore, this contributes to the function of a residential place. In addition, the main

Amsterdam Tourist Office and departure quays for the tourist boats (highlighted in yellow on the map in figure 2) are located next to this station which attracts many tourists as well (Amsterdam.info, z.d.).

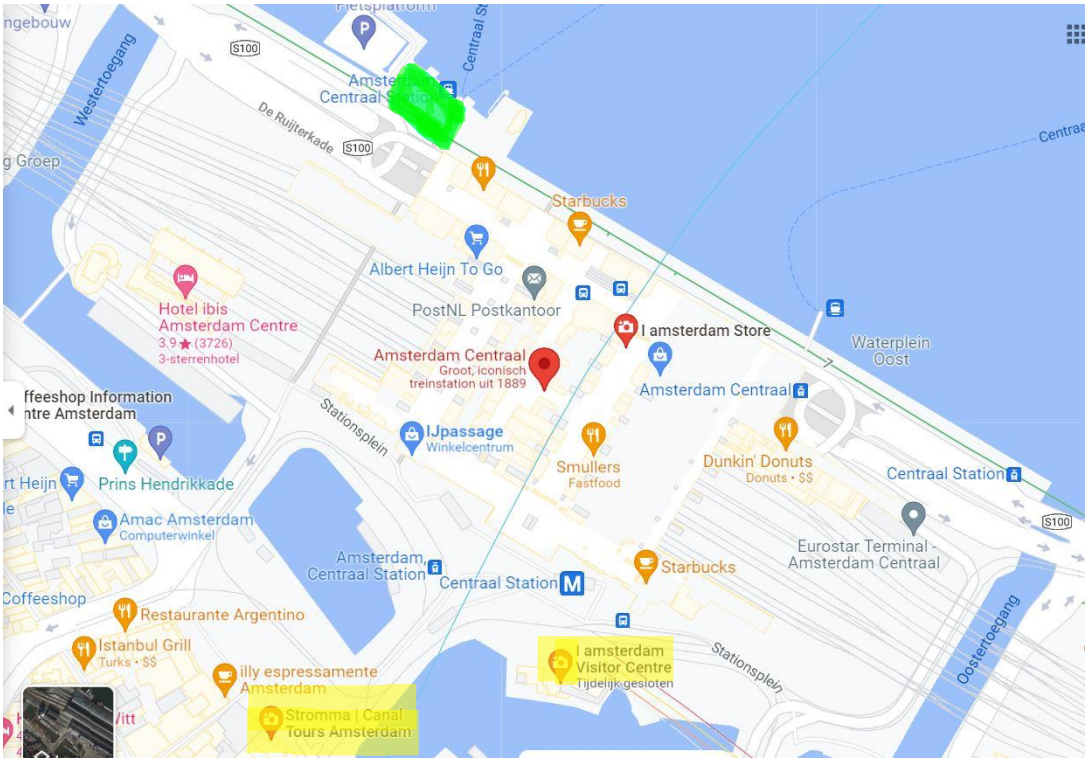

Figure 2: Map of Amsterdam Central Station (Google Maps, n.d.)

1.1 Problem Statement

As stated before, the shared space behind Amsterdam Central Station can be entered from several directions. People who visit this shared space more often might get used to this busy place and now just 'go with the flow'. But what about people who may not be familiar with such a shared space, like tourists? They might feel insecure or even panic when entering this area with cyclists, mopeds and pedestrians moving along each other without clear traffic regulations. It is important to look at their opinion as well. Therefore, the focus of this research is on the experience of traffic safety of tourists and locals in the shared space behind Amsterdam Central Station. This means a subjective study on traffic safety is conducted. The type of road users that is focused on are pedestrians and cyclists as they are the most vulnerable road users (European Commission, 2016).

1.2 Objective

The goal of this research is to investigate how tourists experience the traffic safety compared to locals in the shared space behind Amsterdam Central Station. If the outcome of this research shows that either tourists, locals or both groups feel unsafe in this shared space, the municipality of Amsterdam could be advised to perhaps adjust certain aspects of this shared space or intervene by providing more information about the concept, for example at

Schiphol Airport. Furthermore, suggestions about, for example, the setup of the survey, certain influential factors or suggested further research could be made to other researches.

1.3 Research questions

For this problem the following research question is formulated:

How do international inbound tourists experience traffic safety in the shared space behind Amsterdam Central Station compared to locals?

In this research, locals refer to Dutch inhabitants. International inbound tourists are defined as “people who travel to a country other than in which they have their usual residence for a period not exceeding 12 month for leisure, business or other personal purposes, and not for permanent work” (Eurostat, n.d.). In this research, sometimes only the word tourist is mentioned, but this always refers to the international inbound tourists.

To answer the main research question, four sub-questions are formulated:

1. *What is the definition of a shared space?*

   This sub question is relevant to the main research question as it is crucial to properly understand the concept of a shared space before investigating the traffic safety in that area. To answer this question, a literature study will be done.

2. *What are the design characteristics of the shared space behind Amsterdam Central Station?*

   This question is related to the main research question as this research will be focused on the shared space behind Amsterdam Central Station and therefore the specific design guidelines of this shared space must be known. To answer this sub question a literature study will be done.

3. *Which factors play a role in the feeling of traffic safety?*

   This sub question is crucial to be able to answer the main research question, because before investigating how tourists experience traffic safety it must be clear which factors contribute to the feeling of safety (regarding traffic safety). To answer this question, a literature study will be done and a conceptual framework will be created to provide a good overview of these factors. These factors can then be used in the survey and data analysis of the results of the survey.

4. *What were the intentions of the municipality of Amsterdam to develop a shared space behind Amsterdam Central Station?*

   This sub question is related to the main research question as it is relevant to know why the municipality of Amsterdam decided to design the shared space at that particular location, as it is one of the places in Amsterdam where there are many tourists. To answer this question, an interview will be held with an employee of the municipality of Amsterdam.

1.4 Stakeholders

The stakeholders that are relevant for this research include the tourists, the locals, the municipality of Amsterdam, Central Station and GVB. Their role is described in table 1.
Table 1: Stakeholders and their role

Stakeholder	**Role**
Tourists (pedestrians & cyclists)	They make use of the shared space, but might have never seen such a concept in real life. It is important to investigate how they experience the safety.
Locals (pedestrians & cyclists)	They make use of the shared space. It is important to investigate their safety feeling in the shared space as well. In this way the opinion of the tourists can be put in a better perspective.
Municipality of Amsterdam	They have made the decision to design a shared space behind Amsterdam Central Station and are responsible for the development of this area.
Central Station (CS)	This station is relevant as most of the road users might use station facility. It is a central place for accommodation that attracts many tourists and locals.
GVB (municipal transport company)	They are responsible for the city ferry lines which play an important role in the traffic flow. When more than hundred people leave the ferry at once, the traffic density at the shared space increases very rapidly.

1.5 Outline report

This report consists of 6 chapters. Chapter 2 provides a literature study about the concept of a shared space and traffic safety factors. Chapter 3 describes the methodology for this research. This includes the literature study, the preparation for the interview with an employee of the municipality of Amsterdam, the setup of the survey and the type of data analyses that will be done. In chapter 4 the results of the interview and the survey analyzed and discussed. In chapter 5 a discussion on the results is provided and a conclusion on the results and discussion will be drawn in chapter 6. The questions of the interview can be found in appendix A. Appendix B contains the questions of the survey. In appendix C and D the results of the Mann-Whitney U test and the Kruskal-Wallis test can be found.

2. Literature study

This chapter provides background information about shared space and an analysis of the factors that influence the traffic safety. Section 2.1 explains the concept of a shared space. The design of the shared space behind Amsterdam Central Station is described in section 2.2. Section 2.3 provides an overview of the factors that influence the traffic safety.

2.1 Concept of a shared space

In the 1980s, the Dutch traffic engineer Hans Monderman introduced the idea of redesigning several major streets and the surrounding public space in such a way that road users are encouraged to become more alert, interact with each other and slow down their speed. He suggested that if road users will take more responsibility, a safer traffic environment is created. This led to the development of a new urban design approach called ‘shared space’ (Project for Public Spaces, 2008).

According to CROW (2011) a shared space consists of three aspects:

1. A traffic space:
   This space is designed according to the corresponding design guidelines in order to handle the traffic in a smooth and safe way. Road users must respect the traffic rules.

2. A residential area:
   The design of this area must show that all the road users and functions are equally important. This can for example be an area surrounded by shops, a hospital or a train station. The focus is on the freedom of movement and the social interaction with other road users. Motorized vehicles and bicycles have to adjust to lower speeds and everyone has to take into account the unpredictable behavior of others.

3. A transition area:
   The transition between the traffic space and the residential area must be gradual. A transition area is needed to provide road users sufficient time and the opportunity to anticipate the situation in the residential area.

The concept does thus not only involve the design of a single street, but it includes the design of a whole public space. In a residential area the “traffic is a guest” (Jorna et al., 2013). To express this function in the design, a reduced speed limit is applied and traditional street elements such as traffic signs, kerbs and road surface markings are minimized or removed, resulting in a flat and even surface (Project for Public Spaces, 2008).

Figure 3: Shared space in Oosterwolde (Bilak, 2013)

The removal of these traffic features are not mandatory as there are no fixed rules or design requirements for a shared space. The decision of which traffic features should or should not be implemented depends on the location, the environment and discussions with those involved. The only strict constraint of a shared space is the absence of traffic lights as in this way there will be no segregation of road users, which is what this concept is all about (CROW, 2011).

Monderman has developed over 100 shared spaces and in 2004 his work also reached outside Europe (Project for Public Spaces, 2008). The concept sparked many interests, but also many discussions have taken place regarding the traffic safety (CROW, 2011). The Directorate General for Public works was not fully convinced. Political pressure and the negative public image has in some cases resulted in replacing the shared space by the "traditional" street type including zebra crossings. Even though research has shown that the absence of traditional street elements improves the road safety, residents felt less safe (Van de Vliet, 2013). However, this is not surprising as a shared space results in increased interactions between the road users and this suggests that the number of conflicts will also increase (Gkekas et al., 2020). This will give the road users a feeling of insecurity, as Hans Monderman suggested in his approach. But at the same time: this is how a shared space works. It is assumed that in this way the road user, especially motorized vehicles, will be more "responsible, alert and responsive to evidence of safety and danger" (Adams, 2008).

2.2 Design shared space Amsterdam Central Station

Every shared space has its own characteristics. In the shared space behind Amsterdam Central Station only pedestrians, cyclists and mopeds are allowed (with the exception of certain vehicles such as vehicles that clean the street).

Figure 4: Area behind Amsterdam Central Station in 2015 (Google maps, 2015)

Figure 4 shows how the area behind Amsterdam Central Station looked like in 2015. It can be observed that at that time there were separate road sections for vehicles, cyclists and pedestrians, road surface markings (such as zebra crossings), traffic signs and traffic lights. Also road bumps just before the zebra crossing can be observed. Now, the area consists of a big grey flat surface, as can be seen in figure 5. The only traffic signs in this area can be found at the entrance of the shared space and only include a speed limit sign of 15 kilometers an hour and a blue pedestrian sign under which it is stated that mopeds and cyclists are permitted.

Figure 5: Shared space behind Amsterdam Central Station

When comparing the area in 2015 to the current situation it can be observed that the following traditional street elements have been removed or minimized:

- Traffic lights
- Traffic signs
- Separate road sections
- Road surface markings

The absence of these traffic design features should increase a residential-like feeling. These are a couple of the features that are used for the survey as these distinguish a shared space from a traditional road intersection.

2.3 Traffic safety factors

Before investigating the experience of traffic safety at the shared space, it is important to distinguish the factors that influence the traffic safety. Not many studies have been conducted on the subjective traffic safety. Therefore, factors influencing both subjective and objective traffic safety in any traffic surrounding (so not only a shared space) will be looked at. It should be noted that there are many different factors, but only a selection is made and discussed here.

2.3.1 Listed traffic safety factors

Age
Furian et al. (2016) have researched the influence of age on the perception of traffic safety. They conducted a survey and asked the respondents to rate their concern on road accidents and traffic congestion from 1 to 4, where 1 indicates to be very concerned and 4 indicates to be not concerned at all. They looked at three different age groups: 18 – 34, 35 – 54 and 55+. Their research shows that the older the age group, the more concerned people are regarding road accidents and traffic congestion. According to the statistics on crash rates, injuries and deaths in the United States in 2014-2015, the most fatal crash involvements include the age group of 80 years and older (Tefft, 2017). European Commission (2015) states this can be related to the fact that visual functions decrease as people get older. This includes the visual acuity, which is the ability to see details and thus very important for the perception of traffic signs, signals and long-distance sight.

Gender
Furian et al. (2016) also researched the influence of gender on the perception of safety. Women appeared to be more concerned about road accidents compared to men. However, when looking at the concerns regarding traffic congestion this is the other way around: slightly more men are concerned about a traffic congestion compared to women. A study by Al-Balbissi (2003) focused on the objective safety and observed that male drivers were more involved in accidents compared to female drivers. Globally, almost three times as many males compared to females die in traffic accidents (World Health Organization, 2002).

Residence
A literature research by J. Lee et al. (2014) revealed that the place of residence in the United States affects the involvement of fatal crashes. By registering ZIP codes it was concluded that residents from a rural area are more likely to be involved in fatal crashes. Foreign drivers appear to be more at risk and more involved in traffic accidents as well. This is because they are unfamiliar with the environment and the associated traffic characteristics, which they do not always understand (Yannis et al., 2007).

Mode of transportation
Pedestrians and cyclists are considered the most vulnerable road users, because they cannot protect themselves against traffic with high speed and mass (European Commission, 2016). Globally, almost half of all fatalities in road traffic crashes involve vulnerable road users (Yannis et al., 2020). In Europe, 80% of the vehicles that causes fatalities among

pedestrians and cyclists are motor vehicles (cars, lorries, buses) (European Commission, 2016).

Road design
According to the European Commission (2019) more than 30% of the crashes are related to road infrastructure and surroundings. Several studies have shown that roundabouts are safer compared to intersections were stop signs or signals are applied. This is because drivers must slow down when entering a roundabout and it is a one-way-travel (Washington State Department of Transportation, n.d.). In the Long-term Traffic Safety Plan of the municipality of Amsterdam it is stated that 35 % of the bicycle accidents are caused by obstacles on the road, such as (high) curbstones, street lights and street signs (Gemeente Amsterdam, 2016).

Accompanied people
Several studies have been conducted to research the impact of passengers on driving behaviour. Some studies have shown that drivers accompanied by passengers are less at risk of an accident compared to those who drive alone (Vollrath et al., 2002, Rueda-Domingo, Lardelli-Claret, et al., 2004). A study by C. Lee and Abdel-Aty (2008) showed that strong correlations exist between passenger and crash characteristics. When accompanied by one or more passengers, the driving behaviour of the driver is generally safer. An increase of passengers accompanying the driver shows a decrease in the driver's crash potential. Only younger driver's crash potential increases when accompanied by a younger passenger. Other studies have shown that an increase in the amount of passengers leads to more distractions and an increased risk of accident. For example, research by Hing et al. (2003) revealed that older drivers (75+) show a relatively higher crash causing ratio when accompanied by two or more passengers.

Route familiarity
Route familiarity can have an influence on the driving behaviour and this can have an impact on the safety aspects. According to Intini et al. (2019) a route familiar driver is a "driver who is travelling on a route well-known from long or close association, and the travelling on that specific route composed of different road elements has been the stimulus repeatedly experienced." Intini et al. (2018) researched the impact by conducting a macro-analysis and analysis of more detailed levels considering specific accident, vehicle and person-related variables. It was concluded that route familiarity is an influential factor on the accident risk, which may be due to the over-confidence that lead to distractions and dangerous behaviour. Also research by Burdett et al. (2017) has shown that drivers perform more traffic violations and dangerous behaviour, such as curve cutting tendency and higher speeds, on roads that are familiar to them.

Driver behaviour
Almost 90% of the traffic accidents in Amsterdam are caused by people's unsafe behaviour (Gemeente Amsterdam, 2016). According to the literature research conducted in the United States by Lancaster and Ward (2002) an increased risk in driving behaviour was observed with "personality characteristics among which sensation seeking scales, thrill-seeking, impulsiveness, hostility/aggression, emotional instability and depression". Examples of personality characteristics that influence crash involvement are sensation seeking, low tension tolerance, immaturity and personality disorder.

Weather conditions
During periods of precipitation the visibility of road users is reduced. In addition, aquaplaning can occur due to a layer of water on the road that can cause the vehicle to lose contact with

the surface and slip. On a bright day, the bright rays of the sun can also hinder the view of road users. Furthermore, high wind pressures can push vehicles off course and under extreme conditions can even cause them to roll over. Also pedestrians and two-wheelers can be affected by these high wind pressures and this can be a hindrance to other road users (SWOV, 2012).

Traffic density
A study by Duivenvoorden (2010) revealed that a higher traffic density results in an increase in the number of crashes on 80 km/h roads. This increase was also observed by Kononov et al. (2011), who researched the relation of flow and density of Urban Freeways. The rate of accidents appeared to increase faster when a certain traffic density was reached.

Collision
The municipality of Amsterdam has analyzed incidents involving road users at the shared space behind Amsterdam Central Station to measure the objective safety (V&OR, 2016). An increase in the number of collisions creates a less safe environment.

Other factors
Four other factors, which do not come from literature study, are also considered to be relevant. These factors are listed in table 2.

Table 2: Other influential traffic safety factors

Influential factor	Assumption
Familiarity with concept	Someone who is familiar with the concept of a shared space already know the traffic rules in this area and therefore they might feel more safe than other participants to who this concept is all new.
Purpose of visit	Someone who visits the shared space in their free time might feel more safe as they choose to be at that location compared to someone who has to cross this area as it is part of their route.
Interaction with other road users	The interaction at a shared space is different as there are no traffic regulations and people have to be more alert and and interact with each other which could make them feel less safe than a situation where there is little interaction and everything is arranged with traffic lights and rules.
Time of day	During peak hours the traffic density is higher and therefore the chance of an accident is also higher which can make people feel unsafe

2.3.2 Conceptual framework

To provide a good overview of all the factors discussed above a conceptual framework is created.

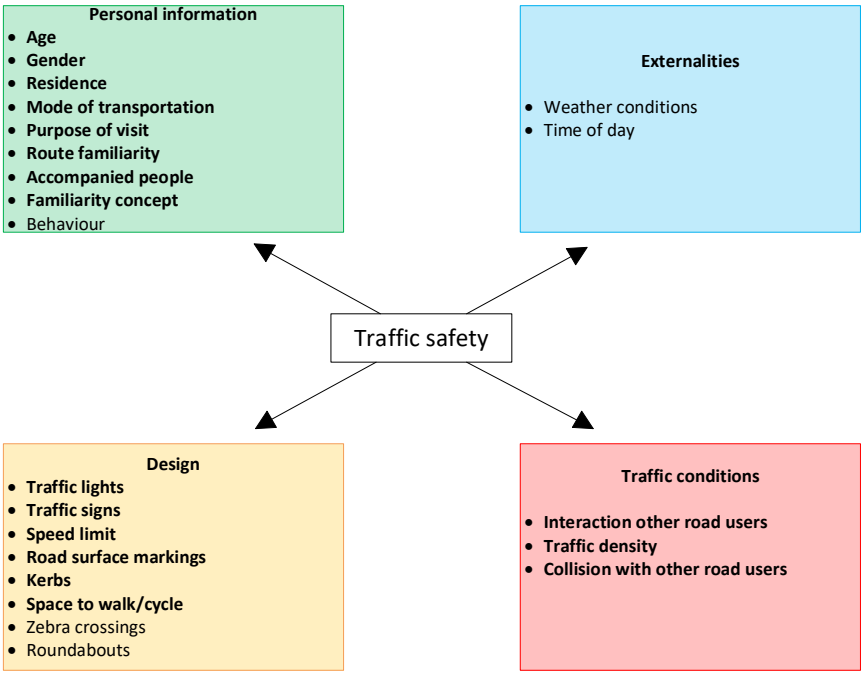

Figure 6: Factors traffic safety

The factors that were discussed in section 3.2.1 have been divided among four different groups: personal information, design, traffic conditions and externalities. Among the design factors, traffic elements have been added that are usually removed in a shared space (which were also discussed in section 2.2). The factors in bold are used for the survey as these seem to be relevant to investigate at the shared space.

3. Methodology

In order to properly conduct this research, a methodology is described.

First a literature study will be conducted to gain more knowledge about the concept of a shared space and the specific shared space behind Amsterdam Central Station. Information obtained from this literature study will be used to answer the first two sub-questions. To be able to answer the third sub-question different factors that influence traffic safety must be distinguished. This information will be obtained from a literature study as well. To provide a good overview of the various factors a conceptual framework will be created.

The fourth sub-question requires a better understanding about the intentions of the development of the shared space behind Amsterdam Central Station. Therefore, an interview with Ruwan Aluvihare will be conducted. Ruwan Aluvihare is a landscape architect and senior chief designer at the municipality of Amsterdam. He will thus be the right person to ask questions about the shared space behind Amsterdam Central Station.

Furthermore, as this research focusses on the subjective safety, a survey will be conducted. This will provide a good overview of the various opinions of tourists and Dutch inhabitants regarding the traffic safety in that shared space.

The following sections explain how each method will be conducted. Section 3.1 explains how the literature study will be conducted. Section 3.2 describes the type of questions that will be asked during the interview with Ruwan Aluvihare. The setup of the survey is explained in section 3.3. Section 3.4 describes how the results of the survey will be analyzed.

3.1 Literature study

To conduct the literature study, sources on the internet are used. Google Scholar is used to search for scientific papers. Search terms that are used include ‘influencing factors (traffic OR road) safety’, ‘demographic factors (traffic OR road) safety’, ‘design factors (traffic OR road) safety’. When relevant articles and reports have been found, the reference list of these reports will also be reviewed.

3.2 Interview

For the interview with Ruwan Aluvihare, questions about the intentions of the development and particular location of the shared space, the traffic safety, the stakeholders and whether (and if so how) they have included the tourists in their design are asked. The interview will be held outside and will be recorded (with permission from Ruwan Aluvihare). To be sure that no valuable information will be lost, notes are taken during the interview as well. The interview can be found in appendix A.

3.3 Survey description

The questions for the survey are based on the safety factors obtained from the literature study. These include the personal data, design components of the shared space and traffic

conditions. The survey is therefore divided into three parts. The survey questions can be found in appendix B.

Part 1: Personal information

The first part of the survey consists of multiple choice questions about personal information. This includes the following information:

- Age
- Gender
- Residence
- Mode of transportation
- Number of people accompanying
- Familiarity with concept
- Purpose of visit
- Number of previous visits

These are factors that have been discussed in the literature study and have been chosen to be important for the research on the experience of safety at the shared space.

Part 2: Design components

The second part of the survey consists of questions about the feeling of traffic safety in relation to the design of the shared space. This includes the following design components:

- Absence of traffic lights
- Limited number of traffic signs
- Absence of road surface markings
- Absence of kerbs
- Absence of a clear sidewalk and bike path
- Applied speed limit of 15 km/h
- The space to walk and cycle.

It is crucial to investigate how participants experience traffic safety regarding these components as these are usually applied in a traditional road intersection, but are minimized or removed in a shared space (except for the speed limit and the space to walk and cycle, because these are design components that usually do not apply at a traditional road intersection but do apply at the shared space). For this part, the participants have to rate the questions from 1 to 6, where 1 indicates a very unsafe feeling or a strong disagreement and 6 indicates a very safe feeling or a strong agreement. This means the participants have to choose between feeling (slightly) more safe or (slightly) more unsafe.

Part 3: Traffic conditions

The last part of the survey consists of questions about the feeling of traffic safety in relation to the traffic conditions at the shared space and contains some questions about the overall experience. This includes the following:

- Interaction with other road users
- Experience of a traffic congestion
- Experience of a collision with another road user

- Experience of the overall traffic safety
- Whether they would visit the shared space again

This part includes multiple choice and rating questions (rating from 1 to 6). The final question provides respondents the opportunity to give feedback or comment on the research and explain their opinion.

Setup

The survey is created using Microsoft Forms and is provided in both English and Dutch. The survey is spread through WhatsApp and is conducted at the shared space behind Amsterdam Central Station in order to make sure that the right respondent group is reached. A QR code is used to share the link of the survey. The first data has been collected on Friday September 17th. On this day 35 respondents have been reached. This data collection was a trial and based on this trial the standard deviation (σ) for the full set of responses can be calculated. For this calculation the question about the experience of the overall traffic safety is used. This results in a standard deviation of 1.03. By using an accuracy (d) of 0.20 and a Z-value of 1.96 (reliability of 95% is chosen) the sample size (n) is calculated using the following formula:

$$n \geq \frac{Z_{\propto/2}^2}{d^2}\ \sigma^2$$

Equation 1: Sample size

This results in a sample size of 102 per group (international inbound tourists and Dutch inhabitants) and thus a sample size of 204 for the entire group. The number of days the data needs to be collected at the shared space can now be calculated by subtracting the 35 respondents that have already been reached from the 204 that needs to be reached in total, and dividing this number by 30 (it is assumed that 30 respondents will be reached per day). From this it follows that the survey must be conducted for 6 more days. However, the survey is also spread through WhatsApp and therefore it has been decided to conduct the survey at the shared space for 5 more days. It was decided to do this on working days and mostly in the evening as it was expected to be more busy on these days and times. Table 3 provides an overview with the dates and times.

Table 3: Date and time survey

Date	**Time**
Friday September 17th	19:30 – 21:30
Monday September 20th	16:00 – 17:30
Tuesday September 21st	19:30 – 21:30
Wednesday September 22nd	18:00 – 19:30
Thursday September 23rd	14:00 – 16:00
Friday September 24th	20:30 – 21:30

3.4 Data analysis

After the survey has been conducted, the data will be analyzed. Section 3.4.1 explains how the descriptive analysis will be conducted. In section 3.4.2 the Mann-Whitney U test is described. Section 3.4.3 describes the Kruskal-Wallis test.

3.4.1 Descriptive analysis

First, a descriptive analysis of the survey results will be done. Bar charts are used to visualize the different outcomes of the survey questions that consists of more than three answers. These include the percentage of:

- Different age groups
- Different types of neighbourhood
- Number of ccompanied people
- Purposes of the visits

By first analyzing the different groups a conclusion can be made on whether or not the formulated null hypotheses can be tested with the Mann-Whitney U test or Kruskal-Wallis test. If certain groups are too small they can be grouped together, but if the difference is still too small after grouping them they are not analyzed any further.

3.4.2 Mann-Whitney U test

One of the statistical tests that will be performed is the Mann-Whitney U test. This is a nonparametric test that compares the difference between two independent groups. In order to use this test the data must comply with four requirements (Laerd Satistics, n.d.):

1. Dependent variable should be ordinal or continuous
2. Independent variable should consist of two categorical groups (for example male and female)
3. Observations should be independent
4. Variables must not be normally distributed

The hypotheses are tested by ranking the results of the survey. The lowest score is given the lowest rank and the highest score the highest rank. The ranks of each group have to be summed up (Field, 2009). If the ranks of the two groups differ from each other, it needs to be determined if this difference is statistically significant. Only when the significant level is lower than 0.05, the null hypotheses must be rejected (Hulp bij Onderzoek, 2021).

The null hypotheses that are formulated based on the suggested safety factors and safety factors found in the literature study will be tested and are listed in table 4.

Table 4: Null hypotheses Mann-Whitney U test

1	There is no difference in the overall experience of traffic safety between different **genders.**
2	There is no difference in the overall experience of traffic safety between different **modes of transportation**.
3	There is no difference in the overall experience of traffic safety regarding being **familiar with the concept**.
4	There is no difference in opinion between tourists and locals regarding the **clarity of the traffic rules** at the shared space.
5	There is no difference in opinion between tourists and locals regarding the **space to walk or cycle** at the shared space.
6	There is no difference in the experience of traffic safety between tourists and locals regarding the **absence of traffic lights** in the shared space.
7	There is no difference in the experience of traffic safety between tourists and locals regarding the **limited number of traffic signs** in the shared space.
8	There is no difference in the experience of traffic safety between tourists and locals regarding the **absence of road surface markings** in the shared space.
9	There is no difference in the experience of traffic safety between tourists and locals regarding the **absence of kerbs** in the shared space.
10	There is no difference in the experience of traffic safety between tourists and locals regarding the **absence of a sidewalk/bike path** in the shared space.
11	There is no difference in the experience of traffic safety between tourists and locals regarding the applied **speed limit (15 km/h)** in the shared space.
12	There is no difference in the experience of traffic safety between tourists and locals regarding the **interaction with other road users** at the shared space.
13	There is no difference in the **overall experience of traffic safety** between tourists and locals.

It is expected that the following hypotheses will be rejected:

- Null hypothesis 1
  Due to the general assumption that men are less fearful compared to women

- Null hypotheses 3
  Someone who is familiar with the concept knows what to expect of the traffic situation and therefore might feel more safe than someone who is unfamiliar.

- Null hypothesis 10
  A lot of countries do not have (as many) bike paths as the Netherlands does. Therefore, tourists might not miss this design aspect in the shared space

- Null hypotheses 12
  Tourists might not be used to the many cyclists that we have in the Netherlands. Therefore, this interaction might be overwhelming for them compared to locals who are already used to the behaviour of the cyclist.

- Null hypotheses 13
  It is assumed that locals are used to the traffic situations in the Netherlands, while tourists might have never even seen such a shared space in their own country.

3.4.3 Kruskal-Wallis test

The other statistical test that is performed is the Kruskal-Wallis test. This test follows the same steps as the Mann-Whitney U test. The only difference is that this test compares the difference between three or more independent groups. The null hypotheses that will be tested with the Kruskal-Wallis test are listed in table 5. These hypotheses are formulated based on the safety factors found in the literature study.

Table 5: Null hypotheses Kruskal-Wallis test

14	There is no difference in the overall experience of traffic safety between different **age groups.**
15	There is no difference in the overall experience of traffic safety regarding the **purpose of the visit** to the shared space.
16	There is no difference in the overall experience of traffic safety regarding the **number of accompanied people** to the shared space.
17	There is no difference in the overall experience of traffic safety regarding the **number of previous visits** to the shared space.
18	There is no difference in the overall experience of traffic safety regarding different **types of neighbourhood** where respondents live.

It is expected that the following null hypotheses will be rejected:

- Null hypothesis 14
  Elderly people might feel less safe than younger people as they are less responsive to a traffic situation, which can scare them off and make them feel unsafe

- Null hypothesis 16
  The larger the number of accompanying people, the more safe one might feel because it can feel more protected.

- Null hypothesis 18
  Someone who lives in a rural area might not be used to such a busy space and might feel less safe than someone who is already used to the busy city life with a high traffic density.

4. Results

This chapter gives an overview of the results of the research. Section 4.1 provides a summary of the interview with Ruwan Aluvihare. The full interview can be found in appendix A. In section 4.2 the results of the survey are analyzed.

4.1 Interview

Ruwan Aluvihare, landscape architect and senior chief designer at the municipality of Amsterdam, provided more information about the shared space behind Amsterdam Central Station during an interview. He has spent years trying to get this concept through in Amsterdam and became a spokesperson for the promotion of this project (shared space behind Amsterdam Central Station). Though he is not the designer of this project, he played a major role in designing the shared space at Leidseplein as well as many other public spaces.

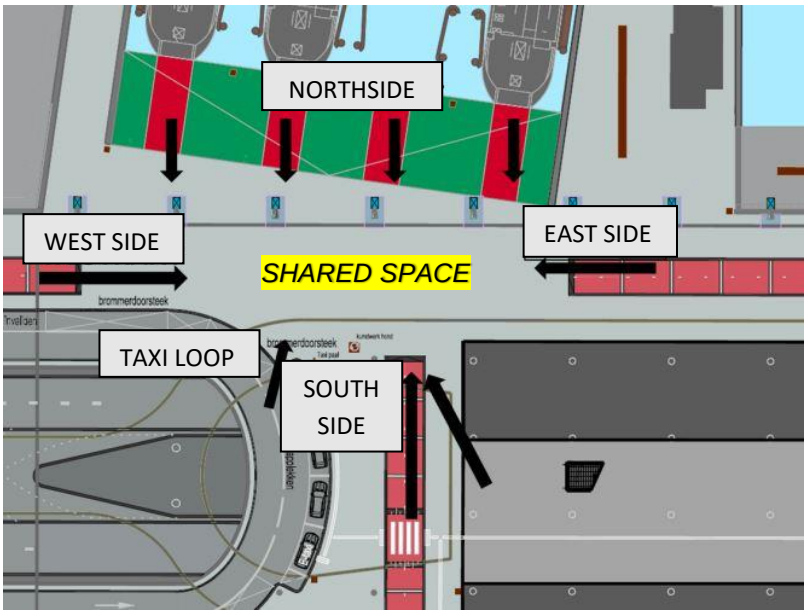

Figure 7: Top view shared space (V&OR, 2016)

The research at the location behind Central Station took some time before the conclusion on how the traffic regulations in the area was arrived at. It revealed that normal traffic rules would not be applicable here because of the abnormal traffic flows that converge from different directions. For example, road users via the tunnel as well as those using the bike paths and the passengers from the city ferry lines which adds to the crowd density when they leave the ferry simultaneously. Therefore, the city ferry lines were the main reason to suggest a shared space.

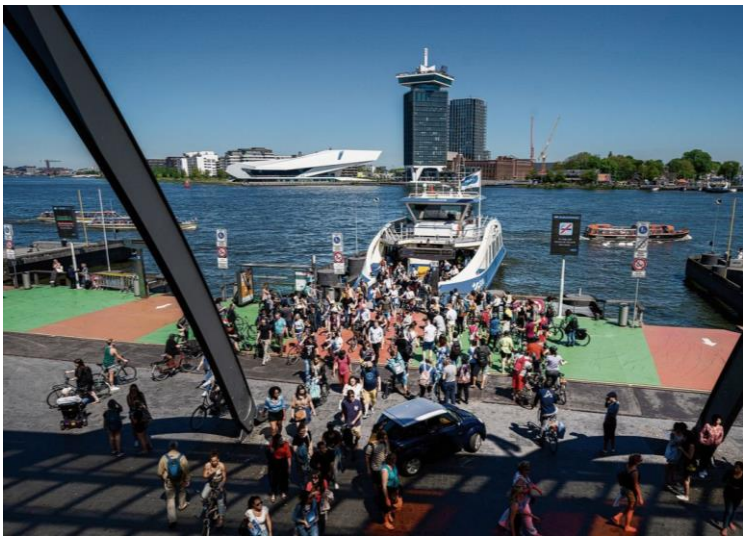

Figure 8: City ferry line (NRC, n.d.)

A lot of politicians as well as disabled people had serious doubts about this project. There were about thirty to forty stakeholders involved, including the traffic committee (the police, fire brigade, etc.), the GVB and Central Station. Tourists were not involved in this project. Eventually, alderman Litjens decided to conduct a pilot project for six months to see whether the concept works. This led to the development of the shared space.

One of the important aspects of the shared space was the size. A shared space should be spacious enough for the road users to pass each other. Another important aspect were the mopeds, because they sometimes drive very fast. By introducing road bumps and traffic signs, that indicate a speed limit of 15 kilometers per hour, before the shared space they should be aware that they have to slow down their speed.

To measure the objective safety at the shared space, the municipality of Amsterdam analyses incidents involving road users. They film the area 24/7 and register the number of incidents. No research has been conducted regarding the traffic safety of tourists and therefore Ruwan thinks this is very relevant as Amsterdam attracts so many of them.

An interesting fact is that Ruwan developed a bicycle street (‘fietsstraat’) at the Sarphatistraat. In this street cars have to give priority to cyclists. Even though it has the same principle, it is not officially applied as a shared space because of the rules applied. The development of this street resulted in an increase of cyclists on this street by 16%. People felt thus more safe in this street than they did before and it has become an even bigger success than shared space.

4.2 Survey

In this section the results of the survey are analyzed. Section 4.2.1 provides a descriptive analysis of the survey results. In section 4.2.2 the results of the Kruskal-Wallis test are provided. Section 4.2.3 provides the results of the Mann-Whitney U test.

4.2.1 Descriptive analysis

In total 254 respondents have filled out the survey, including 85 international inbound tourists. While filtering the data it was observed that ten respondents indicated to be an international inbound tourist while also selected Amsterdam as their place of residence. These two answers contradict each other and therefore all the answers of these ten respondents have been removed from the list. Furthermore, one respondent answered 'prefer not to say' to multiple questions, including the question whether he or she is an international inbound tourist or not. Therefore it has been decided to remove the answers of this respondent from the list as well. This means 75 international inbound tourists and 168 locals remain for further data analysis.

Residence
53.5% of the respondents live in Amsterdam. Only 14% lives at a different location in the Netherlands. This could be explained by the fact that the survey was conducted at the shared space in Amsterdam and therefore there is a higher chance that people who walk there live in Amsterdam. 30% of the respondents live in Europe and only 2.5% lives outside Europe. This means the majority of the tourists live in Europe.

Type of neighbourhood
When looking at the different types of neighbourhood in figure 9, it is observed that 74.7% of the tourists and 79.2% of the locals live in a city. This is 77.8% of the total respondents. Only a small percentage lives either in a suburb, village, countryside or another type of neighbourhood. It is no surprise that the majority of the respondents live in a city, because more than half of the respondents indicated to live in Amsterdam, which is a city. The difference in percentage between living in a city and living in any other type of neighbourhood is too big to give a reliable comparison. Therefore, hypothesis 18 will not be analyzed any further and will thus also not be tested with the Kruskal-Wallis test.

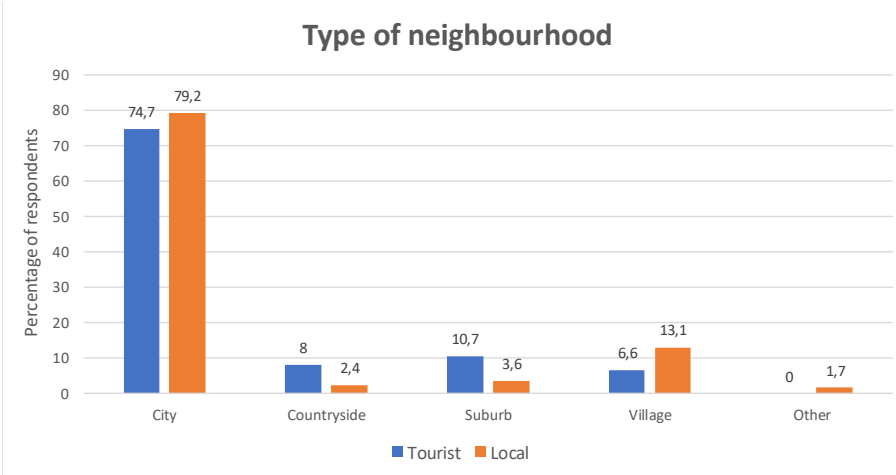

Figure 9: Type of neighbourhood

Gender
The gender distribution is not equal among the respondents. 2% of the respondents preferred not to mention their gender. From the respondents who did indicate their gender, 58.1% are female and 41.9% are male. Hypothesis 1, which is related to the experience of traffic safety between different genders, can be tested with the Mann-Whitney U test because the difference between the total amount of respondents is not too big. However, the sub-groups are also analyzed separately, because a different distribution between the sub-

groups can have an influence on the other safety factors. It is observed that both groups consist of more women than men. 60.8% of the tourists are female while 39.2% are male. Among the locals the difference is smaller: 56.9% are female and 43.1% are male. This should be taken into account when the test indicates a statistically significant difference between genders.

Age groups

43.2% of the total respondents are between 18 and 25 years old. As can be seen I figure 10 this includes 48% of the tourists and 41.1% of the locals. 28% of both subgroups are between 26 and 35 years old. Other age groups are much less in common among the respondents. The age group 65+ has the lowest percentage and none of the tourists are aged 56 or older. This can be explained by the fact that there were not many elderly people present when conducting the survey at the shared space. This could be related to other factors, such as the time at which the survey was conducted or they might rather avoid this busy traffic space. To be able to investigate whether there is a difference in the experience of traffic safety between different age groups, the groups must be large enough to compare them to each other. Therefore, the age group below 18 years old is grouped together with the age group 18 – 25 and the age groups of 46 – 55, 56 – 65 and >65 are grouped together with the age group of 36 – 45. In this way three age groups are formed: below 26, 25 – 36 and above 36. The Kruskal-Wallis test is performed to compare these age groups.

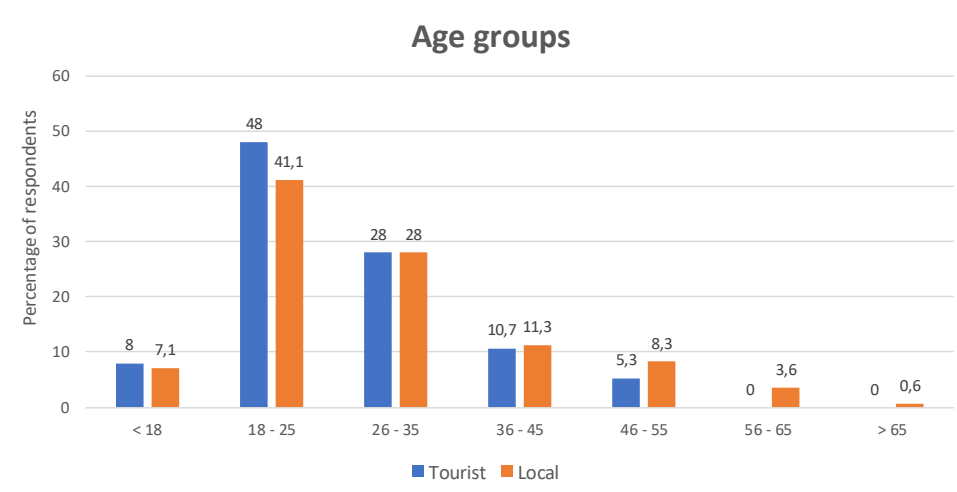

Figure 10: Age groups

Mode of transportation

The distribution of cyclists and pedestrians is almost equal: 47.7% of the respondents walked in the shared space, 50.6% cycled and 1.7% preferred not to mention their mode of transportation. Out of the tourists who did indicate their mode of transportation, 78.4% walked and only 21.6% cycled. This is a very large difference. When comparing this to the locals it is distributed the other way around: 64.8% cycled and 35.2% walked to the shared space. This could be explained by the fact that the Netherlands is a cycling country and a lot of locals use a bike. Null hypothesis 2 is related to the entire group of respondents and as this only differs by 2.9%, the difference in experience of traffic safety with different modes of transportation (that is either walk or bicycle) can be tested with the Mann-Whitney U test. However, also in this case it must be taken into account that a statistically significant difference between different modes of transportation can influence the outcome of other tests regarding different safety factors because the subgroups are not equally distributed.

Accompanied people

0.4% of the respondents preferred not to mention how many people accompanied them. 42.4% of the respondents entered the shared space by themselves. Only a few respondents were accompanied by two, three or more than three people. As these groups are quite small they are grouped together. In this way a more reliable outcome can be obtained when comparing the different groups to each other. This means that three groups are formed: the group that visited the shared space by themself, the group that was accompanied by one other person and the group that was accompanied by two or more people. These groups are tested with the Kruskal-Wallis test. When looking at the subgroups in figure 11, it is observed that 35.1% of the tourists were accompanied by one other person. An equal amount of tourists were just by themselves or accompanied by three or more people. This could be explained by the fact that most of the tourists travel within a group when visiting a country. When looking at the locals, the majority visited the shared space by themselves and only 4.1% were accompanied by more than three people. This unequal division can have an influence on the statistical tests related to other safety factors and therefore has to be taken into account when hypothesis 16 is found to be statistically significant different.

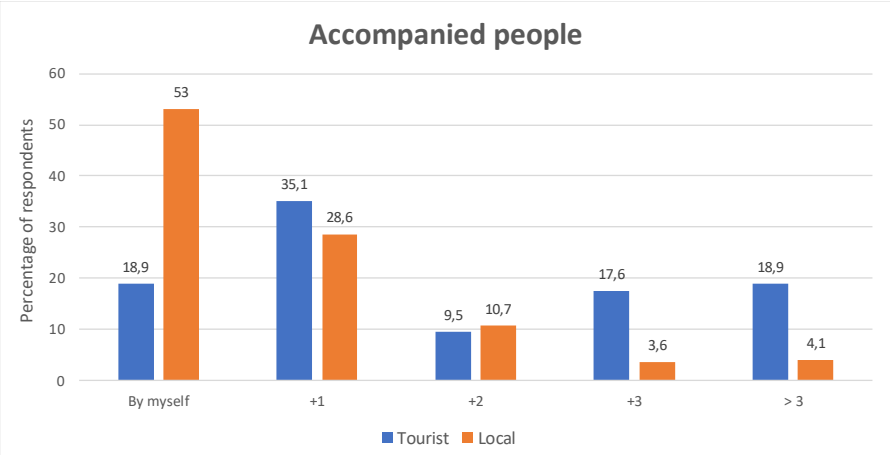

Figure 11: Accompanied people

Purpose visit

Of the total respondents, 0.4% preferred not to indicate the purpose of their visit. ‘On the go’ was the most common answer: 44.9% of the respondents indicated this. 25.9% visited the shared space for leisure, 8.6% for study and 15.2% for work. The number of respondents who visited the area for study or work are added together to make the group bigger and a more reliable comparison can be made. The option ‘other’ was chosen by 5% of the respondents and as it is not known what other purposes are meant, this group will be left out when comparing them with the Kruskal-Wallis test. This means again three groups are formed: on the go, leisure and study/work. When looking at the tourists and locals separately in figure 12, it can be observed that 50% of the locals visited the shared space for leisure, while 43.3% of the tourists were on the go when visiting the shared space. This should be kept in mind when performing the Kruskal-Wallis test.

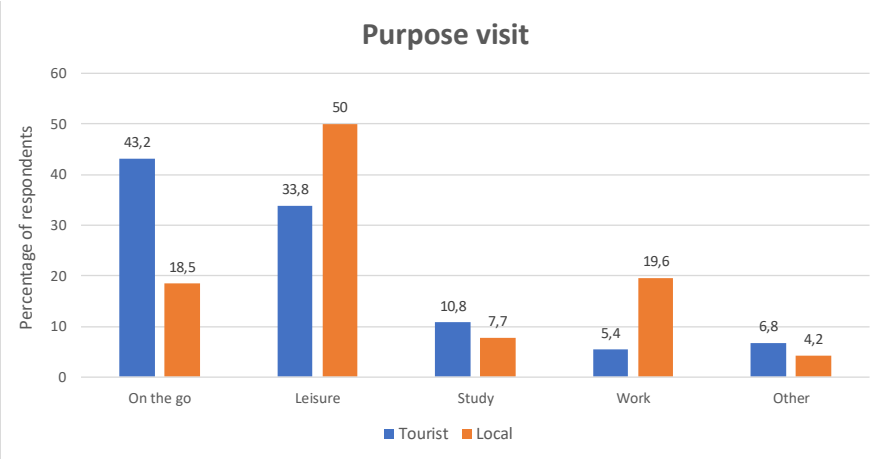

Figure 12: Purpose of visit

Traffic congestion

39.9% of the respondents have never experienced a traffic congestion at the shared space. When looking at the responses of the tourists, almost half of them have never experienced a traffic congestion and the majority who did experience a traffic congestion felt unsafe in this situation. This also applies when looking at the total number of respondents. However, the majority of the locals who did experience a traffic congestion did not feel unsafe. This could be because the locals are used to the busy traffic and have experienced it more often.

Collision

The majority of the tourists and locals have never experienced a collision with another road user at the shared space. Most tourists and locals who did experience a collision involved a cyclist. Remarkable is that the lowest percentage of collisions involved a moped. This could be due to the fact that more cyclists cross this area compared to mopeds. It could also be that mopeds actually pay more attention and are more alert when entering the shared space, which is what the concept encourages. One of the locals commented that the collisions he experiences are mostly with tourists who don't understand the traffic situation.

Frequency visits

The majority of the respondents have visited the shared space a couple of times before and only 8.2% has visited there once before. When looking at the locals, 88.5% have visited the shared space a couple of times before, while this is only 28.3% in the case of the tourists. This can be explained by the fact that most tourists visited Amsterdam for the first time or have just never crossed this area before. Locals might cross this area more often as it can be a part of their route to work, school, etc. One of the tourists commented that he thinks he will get used to the shared space and feel more safe if he visits it more often. Hypothesis 17 will not be tested, because the difference between the frequency of previous visits is too large among the total respondents to provide a reliable comparison.

Familiarity concept

62.1% of the total respondents indicated to be familiar with the concept of a shared space. It is remarkable that 57.3% of the tourists are familiar with the shared space, which is the majority. It could be that they have interpreted it in the wrong way, because a short explanation about this concept was only given after the first part. This was done on purpose in order to not let the respondents be influenced by their answer, however maybe it should have been stated before the question as that would make it more clear that the specific urban design approach was meant. Furthermore, 64.3% of the locals indicated to be familiar

with the concept which actually is a lower percentage than expected. Hypothesis 3 is related to the familiarity of the concept and will be tested with the Mann-Whitney U test.

Visit again
Almost all of the respondent indicated that they would visit the shared space again. This could give an indication on how they have rated the safety, as someone who feels unsafe in a certain environment would probably not (want to) visit this area again.

4.2.2 Mann-Whitney U test

In this section, the results of the Mann-Whitney U test are provided. All the results of the ranks and test statistics can be found in appendix C.

Personal data
Null hypotheses 1 to 3 are related to the experience of the overall traffic safety regarding different genders, mode of transportation and familiarity with concept. Table 6 provides the significance levels of these grouping variables. Only the significance level for the grouping variable gender is below 0.05 and therefore null hypothesis 1 is rejected. This means that there is a difference in the overall experience of traffic safety between different genders.

Table 6: Significance level hypotheses 1 - 3

Grouping variable	**Significance level**
Gender	**0.00**
Mode of transportation	0.74
Familiarity with concept	0.50

The graph in figure 13 provides an overview of the gender distribution among the different rates of traffic safety. The biggest difference between men and women is observed at scores related to feeling very unsafe (1), unsafe (2) and safe (5), of which a higher percentage of women can be observed at scores 1 and 2 and a higher percentage of men can be observed at score 5. It can therefore be concluded that more women experience a stronger feeling of unsafety (with regard to traffic safety) in the shared space than men. This is in line with the prediction made in section 3.4 and could be related to the general view that men are less fearful compared to women. However, further research should be conducted in order to confirm this assumption. Furthermore, since the gender distribution among the locals and tourists is not equal it must be taken into account that this can influence the outcome of the Mann-Whitney U test when comparing the experience of locals and international inbound tourists.

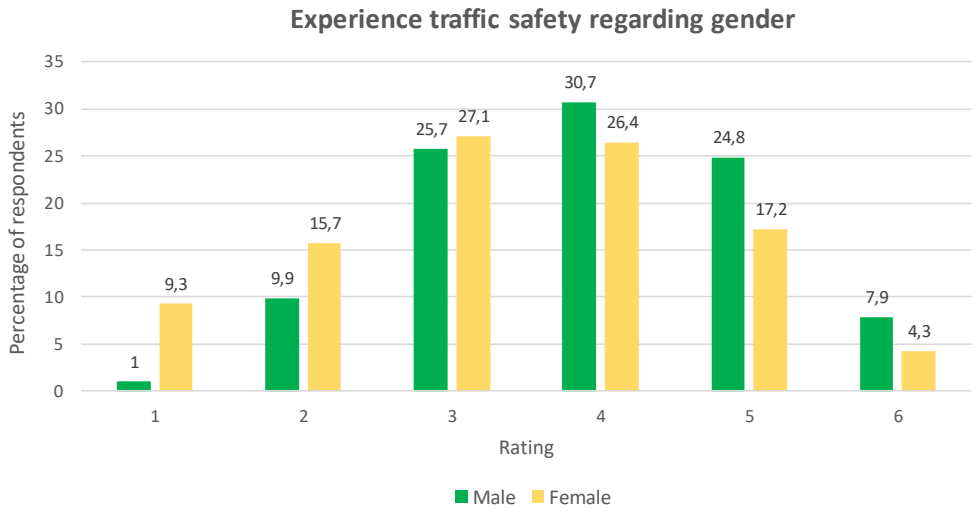

Figure 13: Responses experience traffic safety regarding gender

Design components

Null hypotheses 4 to 11 are based on the experience of traffic safety between international inbound tourists and locals regarding the design components of the shared space. The significance level per different design component for the grouping variable *type of visitor* can be found in table 7. The significance level of the safety regarding the absence of traffic lights, kerbs and a sidewalk and bike path are all below 0.05 and therefore hypotheses 6, 9 and 10 are rejected. This implies that there is a difference in the experience of traffic safety between tourists and locals regarding the absence of traffic lights, kerbs and a sidewalk/bike path. In section 3.4 it was assumed that out of the hypotheses related to the design components only the hypothesis regarding the absence of a sidewalk/bike path would be rejected. Apparently the other two design components are more important to the tourists in their experience of traffic safety than was expected.

Table 7: Significance level hypotheses 4 – 11

Design components	**Significance level**
Traffic rules	0.45
Space to walk/cycle	0.79
Absence traffic lights	**0.03**
Absence traffic signs	0.07
Absence road surface markings	0.05
Absence kerbs	**0.02**
Absence sidewalk & bike path	**0.04**
Applied speed limit	0.56

The graph in figure 14 provides an overview of the different responses regarding the absence of traffic lights. The biggest difference between tourists and locals can be observed at scores related to feeling verry unsafe (1), slightly unsafe (3) and safe(5). A higher percentage of tourists appears to feel slightly unsafe or very unsafe. A higher percentage of locals perceive the absence of kerbs as safe. This could be related to the traffic situation at the place of residence of the tourists. They may be used to the presence of traffic lights at every road intersection and therefore only a few of them feel safe without them. However, further research must be conducted in order to find this out.

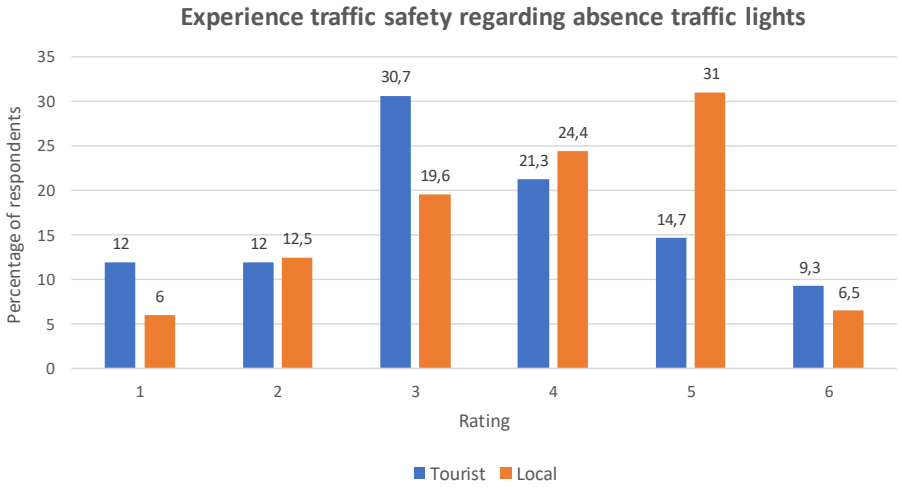

Figure 14: Responses experience traffic safety regarding absence traffic lights

Figure 15 shows the responses regarding the absence of kerbs. In this graph, the biggest difference between tourists and locals can be observed at scores related to an unsafe (2) and very safe (6) feeling. A higher percentage of tourists compared to locals experience the absence of kerbs unsafe, while a higher percentage of locals experience it as very safe. It can therefore be concluded that tourists feel more unsafe towards the absence of kerbs in this shared space than locals do. Apparently, tourists find the presence of kerbs more important compared to locals, which could also be related to the traffic situation and features in their place of residence.

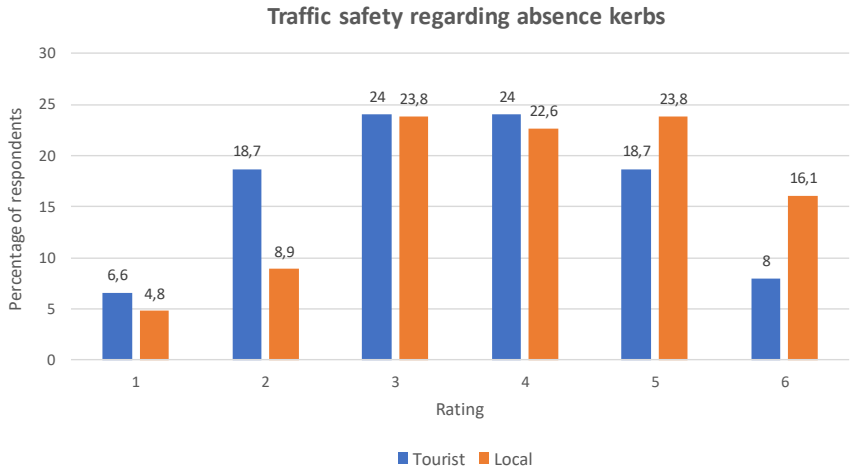

Figure 15: Responses experience traffic safety regarding absence kerbs

In figure 16 the responses regarding the absence of a sidewalk/bike path are presented. The biggest difference between tourists and locals can be observed at the scores related to feeling unsafe (2) and safe (5). A higher percentage of locals experience the absence of a sidewalk/bike path unsafe. In section 3.4 it was assumed that this could be related to the fact that tourists may not have as many bike paths in their country of residence compared to the Netherlands.

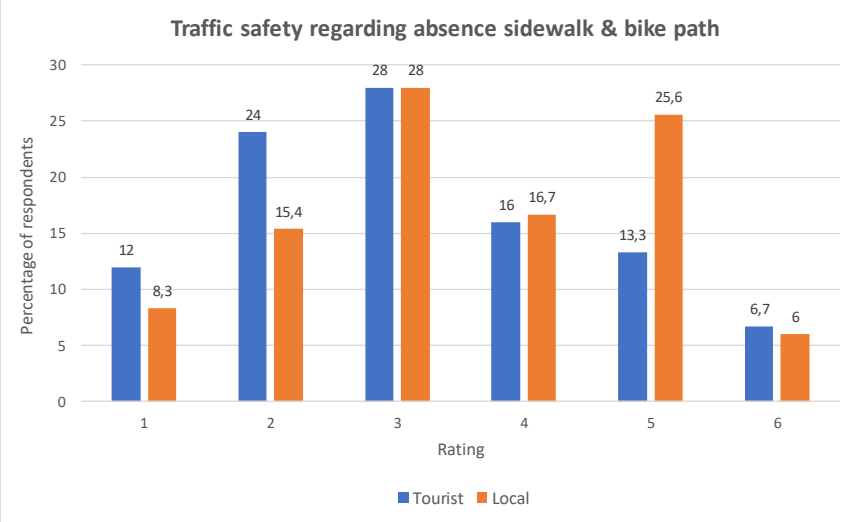

Figure 16: Responses experience traffic safety regarding absence sidewalk/bike path

Traffic conditions

Null hypothesis 12 is related to the interaction with other road users. As shown in table 8, the significance level is higher than 0.05 and therefore the null hypothesis cannot be rejected. This means there is no difference in the overall traffic safety between tourists and locals regarding the interaction with other road users. This is not in line with the assumption in section 3.4. A possible reason could be that everyone experiences an interaction differently and might be even more related to personal characteristics than to a type of visitor.

Table 8: Significance level hypothesis 12

Traffic condition	**Significance level**
Interaction with other road users	0.15

Overall traffic Safety

Null hypothesis 13 is related to the overall experience of traffic safety between tourists and locals. As shown in table 9, the significance level is higher than 0.05 and therefore the null hypothesis cannot be rejected. This means there is no difference in the experience in the overall traffic safety between international inbound tourists and locals. This is in contrast with the assumption stated in section 3.4

Table 9: Significance level hypothesis 13

General	**Significance level**
Overall traffic safety	0.90

Even though the hypothesis is rejected, the different scores have been analyzed to see whether this means both groups feel more safe or unsafe. It appears that a small majority of both international inbound tourists and locals experience the overall traffic safety as more safe (scores ranging from 4 to 6) than unsafe (scores ranging from 1 to 3).

4.2.3 Kruskal-Wallis test

For the hypotheses that contain more than two independent groups the Kruskal-Wallis test is performed. Null hypotheses 14 to 16 will be tested, which regards the age, number of accompanied people and purpose of the visit.

As shown in table 10, none of the significance levels of these grouping variables are below 0.05 and therefore it can be concluded that there is no difference in the overall experience of traffic safety between different age groups and regarding the number of previous visits and number of accompanied people to the shared space. A possible reason could be that the distribution of ages within a group is not equal. The descriptive analysis already showed that zero tourists were aged 56+. Therefore, not all ages have been included equally. Regarding the accompanied people, it could be that even though some participants were accompanied by one or more persons they still rated the safety as how they experience it on their own.

Table 10: Significance levels

Grouping variable	**Significance level**
Age	0.14
Accompany	0.40
Purpose	0.58

5. Discussion

For this research, first a literature study was conducted. The literature study provided a better understanding of the concept of a shared space and also distinguished the traffic safety factors. However, a more concise selection of these factors could have been made, because a lot of factors had to be analyzed while it would have been better to focus on and also describe the correlation between a smaller group of factors.

Furthermore, a survey was conducted to acquire a good understanding on the opinions of the tourists and the locals. As mentioned in the survey description, the aim was to reach at least 102 respondents per group (tourists and locals). 168 locals have been reached, which is larger than the required sample size. Therefore, it can be stated that this sample size is large enough to assume the outcome of the data analysis regarding locals is reliable. Since only 75 international inbound tourists remained for data analysis it can be concluded that the sample size has not been met and therefore it cannot be stated that the data analysis of the tourists responses gives a reliable outcome. This shows that it is important to always reach out for more participants and conduct the survey a few days extra to make sure the sample size is met (for both groups). Another possibility was to not only include international inbound tourists but also domestic inbound tourists, because due to the COVID pandemic not as many tourists were around as in previous years before the pandemic. Therefore it is suggested to try and conduct this research next year.

The first part of the survey consisted of questions related to personal information. Regarding the question about the purpose of the visit, the multiple choice answers were not well thought through because people who are on the way may still be on their way to work or school as it is not necessarily the place to actually study or work. Also the question about the number of accompanied people does not necessarily have an influence on the outcome of the experience of traffic safety, because someone accompanied by one or more persons could have rated the safety as how they experience it when they are by themself. Furthermore, the factor collision should not have been included, because this is a factor that measures the objective safety while this research focuses on the subjective safety. However, the fact that someone has experienced a collision before can influence their feeling towards the traffic safety as how they experience it now. Lastly, the question *would you visit this shared space again* could have been formulated differently, because some people have to pass this area in order to reach their work/school, etc., and therefore don't always have a choice. A better formulation would for example be: *Would you rather avoid this shared space?*

To analyze the results of the survey two statistical tests were performed. One of the (personal) factors that appeared to influence the experience of traffic safety is gender: women experience a stronger feeling of unsafety (regarding traffic safety) compared to men. Since both tourists and locals consists of more women, this aspect might influence the results of the statistical test related to other (design) factors. Also, (a combination of) other factors such as weather conditions or mood could have influenced the experience at that moment. This has not been taken into account and should be examined in further research.

6. Conclusion

The goal of this chapter is to answer the main research question:

How do international inbound tourists experience traffic safety at the shared space behind Amsterdam Central Station compared to locals?'

The interview that was conducted with Ruwan Aluvihare provided useful insights on the intention of the development of the shared space behind Amsterdam Central Station. The main reason for the development of the shared space behind Amsterdam were the city ferry lines, which contribute the most to the traffic density. The municipality had thus analyzed the traffic situation at that location, but did not involve tourists or locals in their process or decision making.

A survey was conducted at the shared space behind Amsterdam Central Station. The results of the survey were analyzed with the Mann-Whitney U test and Kruskal-Wallis test. The Mann-Whitney U test showed there is a statistically significant difference in experience of the overall traffic safety between different genders. When analyzing the scores of the respondents it was observed that women experience a stronger feeling of unsafety (regarding traffic safety) than men. The Mann-Whitney U test also showed a statistically significant difference in the experience of traffic safety between international inbound tourists and locals regarding the absence of traffic lights, kerbs and a sidewalk/bike path. For each of these design components, a higher percentage of tourists experienced this as unsafe. However, as both groups consists of more women than men, it must be taken into account that the gender could influence the outcome of the statistical test regarding other safety factors, in this case the design factors.

The experience of the overall traffic safety is not statistically different between international inbound tourists and locals. A slight majority of the tourists as well as the locals indicated to experience the traffic safety more safe than unsafe. However, it needs to be kept in mind that this is only a small part of a population.

None of the factors that were tested with the Kruskal-Wallis test appeared to be significantly different.

Overall, it can be concluded that a slight majority of the international inbound tourists and locals feel safe in the shared space. This means there is no difference in experience in the overall traffic safety between these groups. However, when zooming in on the design factors, international inbound tourists feel more unsafe compared to locals regarding the absence of traffic lights, kerbs and a sidewalk/bike path.

As a result of this research, the municipality of Amsterdam is advised to evaluate the shared space more often and to include the experience of all road users, including tourists. Adding traffic lights, kerbs and a sidewalk and/or bike path would be difficult as these are the traffic elements that have been removed from the area in order to create a shared space. However, the municipality of Amsterdam could think of a way to inform tourists about the concept of a shared space. They could for example hand out folders at Amsterdam Central Station or provide them with information at Schiphol Airport.

Furthermore, more studies should be conducted on the experience of traffic safety of tourists in this shared space in order to make a more reliable assessment. Research to investigate whether there is a correlation among the different traffic safety factors is recommended as well.

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Appendix A: Interview

Sarah Quta = interviewer

Ruwan Aluvihare = landscape architect and senior chief designer at municipality of Amsterdam

Sarah: Hallo, leuk u te ontmoeten en heel erg bedankt dat u tijd heeft vrij kunnen maken voor dit interview!

Ruwan: Ja, leuk je te ontmoeten! Geen dank!

Sarah: Als ik het goed heb bent u ontwerper van publieke ruimtes?

Ruwan: Ja, ik ben landschapsarchitect en senior hoofdontwerper bij de Gemeente Amsterdam. Ik ben inderdaad veel betrokken bij publieke ruimten, waaronder het ontwerp voor het Leidseplein, maar ook bij grote parken, bijvoorbeeld het dak boven de A9.

Sarah*:* En bent u ook betrokken geweest bij de shared space achter Amsterdam Centraal?

Ruwan: Ik ben niet de ontwerper van die shared space, maar ik ben jaren bezig geweest om shared space 'geaccepteerd' te krijgen in Amsterdam. Dat was altijd heel moeilijk. Shared space is een concept dat in het noordelijke deel van Europa door een Friese verkeersontwerper, Hans Mondenman, is bedacht. Hij heeft het voor het eerst aan het licht gebracht en vroeg zich af of dit niet een filosofie zou kunnen zijn. Maar wat apart is, is dat als je naar het zuidelijke deel van Europa kijkt, zoals Frankrijk of Italië, shared space vaker voor komt omdat het een beetje onderdeel is van hun mentaliteit. Ook in Ghana denk ik?

Sarah: Ja, haha! Daar heb je inderdaad geen verkeersregels.

Ruwan: Wij hebben natuurlijk heel veel regels en heel veel gescheiden verkeer, maar in andere landen zijn daar vaak de ruimte en middelen er niet voor. Ik vind het daarom best apart dat Hans Monderman het concept hier heeft ingevoerd en er zo beroemd mee is geworden. Ook in Zweden en Engeland, daar werd het meteen omarmt. Dit in tegenstelling tot Nederland, behalve in Friesland dan, waar de verkeersontwerpers en vooral jouw collega's, de civiele verkeersontwerpers het liever op hun eigen manier doen. Bij het Centraal Station werd er voor een hele lange periode onderzoek gedaan over wat hier zou moeten gebeuren, want er komen zoveel stromen bij elkaar. Toen heb ik gewoon gezegd dat dit mij een ideale plek voor shared space leek, al lang voordat het er überhaupt was. Maar goed, het duurde heel lang en op een gegeven moment werd er besloten, volgens mij door toenmalig wethouder Litjens, om een pilot doen en te kijken of het goed werkt. En als het niet goed werkt dan draaien we het gewoon weer om. Er waren toch wel heel veel politici die er tegen waren, dus het was kantje boord. Toen heeft het communicatiebureau van het stadshuis mij gevraagd om woordvoerder te zijn van de shared space. Dus dat is mijn relatie met de shared space. Zo was ik een tijd lang de woordvoerder voor het propageren van de shared space en dat was best wel eng, want het is een pilot en stel dat er iemand dood was gegaan dan hadden mensen gezegd "u zei dat het veilig was".

Sarah: Oh dus u kreeg echt de verantwoordelijkheid?

Ruwan: Ja, ik kreeg de verantwoordelijkheid die ik normaal gesproken niet zou hebben.

Sarah: En wat was dan echt een aandachtspunt in deze shared space?

Ruwan: De conclusie was dat de normale regels hier niet gingen werken. Als we gewoon een fietspad hadden doorgetrokken dan hadden de mensen die van de pont kwamen en mensen vanuit de fietstunnel überhaupt niet de kans gehad om het gebied te kruisen. Dat is gewoon te druk en te snel. Dus je moet de fietsers eigenlijk afremmen, maar dan moeten er meerdere drempels achter elkaar worden geplaatst. En meestal als je negatief begint dan wordt het steeds negatiever. Er komen dan nog meer drempels en dan komen er weer hekwerken bij, het wordt dan een soort bende. Dus het aandachtspunt hier in het ontwerp was hoe groot de shared space zou worden. Volgens mij hebben we best wel een goede lengte gemaakt, want waar het om gaat bij shared space is dat je ruimte biedt voor mensen om uit te wijken. De fietser moet kunnen inschatten van: als ik een klein bochtje neem, dan kunnen we er allebei langs. Als hier alleen een fietspad zou zijn dan kan ik dat kleine bochtje niet maken omdat je op het fietspad moet blijven, dus moet je afremmen. Het ging dus meer om de maatvoering van de shared space en hoe je op een subtiele manier de attentiewaarde toepast (dat is een verkeersterm). Hoe attendeer je mensen op een verandering. Door fietspaden bijvoorbeeld rood te maken kan men door het kleurverschil herkennen dat het een fietspad is. Dus het ging er bij ons om hoe we mensen op het fietspad en mensen vanuit de pont het idee konden geven dat er hier geen regels zijn. En dat is door de inrichting gedaan, met zachte drempels en kleurverschillen.

Sarah: Ah oke. En elke shared space heeft net iets andere ontwerprichtlijnen?

Ruwan: Nou, bij shared space zijn er eigenlijk geen richtlijnen.

Sarah: Nee, klopt. Maar vaak hoor je dat er dan geen verkeerslichten of weinig verkeersborden zijn.

Ruwan: In principe zijn er helemaal geen verkeersborden, behalve in het begin om aan te tonen dat het een shared space is. Maar er is geen bord ‘shared space’. De Nederlandse vertaling is ‘gemeenschappelijke verkeersruimte’, maar dat past niet op een bord.

Sarah: Ja, dus het is eigenlijk meer een verkeersruimte en verblijfsruimte in één.

Ruwan: Ja, in feite heeft Monderman altijd gezegd dat je de verblijfskwaliteit moet vergroten, het gevoel dat het een verblijfsruimte is moet vergroot worden en dan pas zullen mensen langzamer gaan rijden. Op het Leidseplein heb ik ook erg gevochten om geen fietspaden met rood asfalt daar doorheen te trekken, want dan gaat de fietser nog steeds denken van: dit is mijn fietspad, ik rijd nog steeds gewoon 30 kilometer per uur en als iemand erop stapt dan is dat zijn eigen verantwoordelijkheid. Ik wilde eigenlijk helemaal geen fietspaden, maar ik wilde gewoon dezelfde kleur als de voetgangerstegels op het fietspad doen, maar dat is me niet gelukt. In plaats daarvan heb ik rood natuursteen gebruikt. Dus als je ooit op het Leidseplein bent kan je even kijken. Je komt dan vanuit de binnenring, dat is de Weteringschans, bij Paradiso het Leidseplein binnen. Je komt uit op een rood asfalt, dat is ook shared space, en dat is net als de fietsstraat van de Sarphatistraat. Dat is een shared space voor auto’s en fietsers, waarbij de fietsers voorrang hebben. En dan ga je van rood asfalt naar rood natuursteen en dat is het moment waar de fietser psychologisch moet denken van ‘oh ik moet een beetje dimmen’.

Sarah: Maar bij de shared space achter Amsterdam Centraal geldt bijvoorbeeld een snelheid van 15 kilometer per uur en ik heb zelf ook enquêtes uitgedeeld daar en heel veel mensen wisten dat niet.

Ruwan: Is het echt 15 kilometer per uur?

Sarah: Ja, dat staat op een verkeersbord.

Ruwan: Ah dat staat op een bord. Oké, maar dat is vooral voor brommers bedoeld.

Sarah: Dat leek mij ook, want fietsers kunnen sowieso niet echt weten hoe hard ze rijden.

Ruwan: Nee klopt, en ik denk dat de gemiddelde snelheid van een fiets op een shared space veel lager is dan 15 kilometer per uur, want je moet echt afremmen voor de mensen die allemaal tegelijk van de pont komen. 15 kilometer per uur is best wel snel en ik denk dat het eerder tussen de 5 en 10 kilometer per uur ligt.

Sarah: Ja dat denk ik ook, misschien rijden de scooters wel wat harder.

Ruwan: Scooters rijden wel wat harder en dat was ook een belangrijk aandachtspunt. Toen de shared space was geopend ben ik meteen 's ochtends even wezen kijken om te checken of het wel goed gaat. Bij brommers was het wel een probleem, ook in het begin. Ze moesten echt wennen, want ze zijn gewoon gewend om op het fietspad keihard te rijden, wat trouwens ook niet mag. Maar achter Centraal Station mag het nog steeds omdat er geen alternatief is. Als wij brommers van het fietspad af willen hebben dan moet er een weg ernaast zijn waar de brommers wel mogen rijden, maar dat hebben we daar niet.

Sarah: Oké, maar in het algemeen zijn de richtlijnen zo gekozen om de verblijfsruimte te vergroten.

Ruwan: Niet de verblijfsruimten vergroten, maar het gevoel ervan. Het hele gebied moet eruit zien alsof het een stoep is, een voetgangersruimte. Dat is misschien de beste manier om het te verklaren. Je komt dus vanuit een verkeersruimte ineens in een voetgangersruimte en dan moet je denken 'hoe ga ik hier doorheen tot ik weer in de verkeersruimte komt'.

Sarah: En waarom is dan eigenlijk voor de locatie achter het Centraal Station gekozen?

Ruwan: Puur door de ponten. Dat was de bepalende factor. Wat men met normale verkeersegels niet kon regelen is dat als een pont aankomt, en er komen 200 à 300 mensen tegelijk vanaf, hoe zij richting Centraal Station moeten gaan. Hoe regel je dat? We hadden verkeerslichten kunnen plaatsen, maar dat is heel erg duur. Zo'n kruispunt kost al gauw drie ton, dus dat is heel veel geld. En daarnaast letten mensen op zo'n plek daar niet op.

Sarah: Nee inderdaad, dan gaan ze toch wel door rood.

Ruwan: Ja, dus dat was eigenlijk voor ons de belangrijkste reden om het daar te doen. Eigenlijk de enige reden, want je hebt het fietspad die door de tunnel gaat en de pont die bijna tegenover dat fietspad aanmeert. Je hebt vier richtingen die je eigenlijk niet normaal kan ontwerpen. Dus dan moet het maar abnormaal.

Sarah: Maar er zijn natuurlijk ook veel toeristen daar, is daar dan ook rekening mee gehouden?

Ruwan: Nou kijk, toeristen dat is een compleet ander verhaal. Ik heb toeristen geïnterviewd, ook hier in Amsterdam jaren geleden. En ze snapte echt niet dat fietspaden rood moesten zijn.

Sarah: Oh echt!

Ruwan: Ja, ze zeiden dat rood voor hun een gezellige kleur is. Tegenover Centraal Station, dus net voor de Dam, was er een enorm probleem dat toeristen gewoon op het fietspad liepen, dus daarom had ik toeristen daar geïnterviewd om te vragen waarom ze op het fietspad lopen. En zij zeiden van 'nou, het is toch een stoep? Het is een leuke kleur!'. En toen ik ze vroeg van wat voor kleur ze liever hadden gewild om te attenderen dat het een fietspad is zeiden ze zwart. Gewoon asfalt dus, want dat suggereert snelheid en dan ga je

daar niet op lopen. Je loopt niet op asfalt, je loopt op de stoeptegels of een leuke kleur. Dus ik vond het een leuke psychologische verklaring.

Sarah: Ja, wat grappig!

Ruwan: Over dat rode asfalt voer ik heel veel discussies. In Denemarken zijn fietspaden gewoon zwart, maar alleen bij kruispunten of plekken waar het gevaarlijk is, zoals bij een bushalte, zijn ze knal donkerblauw. En Kopenhagen heeft minder dodelijke verkeersslachtoffers dan in Amsterdam, dus ik vraag me altijd af waarom wij alles standaard doen en alle fietspaden rood maken. Wat zal er nou gebeuren als wij de rode kleur alleen bij kruispunten gebruiken en op de rest van de plekken gewoon zwart gebruiken? Dat is veel goedkoper en beter voor het milieu, want het rode asfalt is niet zo milieu vriendelijk. Daar zit letterlijk roest in. Dus dat vond ik ook heel interessant, ik vind verkeerspsychologie heel interessant.

Sarah: Ja, want veel toeristen in dat gebied raken ook helemaal in de war. Maar de focus was dus niet op de toeristen, maar echt op hoe de stromen vanaf de ponten beter konden worden begeleid.

Ruwan: Ja, het ging om de vier richtingen en vooral de bijzondere situatie van de pont waarbij ineens heel veel mensen vanaf komen. Normaal zijn de stromen constant, maar hier komen er ineens gewoon honderden mensen. Hoe moet je dat regelen op een goede manier? En de afstand is kort, de pont stopt daar en 20 meter verder heb je gewoon een fietspad. Dus honderden mensen komen in een soort golf terecht.

Sarah: Ja klopt, op sommige momenten is het daar heel rustig omdat er geen ponten aanmeren, maar zodra die ponten arriveren dan is het opeens heel druk.

Ruwan: Ja klopt.

Sarah: En welke stakeholders waren allemaal betrokken bij het ontwerp van de shared space? Weet u dat?

Ruwan: Oh nou, dat zijn er heel veel. We hebben een verkeerscommissie, daar zit onder andere de politie en brandweer in. Iedereen die iets te maken heeft met veiligheid op straat zit er in, ook de GVB. Dus ja, de hoeveelheid stakeholders is echt enorm.

Sarah: En Centraal Station?

Ruwan: Ja, ik denk dat de beheerders van het Centraal Station ook betrokken zijn geweest, maar die heb ik zelf niet gezien. De GVB zeker, want zij zijn verantwoordelijk voor de pont. Dus ja, ik zou zeggen dat er minimaal dertig of veertig stakeholders betrokken waren. En wel belangrijk om te zeggen is dat de enige mensen die structureel last hebben van dit concept de gehandicapten zijn. Zij zitten ook in de verkeerscommissie en zijn sowieso nooit voorstander van shared space. Dus daarom vind ik ook dat het echt een uitzondering is, je kan niet overal ineens een shared space maken. Je moet kiezen waar je een shared space ontwikkelt en waar niet, want als je blind of slechtziend bent dan is een shared space heel lastig.

Sarah: Ja, heel lastig. Zijn zij de enige die bezwaar hadden gemaakt, of waren er ook nog andere groepen?

Ruwan: Nee, er waren heel veel mensen die dachten dat er mensen dood zouden gaan daar. Ook vanuit de politiek, de gemeenteraad. Ik weet nog dat ik les aan het geven was in Engeland en de journalist van het Parool die mij goed kent, Mark Kruyswijk, mij belde en vroeg: “Ruwan, kan je mij garanderen dat er geen doden gaan vallen morgen, bij de opening

van de shared space?" Ik zei: "Ik denk niet dat er doden gaan vallen", en die quote kwam in de krant. Dus ik dacht ojee, stel dat het wel gebeurt. Ik kan dat natuurlijk niet garanderen. Maar goed bij shared space kunnen er wel ongelukken gebeuren, maar door het afremmen van de snelheid is de kans van een dodelijk ongeluk bijna nul.

Sarah: En de politie, brandweer en ambulance?

Ruwan: Die gingen wel allemaal akkoord. De verkeerscommissie ging akkoord met de pilot, dus zes maanden aankijken hoe het loopt en als de cijfers goed zouden zijn dan blijft de shared space. Dat was de afspraak.

Sarah: En in hoeverre is er van te voren een risico analyse gemaakt?

Ruwan: Dat weet ik niet, maar ik denk dat dat volgens mij onmogelijk is om te doen. Het is natuurlijk een experiment. En zo hebben we de Sarphatistraat ook opgepakt, daar was ik de hoofdontwerper van. Mensen waren ook bang dat er in een fietsstraat doden zouden vallen. Wethouder Litjens, een van de beste wethouders die we hadden, had echt lef. Soms als genoeg raadsleden iets eng vinden dan gaat een wethouder het ook eng vinden, maar Litjens was altijd van "nou dan maken we er toch een pilot van. Even kijken hoe het loopt en als het verkeerd loopt dan draaien we het weer terug." Dus zo was de Sarphatistraat ontwikkeld. Het eerste deel tussen Tropenmuseum en Weesperplein was de pilot. Dat hebben we eigenlijk 'quick en dirty' gedaan om te kijken hoe dat zou lopen. Dat is een nog groter succes geworden dan shared space. De hoeveelheid fietsers nam in deze straat namelijk met 16 procent toe. Dus mensen voelden zich veiliger in die fietsstraat dan voorheen met een aparte fietsstrook die te klein was. Nu moeten de auto's achter de fietsers blijven.

Sarah: Auto's zijn nu dus te gast eigenlijk.

Ruwan: Ja, die zijn te gast. Dus het is een mega succes. Die pilot was zo succesvol, dat de hele binnenring nu op die manier gedaan wordt. Dus we zijn tot Leidseplein gekomen, en het gaat helemaal door tot Haarlemmerplein. En dat heet een fietsstraat. Achter Centraal Station heb je fietsers, brommers en voetgangers, maar geen auto's en bij de Sarphatistraat zijn er auto's en fietsers die de ruimte delen.

Sarah: Ja klopt. En ik had natuurlijk dat document van Maarten gekregen over de verkeersveiligheid. Maar hoe meet de Gemeente dat? Is dat dus echt door naar conflicten te kijken?

Ruwan: Conflictmomenten. Ja, dat is een beetje de klassieke methode van de gemeente. Eerst bedenken ze hoeveel conflictmomenten ze kunnen verwachten, dan filmen ze 24/7 en analyseren ze de film achteraf om te kijken hoeveel conflictmomenten er werkelijk zijn. Dat is best wel een interessante methode.

Sarah: En is of wordt het project ook geëvalueerd?

Ruwan: Ja, volgens mij wel. Volgens mij is er een officiële evaluatie. Ik heb deze zelf niet, maar het zou me verbazen als er geen evaluatie is gedaan. Met vragen als: Is het een goed systeem? Wat hebben we daarvan geleerd? Kunnen we dit toepassen op andere plekken? Wij hebben nergens anders echt zo'n totaal regelloos shared space. Een fietsstraat is nog steeds wel wettelijk geregeld, omdat het een fietspad is waar auto's op mogen rijden. Dus daar zit een wet aan gebonden. Maar shared space is volgens mij nog niet helemaal wettelijk geregeld. Het is een voetgangersgebied waar iets anders is toegestaan. Maar dat is natuurlijk best wel specifiek bij zo'n plek achter Centraal Station.

Sarah: Ja inderdaad. En ik vergelijk natuurlijk de toeristen met locals. Maar hoe relevant is mijn onderzoek nou eigenlijk voor de gemeente?

Ruwan: Nou ik denk dat het sowieso wel relevant is, zeker voor Amsterdam die eigenlijk leeft van toerisme. Ik ben heel benieuwd wat er uit komt, ik heb geen idee. Volgens mij heeft niemand ooit onderzoek gedaan naar toeristen en het verkeer.

Sarah: Nee klopt. Als ik kijk naar de gemiddelde rating gaat het nog best wel gelijk op. De rating loopt van 1 tot 6: niet veilig, wel veilig. En de meeste zitten echt tussen de 3 en 4 in.

Ruwan: Ah ja. Ik geef heel veel rondleidingen voor Engelse studenten en wat zij merken in de laatste 10 jaar is dat zij nu steeds banger worden voor fietsers. Want de studenten van 10 jaar geleden vonden Amsterdam helemaal perfect geregeld en nu vinden de studenten dat fietsers zo snel gaan en met zoveel zijn dat ze er helemaal dizzy van worden. Dus dat is wel een soort trend, ik merk dat zij veel meer moeten oppassen voor fietsers dan 10 jaar geleden.

Sarah: Ah, interessant! Nou volgens mij waren dat alle vragen. Heel erg bedankt!

Ruwan: Graag gedaan!

Sarah: Zou ik trouwens uw naam mogen gebruiken in mijn scriptie?

Ruwan: Ja natuurlijk! Ik zou je scriptie ook graag willen lezen als je klaar bent.

Sarah: Bedankt! Ik zal mijn scriptie naar u opsturen als ik het af heb!

Appendix B: Survey

The survey can be found on the next page.

TU Delft

De beleving van verkeersveiligheid in een shared space

Voor mijn Bachelor eindwerk, onderdeel van de opleiding Civiele Techniek aan de Technische Universiteit Delft, doe ik onderzoek naar de beleving van de verkeersveiligheid van toeristen en de lokale bevolking in de shared space achter het Centraal Station van Amsterdam. De enquête bestaat uit drie korte delen. Het invullen van de gehele enquête duurt ongeveer 10 minuten en is volledig anoniem.

Voor vragen of opmerkingen over dit onderzoek kunt u contact met mij opnemen via het volgende mailadress:
s.m.quta@student.tudelft.nl

Alvast bedankt voor het invullen van deze enquête!

For my Bachelor Thesis, which is part of the Civil Engineering course at Delft University of Technology, I am researching the experience of traffic safety of tourists and locals in the shared space behind Amsterdam Central Station. The survey consists of three short parts. Completing the entire survey will approximately take 10 minutes and is completely anonymous.

If you have any questions or remarks about this research you can contact me by email:
s.m.quta@student.tudelft.nl

Thank you for taking the time to complete this survey!

DISCLAIMER:
We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. We will minimize any risks by making the following arrangement:

1) We will collect no names, phone number, email adresses and home/work adresses so that we cannot track to the respondents. Therefore, the survey is considered to be completely annymous.
2) The option "prefer not to say" in each of the questions is provided to allow participant to opt out. Respondents can decide if they would proceed or not.
3) The processed/anonymized data will be used in the future research on shared spaces.

* Vereist

Shared space behind Amsterdam Central Station

1

Welke taal heeft u voorkeur? / Which language do you prefer? *

- ◯ Nederlands
- ◯ English

Volgende

TU Delft

De beleving van verkeersveiligheid in een shared space ...

* Vereist

Part 1

For the first part of this survey a couple of demographic questions will be asked.

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What mode of transportation are you currently using in this shared space? *

- ◯ Walk
- ◯ Bicycle
- ◯ Prefer not to say

3

How many people have accompanied you to this shared space? *

- ◯ I'm by myself
- ◯ +1
- ◯ +2
- ◯ +3
- ◯ >3
- ◯ Prefer not to say

4

What is your gender? *

- ◯ Male
- ◯ Female
- ◯ Prefer not to say

5

What is your age? *

- ◯ < 18
- ◯ 18 - 25
- ◯ 26 - 35
- ◯ 36 - 45
- ◯ 46 - 55
- ◯ 56 - 65
- ◯ > 65
- ◯ Prefer not to say

6

International inbound tourism is defined as "*people who travel to a country other than in which they have their usual residence for a period not exceeding 12 months for leisure, business and other purposes*".

Are you an international inbound tourist here (in the Netherlands)? *

- ◯ Yes
- ◯ No
- ◯ Prefer not to say

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Where do you live? *

- ◯ Amsterdam
- ◯ Other location in the Netherlands
- ◯ Other country in Europe
- ◯ Outside Europe
- ◯ Prefer not to say

8

In what kind of neighbourhood do you live? *

- ◯ City
- ◯ Countryside
- ◯ Village
- ◯ Suburb
- ◯ Other
- ◯ Prefer not to say

9

Are you familiar with the concept of a shared space? *

- ◯ Yes
- ◯ No
- ◯ Prefer not to say

10

What is your purpose of visiting this shared space? *

- ◯ Work
- ◯ Study
- ◯ Leisure
- ◯ On the go
- ◯ Other
- ◯ Prefer not to say

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Have you visited this shared space before? *

- ◯ Yes, once before
- ◯ Yes, a couple of times
- ◯ No, this is my first time
- ◯ Prefer not to say

Terug | Volgende

Part 2

A shared space is an urban design approach that integrates pedestrians, cyclists and other road users by limiting speeds and removing traditional street elements such as signs, traffic lights, pedestrian barriers, road markings and kerbs.

The second part of this survey contains a couple of questions about how you experience **traffic safety** in relation to the design guideliness of this shared space.

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Please rate the following statement: The traffic rules that apply here are clear enough.

***1**= strongly disagree **2**=disagree **3**=slightly disagree **4**= slightly agree **5**= agree **6**= strongly agree*

*

1	2	3	4	5	6
◯	◯	◯	◯	◯	◯

1 : Strongly disagree

6 : Strongly agree

13

Please rate the following statement: I have enough space to walk/cycle in this shared space.

1= strongly disagree 2=disagree 3=slightly disagree 4= slightly agree 5= agree 6= strongly agree *

1 2 3 4 5 6

1 : Strongly disagree

6 : Strongly agree

14

How safe (referring to traffic safety) does the absence of traffic lights in this shared space make you feel?

1=very unsafe 2=unsafe 3=somewhat unsafe 4= somewhat safe 5= safe 6= very safe *

1 2 3 4 5 6

1 : Very unsafe

6 : Very safe

15

How safe (referring to traffic safety) does the limited number of traffic signs in this shared space make you feel?

1=very unsafe 2=unsafe 3=somewhat unsafe 4= somewhat safe 5= safe 6= very safe *

1 2 3 4 5 6

1 : Very unsafe

6 : Very safe

16

How safe (referring to traffic safety) does the absence of road surface markings in this shared space make you feel?

1=very unsafe 2=unsafe 3=somewhat unsafe 4= somewhat safe 5= safe 6= very safe *

1 2 3 4 5 6

1 : Very unsafe

6 : Very safe

17

How safe (referring to traffic safety) does the absence of kerbs in this shared space make you feel?

1=very unsafe 2=unsafe 3=somewhat unsafe 4= somewhat safe 5= safe 6= very safe *

1 2 3 4 5 6

1 : Very unsafe

6 : Very safe

18

How safe (referring to traffic safety) does the absence of a clear sidewalk and bike path in this shared space make you feel?

1=very unsafe 2=unsafe 3=somewhat unsafe 4= somewhat safe 5= safe 6= very safe *

1 2 3 4 5 6

1 : Very unsafe

6 : Very safe

19

How safe (referring to traffic safety) does the applied speed limit (15 km/h) in this shared space make you feel?

1=very unsafe 2=unsafe 3=somewhat unsafe 4= somewhat safe 5= safe 6= very safe *

1 2 3 4 5 6

1 : Very unsafe

6 : Very safe

Terug Volgende

Part 3

This is the final part of the survey, which will contain a couple of questions about how you experience **traffic safety** in relation to the traffic conditions in this shared space.

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How safe (referring to traffic safety) does the interaction with other road users (cyclists, pedestrians, mopeds) in this shared space make you feel?
***1**=very unsafe* **2**=*unsafe* **3**=*somewhat unsafe* **4**=*somewhat safe* **5**=*safe* **6**=*very safe*
*

1 2 3 4 5 6

1 : Very unsafe

6 : Very safe

21

Have you ever experienced a traffic congestion (= excess of road users resulting in slower speeds) in this shared space? *

- ○ No
- ○ Yes, it made me feel unsafe (referring to traffic safety)
- ○ Yes, but it did not make me feel unsafe (referring to traffic safety)

22

Have you ever experienced a collision with another road user (pedestrians, cyclists, mopeds) in this shared space?
You can choose multiple answers *

- ☐ Yes, with a pedestrian
- ☐ Yes, with a cyclist
- ☐ Yes, with a moped
- ☐ No

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How do you experience the overall traffic safety in this shared space?
***1**=very unsafe* **2**=*unsafe* **3**=*somewhat unsafe* **4**=*somewhat safe* **5**=*safe* **6**=*very safe*
*

1 2 3 4 5 6

1 : Very unsafe

6 : Very safe

24

Would you visit this shared space again? *

- ○ Yes
- ○ No

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Do you have any general feedback or comments about this research?

Voer uw antwoord in

Terug Verzenden

Appendix C: Results Mann-Whitney U test

Ranks

	Mode_of_transportation	N	Mean Rank	Sum of Ranks
Overall_traffic_safety	Walk	116	118,54	13750,50
	Bicycle	123	121,38	14929,50
	Total	239		

Test Statistics[a]

	Overall_traffic_safety
Mann-Whitney U	6964,500
Wilcoxon W	13750,500
Z	-,326
Asymp. Sig. (2-tailed)	,744

a. Grouping Variable: Mode_of_transportation

Figure 17: Traffic safety regarding mode of transportation

Ranks

	Gender	N	Mean Rank	Sum of Ranks
Overall_traffic_safety	Male	101	136,48	13784,00
	Female	140	109,84	15377,00
	Total	241		

Test Statistics[a]

	Overall_traffic_safety
Mann-Whitney U	5507,000
Wilcoxon W	15377,000
Z	-3,007
Asymp. Sig. (2-tailed)	,003

a. Grouping Variable: Gender

Figure 18: Traffic safety regarding gender

Ranks

	Familiarity_concept	N	Mean Rank	Sum of Ranks
Overall_traffic_safety	Familiar	151	124,31	18770,50
	Not familiar	92	118,21	10875,50
	Total	243		

Test Statistics[a]

	Overall_traffic_safety
Mann-Whitney U	6597,500
Wilcoxon W	10875,500
Z	-,674
Asymp. Sig. (2-tailed)	,500

a. Grouping Variable: Familiarity_concept

Figure 19: Traffic safety regarding familiarity concept

Ranks

	Type_of_visitor	N	Mean Rank	Sum of Ranks
Safety__absence__traffic__lights	Tourist	75	108,03	8102,50
	Local	168	128,24	21543,50
	Total	243		

Test Statistics[a]

	Safety__absence__traffic__lights
Mann-Whitney U	5252,500
Wilcoxon W	8102,500
Z	-2,118
Asymp. Sig. (2-tailed)	,034

a. Grouping Variable: Type_of_visitor

Figure 20: Traffic safety absence traffic lights

Ranks

	Type_of_visitor	N	Mean Rank	Sum of Ranks
Safety__absence__traffic__signs	Tourist	75	110,07	8255,50
	Local	168	127,32	21390,50
	Total	243		

Test Statistics[a]

	Safety__absence__traffic__signs
Mann-Whitney U	5405,500
Wilcoxon W	8255,500
Z	-1,808
Asymp. Sig. (2-tailed)	,071

a. Grouping Variable: Type_of_visitor

Figure 21: Traffic safety absence traffic signs

Ranks

	Type_of_visitor	N	Mean Rank	Sum of Ranks
Safety__absence__road_ _surface_markings	Tourist	75	109,25	8194,00
	Local	168	127,69	21452,00
	Total	243		

Test Statistics[a]

	Safety__absence__road__surface_markings
Mann-Whitney U	5344,000
Wilcoxon W	8194,000
Z	-1,939
Asymp. Sig. (2-tailed)	,052

a. Grouping Variable: Type_of_visitor

Figure 22: Traffic safety absence road surface markings

Ranks

	Type_of_visitor	N	Mean Rank	Sum of Ranks
Safety_absence_kerbs	Tourist	75	106,11	7958,00
	Local	168	129,10	21688,00
	Total	243		

Test Statistics[a]

	Safety_absence_kerbs
Mann-Whitney U	5108,000
Wilcoxon W	7958,000
Z	-2,405
Asymp. Sig. (2-tailed)	,016

a. Grouping Variable: Type_of_visitor

Figure 23: Traffic safety absence kerbs

Ranks

	Type_of_visitor	N	Mean Rank	Sum of Ranks
Safety_absence_sidewalk_and_bike_path	Tourist	75	108,33	8124,50
	Local	168	128,10	21521,50
	Total	243		

Test Statistics[a]

	Safety_absence_sidewalk_and_bike_path
Mann-Whitney U	5274,500
Wilcoxon W	8124,500
Z	-2,072
Asymp. Sig. (2-tailed)	,038

a. Grouping Variable: Type_of_visitor

Figure 24: Traffic safety absence sidewalk and bike path

Ranks

	Type_of_visitor	N	Mean Rank	Sum of Ranks
Safety_speed_limit	Tourist	75	118,11	8858,50
	Local	168	123,74	20787,50
	Total	243		

Test Statistics[a]

	Safety_speed_limit
Mann-Whitney U	6008,500
Wilcoxon W	8858,500
Z	-,592
Asymp. Sig. (2-tailed)	,554

a. Grouping Variable: Type_of_visitor

Figure 25: Traffic safety applied speed limit

Ranks

	Type_of_visitor	N	Mean Rank	Sum of Ranks
Safety_interaction_road_users	Tourist	75	112,52	8439,00
	Local	168	126,23	21207,00
	Total	243		

Test Statistics[a]

	Safety_interaction_road_users
Mann-Whitney U	5589,000
Wilcoxon W	8439,000
Z	-1,433
Asymp. Sig. (2-tailed)	,152

a. Grouping Variable: Type_of_visitor

Figure 26: Traffic safety interaction road users

Ranks

	Type_of_visitor	N	Mean Rank	Sum of Ranks
Overall_traffic_safety	Tourist	75	122,82	9211,50
	Local	168	121,63	20434,50
	Total	243		

Test Statistics[a]

	Overall_traffic_safety
Mann-Whitney U	6238,500
Wilcoxon W	20434,500
Z	-,125
Asymp. Sig. (2-tailed)	,901

a. Grouping Variable: Type_of_visitor

Figure 27: Overall traffic safety

Appendix D: Results Kruskal-Wallis test

Ranks

	Age	N	Mean Rank
Overall_traffic_safety	< 26	123	115,30
	26 - 35	68	122,13
	> 35	52	137,67
	Total	243	

Test Statistics[a,b]

	Overall_traffic_safety
Kruskal-Wallis H	3,908
df	2
Asymp. Sig.	,142

a. Kruskal Wallis Test

b. Grouping Variable: Age

Figure 28: Traffic safety - age

Ranks

	Accompany	N	Mean Rank
Overall_traffic_safety	Alone	103	128,30
	+1	74	115,08
	> 1	65	118,03
	Total	242	

Test Statistics[a,b]

	Overall_traffic_safety
Kruskal-Wallis H	1,851
df	2
Asymp. Sig.	,396

a. Kruskal Wallis Test

b. Grouping Variable: Accompany

Figure 29: Traffic safety - accompany

Ranks

	Purpose_visit	N	Mean Rank
Overall_traffic_safety	On the go	109	116,88
	Leisure	63	119,87
	Study/work	58	108,17
	Total	230	

Test Statistics[a,b]

	Overall_traffic_safety
Kruskal-Wallis H	1,079
df	2
Asymp. Sig.	,583

a. Kruskal Wallis Test

b. Grouping Variable: Purpose_visit

Figure 30: Traffic safety - purpose visit