Pedestrian movement and its effect on sociability of public spaces

A case study on Amsterdam

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Abstract

Pedestrians move in public spaces for different reasons such as shopping, going to work or school and sometimes no reason at all. In order to make walking more efficient and enjoyable for pedestrians, it is of value to understand how these movements differ from each other in terms of their characteristics, needs and sociability. This research focuses on two main movements i.e. to-movement, which refers to a space being used as destination, and through-movement, which refers to a space being used as a route. The research aims to understand how these movements differ in terms of sociability. Therefore, three parameters of sociability that can be directly related to walking have been studied. These parameters are cooperation, social interaction, and being friendly and welcoming.

The study has been conducted on two streets in Amsterdam that each host one of the mentioned movements. In order to identify the type of movement and its characteristics, the case studies have used tools such as countings, trackings, surveys, historical research and direct observations. The results of this research show that there is a certain level of freedom in walking, stopping and looking around that is associated with the to-movement in Kalverstraat. This freedom, which doesn’t exist as much in the through-movement in Reguliersbreestraat, has its positive and negative effects on sociability in the context of movement. This research found a number of differences and one similarity between to/through movement. In general, to-movement resulted in a more positive perception of place compared to through-movement. The to-movement in Kalverstraat results in a lower level of walking cooperation, higher level of social interaction and similar level of friendliness and being welcoming for pedestrians compared to the through-movement in Reguliersbreestraat.

As a contribution to the planning strategies regarding the chosen streets, a number of strategies were suggested that can help make walking more efficient and enjoyable in those street. A row of pop-up narrow benches and flower pots are suggested to be put in the middle of the street with to-movement in order to organize the movement that currently suffers from blockage caused by counter-flows and stationary activities. These obstacles create safe spaces for pedestrians who want to stop in the middle of the street. Artificial grass with high level of water drainage and noise absorption is suggested to be put in the middle of the street with through-movement in order to make the tram tracks more visible, reduce noise caused by the trams and make walking more organized.
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Introduction

Background

Public spaces such as squares, parks and main streets have had crucial roles in the creation of city life. Some of their earlier roles have been faded away throughout history while others remain essential for today's society (Mehta-1 2013). The advancement of technology and digitalization has certainly had its effect on the way people live in cities. However, people still rely on the public space for functional, social and leisure activities such as shopping, interacting with other people and even relaxation (Mehta-2 2013). Seeing how these spaces are used by a large number of people for a wide range of reasons, it is crucial to focus on the sociability of these places in order to maintain the attraction and the functions that they offer to people.

Public spaces have their own environment. This environment consists of different physical and social elements and it is the environment that turns a space into a place. According to Cross (2001), place should be considered as a psychological and interactional concept rather than only a physical one. This view corresponds with Canter’s (1977) perspective when he introduced his visual metaphor for the nature of places (See figure 1.). He explains that places are results of combining physical attributes, conceptions and activities.

![Figure 1 Visual metaphor for the nature of places (Canter 1977, p.158)](image)

Having this understanding of city environments in mind, one can understand the different domains in which sociability of public spaces can be practiced. The concept of sociability has been practiced by many urbanists, planners and designers such as Jan Gehl (2011 & 2013), William Whyte (1980) and Jane Jacobs (1961) in the context of physical attributes. Regarding the other element of the environment, activities, the importance of presence of people has been mentioned by many urbanists. Among all, Gehl (2011) mentions that the presence of only 14 to 20 people is enough to make a space look lively and stimulating. In addition, Jane Jacobs (1961)
brings the quality of safety and liveliness into light by her concept of *eyes on the street*. In other words, she explains how the presence of people creates natural surveillance in public spaces which leads to more safety.

“What attracts people most, it would appear, is other people.” (Whyte 1980, p.19)

This classic quote by Whyte can generally present the level of how studies of sociability of public spaces recognize the effect of people. However there is much more to people than just recognizing their presence. Depending on the quality of the physical environment, pedestrian activities can be divided into the two main groups of necessary and optional activities (Gehl 2011). Necessary activities are those that are more or less compulsory and optional activities are those that are done in case there is a wish to do so or if the time and space allows them. Following this division, pedestrian activities tend to differ in terms of questions such as how, by whom and how long a certain activity is done (Gehl 2011). According to the field of environmental psychology, there is a bidirectional connection between people and their environment (Lew 2006). For instance, environments with high outdoor quality tend to host longer lasting activities compared to environments with lower outdoor qualities (Gehl 2011). Considering this bidirectional relationship from the opposite direction, this research focuses on the role of pedestrian movements in the sociability of public spaces.

Pedestrians have had different roles in the city in different eras. During medieval times, the city was dictated by pedestrian traffic (Gehl 2011). Therefore, in order to create an accessible city, everything and everyone needed to be close to each other. As a result, the medieval urban design and configuration encourages pedestrian traffic while cities or areas that were created during functionalism have an opposite characteristic (Gehl 2011). Seeing how many European city centers like Amsterdam belong to the medieval era (PBL 2016) and their urban centrality has been preserved, it is of value to consider pedestrians as important participants in the city. Depending on the capacity of public spaces, there is a limit to how many pedestrians can use it at the same time in order to avoid crowdedness.

The central parts of the city of Amsterdam have been chosen as the main domain of study in this research. The reason behind this decision is mainly the fact that this research has been conducted in the form of an internship in the Municipality of Amsterdam where crowdedness of some public spaces were addressed as main issues. Further reasons behind choosing Amsterdam as the main domain of study are explained in the following subchapter.
Pedestrians in central Amsterdam

Depending on a person’s role in the city, whether they are citizens, tourists or other visitors, the amount and type of walking varies (City of Amsterdam-1 2016). Located in the north Holland province and in the western part of the country, the Dutch capital, Amsterdam, had a population of roughly 814 000 people within the city boundaries year 2016 (World population review 2017). The city has a population density of 4 908 people per square kilometers. The roots of the current urban structure of the city relate back to medieval times (PBL 2016). Currently, Amsterdam is experiencing a rapid population growth. According to the City of Amsterdam (City of Amsterdam-2 2016), the population of the city has increased by 9 percent from 2008 to 2014 and is expected to continue growing in the near future. According to the city of Amsterdam (2017), 23 percent of the residents of the city travel on foot.

In addition to the inhabitants, Amsterdam receives a significant number of Dutch and non-Dutch visitors. The city is one of the most popular touristic destinations in Europe and the number of its overnight visitors experienced an increase of 25 percent from 2010 till 2015 (City of Amsterdam-2 2016). There are three main reasons why tourist choose Amsterdam as a destination. The historic town and the UNESCO heritage canals, the wide range of offered museums and the tolerant urbanity (The city of Amsterdam-2 2016). The first two reasons mostly belong to the center of the city which is another reason behind the pressure on the city center. Furthermore, the center of the city hosts several different clusters in the context of culture, knowledge and convention which attracts even more visitors to the city with non-touristic motives (de Hoog 2013). According to the city of Amsterdam (2017), 80 percent of all tourists travel on foot and 50 percent of rail passengers, i.e. visitors with non-touristic motives, walk from the station to their destination in the city.

This combination of inhabitants, tourists and visitors has put the center of the city under pressure in terms of space, functions and identity. The focus of this research will be on the public spaces of the central part of the city. As mentioned above, these pedestrians have different motives which leads to different behaviors in the public spaces. As an example, inhabitants usually use the public spaces to get from A to B while tourists have a more explorative aim when it comes to movement (City of Amsterdam 2017). This research aims to understand the relationship between different types of pedestrian movement on sociability of public spaces. Seeing how central parts of Amsterdam are currently experiencing a mixture of movement types, the city has been chosen as the case under study in this research. So what are the main types of pedestrian movements? How do they affect the sociability of a space in terms of its movement and what solutions can possibly improve the level of sociability in such spaces? These questions are the base of this research and will be elaborated in the following subchapters.
Aim of the research
The aim of this research is to contribute knowledge to the planning and design practices regarding different types of pedestrian movements and their effect on sociability of public spaces.

Objective and relevance of the research
The objective of this research is to suggest possible improvements in the sociability of public spaces in the context of pedestrian movement.

This research has been done in the relevance of making pedestrian movement more efficient and enjoyable while respecting the fact that different environments are meant to serve different needs.

Research questions
The main research question that shapes this research is presented below and it's followed by four sub-questions.

Main research question
How do different types of pedestrian movement affect the sociability of public spaces?
-A case study of Amsterdam-

Sub-questions

*Theoretical*
- What is sociability in the context of movement?

*Empirical*
- How does to-movement affect the sociability of public space?
- How does through-movement affect the sociability of public space?

*Analytical/Strategic*
- How can knowledge of different types of pedestrian movement help the discipline of urban planning and design create sociable places for pedestrians?
Disposition

The introduction offers a general overview on the starting points of this research where the objectives, aim and the guiding research questions are presented. The next chapter, Theories and definitions, includes a collection of all the theories, definitions and guidelines that have been used as a base for this research. Theories and definitions are then followed by a methodology chapter which explains the reasons behind choosing the main research method as well as detailed information on how the method has been used. Case studies and results follows the previous chapter. In this chapter, a comprehensive introduction on the chosen cases and the results of the case studies are presented in details. These results are analyzed and discussed based on the studies literature in the next chapter. Based on the analysis, in the next chapter, a number of strategies have been suggested in order to possibly solve the founded issues in each unit of analysis. The overall conclusions are then presented in the conclusions chapter in order to sum up what the research has achieved. The report ends with a chapter called Future research which suggests how future research can cover study areas that are missing in this research.
Theories and definitions

The main research question that is aimed to be answered in this research holds three terms that must be defined and clarified. These terms are *pedestrian movement*, *sociability* and *public space*. Additionally, the field of *environmental psychology* that focuses on the bidirectional relationship between people and their environment is central to this research. Therefore, some theories and definitions belonging to this field must also be presented. The following subchapters include relevant definitions and theories that form the base of this research.

Pedestrian movement

The city of Amsterdam defines a pedestrian as a person on foot, possibly supported by tools such as walkers or wheelchairs who moves in public spaces (City of Amsterdam, 2017). Since this research focuses on two streets in Amsterdam, the above mentioned definition of a pedestrian will be used throughout the whole research. Furthermore, the city presents the differences between members of the pedestrian group in terms of motive, level of mobility and knowledge of the area. Some basic information about pedestrians in central Amsterdam are as follows:

- Their average walking speed is 0.8 to 1.2 meters per second.
- They often move in groups.
- Their choice of route can depend on factors such as good connections, condition of the pavement, safe crosswalks and sense of security.
- Their needs depend on their motives. If the motive is just commuting, then high speed is a need. If the motive is recreation, then attractiveness of the route is a need.

Pedestrians have different motives that require different movements. However, there are other factors that affect how people walk other than their motive such as gender, walking individually or in a group, the nature of the group i.e. colleagues, family, etc, density of pedestrians, number of visible activities and even the physical configuration of the space that the movement takes place in.

Firstly, let us look at the relationship between physical configuration, attractors and movement. According to Bill Hillier (1993), physical configuration, i.e. morphology, is the primary factor that affects movement. This statement may not correspond with works of urban activists such as Jane Jacobs (1961) who focuses on the diversity of functions to attract more people or John Zacharias (2001) who states that pedestrian distribution is directly related to commercial exploitation. However, Hillier’s statement doesn’t deny the influence of land use on movement. He explains further that attractors such as shops, restaurants and cafes have a multiplier effect on attracting movement. In other words, configuration is the primary reason that attracted both movement and attractors but studying current situations shows that attractors may play an even
stronger role in attracting people. So before assuming that pedestrians are moving in a place because of the attractors, we should look further behind and see why the attractors are established there in the first place. The figure below shows the relationship between these three factors. (See figure 4.) In this figure, “C” stands for configuration, “A” stands for attractors and “M” stands for movement.

![Figure 2 Relationship between configuration, attractors and movement (Hillier 1993, p.31)](image)

According this figure, the movement and attractors can be influenced by configuration but the opposite connection doesn’t exist. Furthermore, the figure shows that movement and attractors can influence one another, meaning that more people result in more attractors and vice versa. So as a conclusion, Hillier states that physical configuration is the primary factor that leads movement but depending on the case, attractors can play an even stronger role in leading movement after configuration. So studying the characteristics of the physical configuration of the place is of value for understanding pedestrian movement.

Besides generating movement, there are factors that influence the type of movement. Gender has shown to play a role in people's walking speeds. According to a study done on the effect of social roles on pedestrian behaviour (Zanlungo et al, 2016) women usually walk slower compared to men and when in group, women tend to walk closer to each other compared to men. Additionally, the study shows that walking groups walk with different speeds and distances depending on their relationship and purpose. For instance, families, couples and friends walk with similar velocities while colleagues walk much faster. Based on this result, it can be said that purpose has a stronger effect on velocity than relation. On the other hand, walking distances are strongly related to relationships. Couples for instance walk much closer to each other compared to colleagues. In order to avoid collision with other pedestrians and objects, pedestrians keep a certain distance from walls, street borders and other pedestrians (Helbing et al 2001). As the pedestrians hurry, or the movement density increases, this distance decreases. Another self-organizing strategy that reduces the frequency of collision between pedestrians is how they naturally move to a side which leads to separation of oppositely moving pedestrians. However, even after this separation, at high pedestrian densities, people in a hurry try to use any gap in order to take over the movement which results in obstructions of the opposite walking direction (Helbing et al 2001).
These examples show the different ways in which people walk which creates the need for a clear classification of pedestrian movements. The following subchapter defines the two main types of pedestrian movement.

To-movement and through-movement

Hillier (1993) explains that people consider street layouts in two different ways. Street layouts either mean a system of possible routes or a system of origins and destinations. Depending on how people consider street layouts, their movement can be divided into two groups; to-movement and through-movement. As their names indicate, these two groups of movement differ based on the reason people walk in a street. If the reason for walking in the street is the attractors or other reasons that are located inside the street, then the pedestrian movement is called to-movement. If the reason for walking in a street is reaching a destination that requires you passing that street, then the pedestrian movement is called through-movement.

The city of Amsterdam (City of Amsterdam-1 2016) recognizes the two types of pedestrian movement in a study done on pedestrian movement in the city. The city mentions that other than trips made strictly from A to B i.e. through-movement, there is another type of pedestrian movement that has a more recreational character i.e. to-movement. In other words, not all pedestrians movements aim to reach from A to B as fast as possible and for them, an attractive route is part of the pedestrian experience which can mean staying in a place for shopping, eating and so on. Through-movements can be found mostly in pedestrian routes between major hubs (City of Amsterdam-1 2016). Examples of these could be pedestrian routes between education centers such as universities and metro stations. The image below is made by the city of Amsterdam (City of Amsterdam, 2017) and it illustrates the difference between these two types of movement (See figure 5.).
Additionally, the city (City of Amsterdam-1 2016) identifies another type of street that hosts large flows of pedestrians and they are streets that offer a high number of people-attracting services such as shops, restaurants, museums, etc. in length of at least 50 meters. These are the streets that are more likely to have to-movement occur in them.

The intention of this research is to understand how each of these movement types influence their environment and how this understanding can help create planning and design strategies for making walking more efficient and enjoyable.

**Sociability**

Sociability of public urban spaces has been under focus ever since functionalism had its effects on cities during the 1930’s (Gehl 2011). Functionalistic urban planning and design was primarily based on a medical knowledge that was developed during the 1800s and the beginning of the 1900s. This medical knowledge focused on healthy and psychologically suitable architecture which provides light, air, sun and ventilation for the residents and users of the buildings.
However, functionalism paid little attention to streets, squares and spaces outside buildings. According to Gehl (2011), functionalism had a strict physical and material nature and therefore, there was little attention paid to social and psychological issues inside and outside buildings. One of the clear effects of such way of planning, he points out, was the disappearance of streets and squares from the new building projects. Elements that had always created focal points and gathering places where now being ignored and erased from new projects. This ideology and its influence on cities called for a change in the way planners and decision makers viewed the importance of public social life.

The concept of sociability has ever since been under focus and it has been defined in various ways. Gehl (2013) in his book *How to study public life* focuses on people’s requirements from public spaces. Although he never mentions the exact word “sociable”, much of his focus is on creating lively and comfortable public places where people have a variety of activities to choose from. He analyses some basic pedestrian behavior in relation to parameters such as liveliness, comfort, etc. According to Gehl (2011 & 2013):

- slower walking speed indicates more liveliness,
- more sitting places result in more people sitting,
- evening walks often take place in streets with lighting,
- pavement must be comfortable for walking,
- our field of vision covers primarily ground floors, therefore we must focus on creating attractive activities there.

Regarding pedestrians field of vision, Gehl (2013) created several different categories of facades. These categories are represented below (See figure 6.).
The list above is just a sample of some of the physical aspects that can transform a non-attractive place into a “sociable” place. As it is shown from the list above, Gehl had focused on using physical attributes to make people feel more welcome, safe and entertained. This way of practice corresponds perfectly with Lynch’s point of view when he stated:

“we must consider not just the city as a thing in itself, but the city being perceived by its inhabitants.”, (Lynch 1960, p.3)
So understanding people’s perceptions is crucial for creating successful places. According to a study done on the relationship between pedestrian flow and subjective urban street impression (Tsuji & Uchida 2005), we need to understand urban street impressions by visitors and factors that can affect them. These factors are either stationary or moving objects. This study analysis pedestrian perception based on the existing movement in a street. Some of the results are listed briefly below.

- The higher density the more hustle pedestrians experience,
- The faster average walking speed, the more liveliness pedestrians experience,
- The higher density the lower satisfaction level is,
- The higher average walking speed, the higher satisfaction level is.

The first finding in the list above indicates the exact opposite of Gehl’s (2013) statement about the relationship between walking speed and perceived liveliness. This contradiction is directly related to people’s purpose for being in public spaces (Canter 1977). The relationship between purpose and perception is explained more thoroughly in the subchapter Environmental psychology.

Going back to the concept of sociability while having stationary things and moving objects in perspective, we can look at two recent definitions of the concept of sociability. Webster’s dictionary defines the word sociable by pointing out three main pillars that form the concept: requiring companionship, friendliness and pleasant relations in an informal and easy context (Merriam-Webster n.d.). Mehta (Mehta-1, 2013) in his book The Street- A quintessential social public space, aims to understand how we can create sociable streets. To determine whether a street is sociable or not, Mehta focuses on the types and numbers of activities and behaviors that the street supports. As a result, according to Mehta (Mehta-1, 2013) sociable streets are streets that support active and passive activities throughout most of the day and week. Additionally, he mentions that accessibility of these streets is also of high value in determining the streets sociability.

“A sociable street is defined as a street that is open to the public, where people are present throughout the day and week, engaged—individually or in groups—in a variety of active or passive social behaviors that are predominantly stationary and sustained in nature.”, (Mehta-1, 2013, p. 24)

Mehta later mentions that in this book, he is not interested in streets that appear sociable as a result of pedestrians walking through it i.e. a dynamic activity. More specifically, he is interested in streets that are sociable throughout most of the day and week as a result of what they offer. Opposite to his interest, this research focuses on sociability in the context of movement. In other
words, even if the street is not crowded throughout the whole day and week, there are time
periods when the street is typically used and the sociability of the movement at that time is of
interest to this research. As mentioned in the introduction, the relevance of this research is to
make walking more efficient and enjoyable while respecting the fact that different places serve
different needs. Some streets are created to provide shopping and leisure opportunities for people
while others are created to make sure people can reach their destination in an efficient way.
According to Gehl (2013), planners and designers must have basic knowledge about how long
various public activities take. This basic knowledge qualifies the decisions about activity
orientation. By inviting people to longer periods of staying in some spaces, we can leave space to
more transient activities. He then recognizes that in some places, people desire to hurry by as
quickly as possible in order to make space for the others. Seeing how this research focuses on
two different types of movement and how they influence the sociability of a place, it is vital to
understand the concept of sociability in the context of movement.

Sociability in the context of movement

Project for public spaces (PPS), a planning, design and educational organization based in the
United States of America, has done a high number of projects worldwide with the aim of
creating and sustaining public spaces that build stronger communities (PPS, n.d.). This
organization was founded in 1975 in order to widen the work of William Whyte, the author of
The social life of small urban places. As a result of a various range of experiences in place
making, PPS created a diagram that presents key attributes that make a successful place together
with their intangibles and measurable. The place diagram is presented below (See figure 7.).
As shown in the figure above, PPS recognizes sociability as a key attribute in creation of successful places. According to PPS (2009), the intangibles of sociability are being:

- diverse,
- stewardship,
- cooperative,
- neighborly,
- proud,
- friendly,
- Interactive and
- Welcoming.

In order to evaluate the sociability of the movements, a number of intangibles of sociability have been chosen as a guideline. The chosen intangibles are ones that relate directly to movement. These intangibles, together with their explanations are presented below.

**Cooperation**
To be able to have an efficient and enjoyable walk, it is important to come across as few obstacles as possible. In the context of movement, other people can also be considered as
obstacles if they have different walking speeds or if they simply stand in the middle of the street. Therefore, it is important that participants of movements in the same space cooperate with one another. Pedestrians cooperate in a tactical way in order to minimize involvement and maximize social order. This cooperation creates successfully functioning public interactions (Karp et al, 1977).

Interaction
Interaction is a crucial parameter in order to have a successful and pleasant movement. According to a study done on pedestrian reactions and interactions, pedestrians trust others to make their presence known (Wolfinger 1995). This trust can be broken by unexpected events. Surprises can then lead to reactions such as annoyance, showing fear and maybe even anger. Additionally, Jane Jacobs (1961) states that conversations aren’t commonly generated where public characters and sidewalk life are lacking. So conversations in a place are highly influenced by the sociable qualities of that place.

Friendliness and welcoming
Pedestrians can be apologetic, appreciative or the opposite towards each other (Wolfinger 1995). Smiles are a common way of expressing appreciation in situations when one pedestrian has to compromise in order to make way for another pedestrian for instance. Being apologetic is another way of creating a friendly atmosphere in the context of movement. Although pedestrians try their best to avoid collision with others, sometimes, more common in higher densities, people collide with each other. Apologizing can maintain pleasant level of friendliness in the movement. Additionally, there is a general level of friendliness and being welcoming that is explained by Gehl (2013). According to him, people don’t always have a specific reason for being in a certain public space. Their purpose of coming out might be obtaining a rational objective such as shopping or running errands. However, during their whole time being outside, they might end up in places just for the sake of looking at people and enjoying public life in general. Therefore, it is crucial to make sure that public spaces have something to offer. This something can be directly related to type of movement that takes place in that street. If the movement has a recreational nature, a bench to sit on can make a difference. If the movement has a transient nature, creating a visually attractive space can make a difference.

To sum up, the sociability of the movements in this study will be evaluated through the three main parameters of cooperation, interaction and friendliness and being welcoming.

In addition to these three parameters, there are levels of service created by John Fruin (1971) that can determine how efficient walking is in various places. As shown in the table below, the levels start from A to F with A being the level that provides a free flow and F being the level that causes a breakdown of movement. There are various ways of calculating each parameter such as density and flow rate. In this research, focus is on the minimum area needed per pedestrian in
order to have an efficient movement. The table below shows this attribute relative to different levels of service (See figure 8.).

<table>
<thead>
<tr>
<th>LOS</th>
<th>Ped. Volume (f)</th>
<th>Average Area (a)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pr/ft pr/m</td>
<td>ft2/pr m2/pr</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>7 or 23 or less</td>
<td>35 or 3.3 or more</td>
<td>Threshold of free flow, convenient passing, conflicts avoidable.</td>
</tr>
<tr>
<td>B</td>
<td>7-10 23-33</td>
<td>25-35 2.3-3.3</td>
<td>Minor conflicts, passing and speed restrictions</td>
</tr>
<tr>
<td>C</td>
<td>10-15 33-49</td>
<td>15-25 1.4-2.3</td>
<td>Crowded but fluid movement, passing restricted, cross and reverse flows difficult.</td>
</tr>
<tr>
<td>D</td>
<td>15-20 49-66</td>
<td>10-15 0.9-1.4</td>
<td>Significant conflicts, passing and speed restrictions, intermittent shuffling.</td>
</tr>
<tr>
<td>E</td>
<td>20-25 66-82</td>
<td>5-10 0.5-0.9</td>
<td>Shuffling val: reverse, passing and cross flows very difficult; intermittent stopping.</td>
</tr>
<tr>
<td>F</td>
<td>Flow variable up to maximum</td>
<td>5 or 0.5 or less</td>
<td>Critical density, flow sporadic, frequent stops, contacts with others.</td>
</tr>
</tbody>
</table>

Figure 6 Fruin's levels of service (Fruin 1971)

The city of Amsterdam (2017) has identified level of service C as the level in which there is enough space for people to walk almost conflict free. Therefore, as from 2016, level of service C has been the official minimum requirement for the level of service in routes that prioritize pedestrians.

Public space

Public spaces have had central roles in city life throughout history. Some roles have faded away due to evolutions such as advancement of technology while other roles remain more or less the same. Historically, public spaces intended to fulfill basic survival, communication and entertainment needs in order to provide political, religious, social and commercial functions for the people (Mehta 2013). Many of these roles have been shifted to the private realm by the more recent societies (Brill 1989). However, people still rely on public spaces for activities such as leisure, shopping, eating, meeting, playing and so on. The social role of public spaces has furthermore been emphasized by Thomas (1991). He suggested that public spaces are required in order for individuals and communities to enrich their lives using the opportunities from public spaces. According to Thomas (1991), public spaces function as an arena for public life, where
different social groups can meet and observe the displayed images and symbols of the society. It also functions as a communication system for urban activities.

Public space is a key concept in the main research question of this study. For the sake of clarification, it is crucial to define what is actually being referred to as public space in this research. Definitions of public space can vary depending on issues of ownership, access, control, and use. Ali Madanipour (1996) defines public space using the issues of control and access. His definition of public space is spaces that are not controlled by private individuals or organizations and hence are open to the public. Others base their definitions strictly on access and they ignore issues or ownership. Their definition of a public space is a publicly accessible space used by groups or individuals to do their activities (Carr et al 1992). The focus of this research is on the bidirectional relationship between movement and sociability. Movement occurs mostly where movement is allowed. In other words, people move in places that they have access to. Therefore, for the sake of this research, we choose the definition of public space that focuses on the issue of access rather than ownership. So public space in this research refers to spaces that are publicly accessible for all city users as a space where they can do their individual or group activities.

Environmental psychology

Pedestrians move for different reasons such as reaching a routine destination like work or school, shopping, relaxation, leisure, meeting friends and so on. Due to the differences between the nature of the movements and the physical spaces, pedestrians have different characteristics throughout their movement. These characteristics can be walking speed, attitude and cooperation with others. Seeing how pedestrians are a noticeable element of an urban environment, it is of relevance to study their relationship with the environment. The field of environmental psychology focuses on this relationship. In other words, environmental psychologists work towards finding ways in which places and people affect one another (Lew 2006). More thoroughly, a systematic evaluation of places through a psychological lens can help us identify how environments are perceived by people and how people interact with them, how environments affect people’s attitudes and behavior and in turn, how people’s behaviors shape the environment. Having knowledge on these relationships can later on be used as a tool for creating lively urban places (Lew 2006).

David Canter (1977) in his book The psychology of place explains that an environment, unlike an object, has many characteristics that define it. Furthermore he explains that places are results of relationships between three main components: actions, conceptions and physical attributes (Canter 1977). There are patterns of mutual causation that generate person-environment relationships. All processes in the environment have a social component and all social processes take place in an environment (Canter 1987). Although Canter’s work belongs to the field of social psychology, much if his theories relate to environmental psychology as well. He suggests
that first, we need to understand the physical form of the space. Second, we need to understand the types of behavior that are associated with the space. And lastly, we need to understand that people evaluate the place based on what they intended to achieve in that place (Canter 1977). Understanding the physical form of the space has already been explained in the pedestrian movement subchapter based on the findings of Hillier (1993). The types of behavior that are associated with a space are explained with the concept of behavior setting in the following subchapter. And finally, place evaluation and how it works is explained in the final subchapter.

Behavior setting

Aside from studying the physical attributes of a place such as street width, block size, number of shops and restaurants, type of facade and so on, a common way of identifying part of the identity of a place is to understand the do’s and don’ts of that place (Canter 1977). In other words, understand what activities are appropriate in that place and what activities don’t belong there. This method has been used in other studies and researches by providing a list of activities and asking the participants to choose the ones that they think is appropriate in that place with regards to how others are moving (Heft et al 2014). This type of research is aiming to discover whether people can identify patterns of actions or not and whether they behave according to that identification. The concept of behavior setting explains these relationships in a more detailed way in the context of movement.

The concept of behavior setting (Heft et al 2014) explains how people can recognize the nature of the movement in a place just by observing people’s behaviors. In other words, people can understand the type of movement that is appropriate in a place simply by observing people’s movements and without knowing the physical characteristics of that place such as land use, configuration and so on. Therefore, the movements of the people in a place affects other people and how they behave. These effects are made by extra-individual dynamic structures referred to as behavior settings by the social scientist Roger Barker (1968). In order to understand whether or not people can identify the behavior setting of a place, Heft et al (2014), conducted an experiment in which he showed a video of moving objects that represented people. The participants were then asked to choose a place they thought the movement was taking place in. The places were given to the respondents as a list of possible answers such as a bank, church service, park and so on. For example, if the respondents chose church service, that meant that the behavior setting they identified in the video was similar to how people usually behave in a church service, i.e. not moving so much and facing the same direction as the others.

In the study by Heft et al (2014), it is explained that actions of individuals are never free standing. They always occur somewhere and in some context. It is furthermore explained that actions are double-sided. On the one hand, people operate in manners that are socially normative and on the other hand, people also have to limit their actions depending on what is not socially normative in a place. Individuals follow these patterns in order to contribute to the creation and
maintenance of the behavior setting of a place. There are two factors that help people identify the type of behavior setting of a place. Human actions and physical layout (Heft et al 2014). However, physical layout works as a support.

Place evaluation

As explained in the methodology, much of the empirical results of this study are based on people’s place evaluations. Therefore, it is crucial to understand the concept of place evaluation and how it functions. The field of environmental psychology evaluates places from a psychological perspective (Lew 2006). In other words, it aims to understand how people perceive places and how this perception affects their place evaluation. According to Canter (1987), place evaluation is directly connected to actions. He explains further that when we ask a person what they think about a place in terms of noise, lighting, etc. they will evaluate these attributes based on the things they would have liked to achieve in that place. Therefore, researchers must have an analytic eye on people’s place evaluations with the help of complementary questions such as: what is the reason that you are here?
Methodology

The focus of this research is on different types of pedestrian movements which means that this research is of behavioral type. According to Newman et al (1998), behavioral researches are made up of a combination of qualitative and quantitative methods. It is further explained that qualitative methods are usually the beginning point of a research which is then followed by quantitative methodologies. This research also aims to generalize its conclusions which according Newman et al (1998) requires valid and reliable measures that can be achieved through quantitative methodologies.

This chapter first explains how the main research method has been chosen based on the guidelines of Yin (2009). Secondly, the filters that were used to choose the cases and the methods used to collect data are explained. Thirdly, the sequence of the case study is explained in four steps. Finally, a number of notes regarding validity and limitations is presented which lead to suggestions for future research. This chapter follows a sequential order in order to clarify the reasons behind the choices made in the research.

Choosing the main research method

Choosing the main research method is a process of several steps. To be precise, Yin (2009) suggests that in order to choose your main research method, you need to classify your research question [topic] in three categories. The figure below shows this classification (See figure 2.).

<table>
<thead>
<tr>
<th>METHOD</th>
<th>Form of Research Question</th>
<th>Requires Control of Behavioral Events?</th>
<th>Focuses on Contemporary Events?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>how, why?</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Survey</td>
<td>who, what, where, how many, how much?</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Archival Analysis</td>
<td>who, what, where, how many, how much?</td>
<td>no</td>
<td>yes/no</td>
</tr>
<tr>
<td>History</td>
<td>how, why?</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Case Study</td>
<td>how, why?</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

Figure 7 Three steps for choosing the main methodology (Yin 2009, p.8)
Let us start from the first step which is identifying the form of research question. According to Yin (2009), research questions are mainly divided into “who”, “what”, “where”, “how” and “why” questions. The main research question of this research is: How does pedestrian movement affect the sociability of public spaces? So as seen above, the main research question is a “how” question. These types of questions usually have an explanatory nature and they are more likely to be answered by case studies, histories and experiments (Yin 2009). The reason behind this is that explanatory questions intend to capture operational links and trace them over time. However, as can be seen in the table above, the “how” question creates overlappings in different methods. Therefore, we need to use the two other classifications in order to determine the main research method.

The second step is knowing whether or not we have control over and access to behavioral events and the third step is knowing whether or not we are studying contemporary or historical events (Yin 2009). In cases where there is no access to behavioral events, histories are usually chosen as the main research method. Histories intend to investigate the past and no participant of the past is alive to report on the situation. Therefore, the researcher can’t have direct contact with the participants. However, histories can also be used for contemporary contexts and in that case, the method overlaps with case studies. Case studies intend to explain contemporary events (Yin 2009). In these studies, the researcher has access to participants who are/were directly involved in the case. However, the researcher doesn’t have control over behavioral events and can’t manipulate the relevant behaviors. This restriction on control over behavioral events crosses out experiments as they usually tend to manipulate or control relevant behaviors. Between case studies and histories, there are two main differences. Case studies rely on direct observations of the studied events and interviews with the people involved in the event. So acknowledging the things case studies and histories have in common, it is still clear that case studies have access to a wider range of sources such as documents, artifacts, observations and interviews compared to histories.

Coming back to the research question of this study, it is clear that the goal is to reach an understanding of the effects of common pedestrian movements on the sociability of public spaces. The research doesn’t intend to place pedestrians in an unusual situation in order to see how they react. Therefore, pedestrian movements will not be controlled or manipulated in this study. Additionally, current pedestrian movements and opinions are accessible in this research. In other words, this research has direct access to relevant participants. The three stages of method identification have now been completed and it is clear that the appropriate research method is a case study. However, there is more to investigate regarding this method. The following chapter explains the different types of case studies and how to choose the suitable type.
Identifying the type of case study

There are three main types of case studies for research purposes (Yin 2009). These are explanatory, descriptive and exploratory. Explanatory case studies aim to explain probable causal links in a real life context. These understandings are usually too complex for surveys or experimental strategies. As mentioned in the introduction, this study intends to understand the bidirectional relationship between pedestrian behavior and sociability of public space. In order to do so, we first need to understand the reasons behind certain pedestrian behavior. Then it’ll be possible to study how their behavior affected their environment and the sociability of the public space that they are in. In other words, the study aims to explain a chain of actions and reactions in the context of pedestrian movement and the sociability of public spaces. Therefore, finding and understanding a causal link in a real life context is of importance. Based on this explanation, the case study used in this research is identified as explanatory.

Another important classification of case studies focuses on their design. This classification is based on whether the study includes single or multiple contexts and units of analysis (Yin 2009). The context here refers to the general understanding that the researcher wants to gain and the units of analysis are simply the case(s) that are being studied. The figure below shows four basic designs for case studies (See figure 3.).

![Figure 8 Different types of case studies (Yin 2009, p.46)](image)
The main research question in this study intends to gather information about the relationship between pedestrian behavior and the sociability of public spaces. This relationship is the context of the study. Furthermore, looking at the empirical sub questions, we see that this relationship has been chosen to be studied in two different ways, each focusing on a different type of movement. To/through movement can be seen separately and combined in urban spaces. However, in order to reduce confusion and involvement of undesired parameters, this study focuses on cases where these movements are separated. Therefore, two units of analysis will be studied in this research; one hosting to-movement and the other hosting through-movement. As a conclusion, this research is done in one single context through two different units of analysis. Therefore, according to the table above, this research is done by a single embedded case study.

Depending on what the research intends to investigate, the choice of units of analysis (cases) can vary. The chosen cases can therefore be critical, extreme or unique, typical, revelatory and longitudinal (Yin 2009). The chosen cases in this study are primarily typical cases. These cases that are also known as representative cases, represent circumstances and conditions of an everyday or commonplace situations. The information provided by these cases are assumed to be about the average person or organization.

Case selection and data collection

The research questions in this research have been chosen primarily based on interest. However, the final form of the research questions and what they aim to achieve has been inspired by previous research. Much has been researched regarding the effects of activities and physical attributes on the sociability of public urban spaces by urban designers, urbanists and activist such as Jan Gehl (2011 & 2013), William H. Whyte (1980) and Jane Jacobs (1961). However, not much has been researched regarding the relationship between sociability and movement. Canter (1977) recognizes activities as one of the three components of a place. There are different types of activities that can take place in a space and movement is one them. This research aims to understand the relationship between movement and sociability of public spaces.

The definition of the unit of analysis, otherwise known as the case, is directly related to how the research question is formulated (Yin 2009). The research questions in this study clearly favor specific types of cases to other ones. The focus of the research questions is primarily on pedestrian movements which leads to choosing public spaces that host a considerable flow of pedestrians. Since the effects of the movements will be examined, it is of value to eliminate public spaces that have other modes of traffic in order to reduce the complications caused by other factors involved. So the first filter that the cases should go to is being mainly pedestrian zones. Secondly, the research questions focus on two main types of pedestrian movement that will be explained in the next chapter. Another clear filter appears here. Each chosen case should
host one of the two types of movement. Thirdly, it is important to decide the time period when
the cases are going to be studied. As mentioned before, the chosen cases in this study are typical
cases. Therefore, the time period when they will be studied should also be a typical time. In other
words, specific times where the public spaces are extra crowded are not suitable for this research.
Therefore, the chosen cases will be studied on regular weekdays, outside of rush-hour and during
opening hours of shops and businesses that exist in the chosen public spaces.

Based on these three filters, the two streets of Kalverstraat and Reguliersbreestraat have been
chosen. Kalverstraat is a pedestrian street where no other type of traffic is allowed. Reguliersbreestraat is also a pedestrian zone with two tram tracks passing it in the middle. Other
than the trams, no other type of traffic is allowed in the street. In the case study chapter, it is
further explained how each of these streets have shown to have one of the two types of
pedestrian movement.

Data collection in this research has been done with the help of several different sources. Yin
(2009) introduces six main sources of evidence in a case study. Among them, documentations,
direct observations and surveys have been used in this research. In addition to Yin’s sources of
evidence, a set of quantitative data was required to understand the quantitative phenomenon that
belongs to each case. In order to obtain such information, a number of methods such as counting
and tracking that is introduced by Gehl (2013) were used. A number of documents in forms of
formal studies, evaluation of the same site under study and articles appearing in older magazines
were studied during the case studies. In order to avoid making conclusions that are based on bias
documents (Yin 2009), more than one document has been studied if available.

Regarding the direct observations, surveys, countings and trackings, a total number of 2 days
was dedicated to each street in order to conduct the necessary research. These 4 days were
Tuesday, Wednesday, Thursday and Tuesday again. Fridays and weekends were not chosen due
to their untypical crowdedness and Mondays weren't chosen due to the late opening hours of
shops on Mondays. The weather during the chosen days was sunny. Rainy days were avoided
due to the irregular walking patterns they create. As an observer, I was sitting in a space on the
second floor of a building in each street in order to have a clear view on the movement. My
physical absence in the street also helped not to cause any change of pedestrian behavior due to
the presence of a noter. However, during both days in each street, the countings, trackings and
observations were conducted from the exact same spot. The intention with repeating the above
mentioned research methods is to understand whether or not a change in some circumstances
such as day, location and respondents will generate similar results as the first time. In case the
answer is yes, the results will be considered more reliable. Due to the absence of any other
spaces with a clear view from above, I had to repeat the procedures from the same spot. A
change of location could have led to more reliable results. Direct observations were done in the
earliest stages of the research in order for the researcher to gain general information about the
cases. In order to gain knowledge on information directly related to the pedestrians in each case, structured questions were given to them in the form of a survey (See appendix 1.). This source of evidence is seen as a structured interview that is required to be answered by a larger number of respondents and it is one the six main sources of evidence (Yin 2009). In each street, a total number of 40 respondents answered the surveys. The reason behind surveying this specific number of people is that by the time almost 30 answers were gathered, a clear pattern was identified between the answers and the last few surveys, 10 to be precise, were generally not adding new information to the research. Supporting textbooks in the field of research methodologies were studied as a guideline for the research. In the following subchapter, it is further explained in which stage of the case study was each method used.

Steps of the case study

The two case studies follow the four steps explained below. Each step aims to answer specific type of question and therefore, the methods used in each step are specifically chosen for that step.

1. **Identifying the type of movement and reasons behind the type of movement:**

The first step of the case studies is identifying the type of pedestrian movement, i.e. to-movement or through-movement, that takes place in the chosen streets. In order to do so, it is crucial to have an understanding of the nature and the configuration of the street, the reason it was created, how it has been used throughout history and how is it being used currently.

Gathering information about the history of the street requires methods that do not have control over behavioral events and do not focus on current events. According to Yin (2009) the suitable choice of method is conducting a historical study. This method is aimed to answer questions such as why the street was created? What kinds of activities have taken place in that street? Who used to use this street and how? Since there are no living participants that can be interviewed and there is no opportunity for direct observations, historical studies are suitable options for this stage of the study.

Additionally, this stage of the case studies aims to understand how the streets are currently being used. The first step is to identify the type of businesses that are active in or around the streets. For example, businesses such as clothing shops, cafes and restaurants invite people to the street for a longer stay (Gehl & Svarre 2013) while fast and take-away activities are meant to serve people in a transient matter (Cinematic city 2014). This identification has been done by direct observations by the researcher. In order to confirm how the streets are being used, a survey was conducted and pedestrians in
each street were asked to answer it (See appendix 1.). In the survey, the pedestrians were asked why they were in that street. The different answers from the respondents confirms the type of the streets and how they are currently being used and what movement takes place in them.

2. **Identifying the characteristics of the movement:**

After identifying the type of movement that takes place in the two streets, the characteristics of each movement should be identified. Since the aim of this research is to make walking more efficient and enjoyable, it is crucial to know the core characteristics of each movement i.e. speed, cooperation, organization, etc. . Having knowledge over the core characteristics of each movement will not only result in a better understanding of the causal links between movement and sociability, but also help planners create effective strategies in order to preserve the positive characteristics of each movement and tackle the negative characteristics.

The methods used in this stage are mostly chosen based on the tool selection guide introduced by Gehl (2013). Countings and trackings were the two main tools that were used in this stage. Pedestrian flow, stationary activities, gender distribution, groups and individuals, walking density and directions were the main attributes that were counted in the streets. Walking speed was the only attribute that was measured by tracking. In other words, an imaginary line with a known length would be chosen on the streets and the time it took for pedestrians to walk that line would be measured. So the pedestrians were tracked during short time intervals. In order to obtain a realistic sample of the daily rhythm of the street, all the countings and trackings were done during 10-minute intervals every hour. The general timing for case studies has previously been explained in the Case selection and data collection subchapter.

3. **Identifying the effects of the movement:**

The third stage of the case studies is to identify the positive and negative effects that these movements have on the sociability of the space in terms of its movement. This stage of the study is mainly done with the help of the surveys which includes questions such as:

How does people’s behavior change when in that street? What do they think of walking there compared to other streets? What do they want to do there and what don’t they want to do there? How do people act regarding each other? (See appendix 1.)

The survey includes questions regarding people’s perceptions of the two streets. The questions are designed based on previous research on place psychology and behavior
settings that will be presented in details in the theory chapter. The main aim of this step of the case study is to determine whether or not pedestrians recognize the behavior setting of a place and then act accordingly. Much like the research by Heft et al (2014), this step of the case study aims to understands the relationship between the behavior setting of these streets and pedestrians recognition. Therefore, the respondents had to answer whether or not they see similarities between the street they were walking in and places such as a train station or a playground just based on the way people walk in these places. This question aimed to see whether or not pedestrians identify the type of movement without directly noticing it. Train station, bus terminal and airport gate area were chosen as places that represent through-movement and grocery store, art exhibition and playground were chosen as places that represent a more free and relaxed to-movement.

4. **Creating strategies to minimize the negative effects and also strategies for increasing efficiency and joy of walking.**

Based on the findings on each movement, separate strategies will be suggested in order to reduce the negative attributes in street that create annoyance for the pedestrians. The suggested strategies are supported by previous research and inspired by already existing solutions in other locations.

**Validity and limitations**

Yin (2009) introduces four tests that can be used to determine the quality of the research. These tests concern construct validity, internal validity, external validity and reliability.

Construct validity test aims to determine whether or not the researcher has developed a sufficiently operational set of measures (Yin 2009). In other words, this test aims to determine the level of objectivity in data collection. During the data collection stage, one tactic that can help create construct validity is using multiple sources of evidence. In the case study in this research, the first step was to determine the type of movement that occurs in each street. In order to do so, the movement in the street has been studied through three different lenses i.e. history, morphology and current user’s responses. The results of these three studies correspond with the study’s literature which strengthens the construct validity of the results. In the later stages of the case study, the surveys, the countings and the trackings complement each other in order to construct an analysis that is based on multiple sets of data.

Internal validity is a test that only concerns explanatory case studies. As explained before, this case study is of explanatory nature which makes this test applicable to itself. When researchers aim to conclude that event x has happened because of factor y, they need to make sure that there aren’t any other factors that may have caused event x to happen. As mentioned in the
introduction, there is an important relationship between activities, configuration and conceptions. Throughout the whole research, the influence of these three components of a place have been taken into consideration in order not to miss out on any factor that might have had an influence on the item under study. In the analysis, a number of rival explanations have been presented in order to clarify that there can be other factors involved in the creation of phenomenon x.

External validity aims to determine whether or not the results are generalizable or not (Yin 2009). When studying a few number of units of analysis, the results are completely dependent on the data about those units. On the one hand, the results of this case study is based on a study done on two Dutch streets in Amsterdam and they are aimed to be generalized in order to make the suggested strategies more applicable to other cases. On the other hand, the results of this study are mainly based on human behaviors. In the context of human behavior, generalization is often suspect due to the many different attributes that specifically belong to that certain group of people (Gillham 2000). So, can these results be applicable to other streets all around the world? The answer is no. In order to be able to create generalizable theories about to/through movement, each of these movements need to be studied in multiple public spaces all around the world. Only then could the possible similar results be applicable on a broader context.

Reliability is a well-known test that makes sure the study will give similar results in case of repetition. In other words, if another researcher were to repeat the exact same procedure, he/she must reach the same results as the previous researcher. The quantitative results of this study are mainly based on countings and trackings done by one person, the researcher. In order to increase the reliability of these data, countings and trackings were repeated twice in each street. The obtained data from these two days resulted in similar conclusions which increases the reliability of the data. In addition, in order to gather a realistic sample of the rhythm of the streets, countings and trackings were done during a time period of ten minutes every hour.

“Counting for ten minutes, once an hour, provides a rather precise picture of the daily rhythm. City life has shown to be quite rhythmic and uniform from one day to the next, rather like a lung that breathes. Yesterday is very much like tomorrow.”, (Gehl 2013, p.25)

The answers from the surveys from both streets were to be compared to each other in some cases. Therefore, in order to make them comparable, it was necessary to reduce differences between the respondents. Seeing how people’s perception of a place is highly dependent on what they are planning to achieve in that place (Canter 1977), the surveys in each street had to be answered by approximately equal numbers of tourists, inhabitants and visitors and this goal was achieved.
Internship at the Municipality of Amsterdam

This academic research was conducted at the municipality of Amsterdam in the frame of an internship with a duration of five months from February until June 2017. My position at the municipality of Amsterdam was an independent researcher. However, regarding my geographical field of study, I was suggested to conduct a research on the central part of Amsterdam that faces high numbers of visitors on foot, bike and even car. The internship offered access to detailed information about the city in forms of statistics, reports and magazines. The duration of the internship on the one hand allowed enough time to conduct a comprehensive research on the chosen streets. On the other hand, a longer time period would have allowed the involvement of more cases, even outside Amsterdam, which could lead to more generalizable results.
Case studies and results

The city of Amsterdam (2017) explains how the central parts of the city, i.e. districts Center east and Center west, have become a domain for pedestrians (See figure 9.). Even though much has been done to make space for pedestrians, some parts of the city center are still facing pressure due to high numbers of pedestrian users. The city is expected to face an increase in the number of pedestrians moving in the city center in the coming years. More specifically, the number of tourists as well as the population are both expected to increase. The share of walking is remarkably high among tourists. In general, people are least satisfied with the pedestrian conditions in the city center compared to other parts of the city. Therefore, the focus of this research is on the central parts of the city (See figure 9.).

Since this research is focusing on two main types of pedestrian movement, two streets have been chosen for the case studies that host these two types of movement. Another criteria for choosing the cases was a high volume of pedestrian movement that exists in the streets. The chosen streets for the case studies are Kalverstraat and Reguliersbreestraat (See figure 10.).
Both of these streets are pedestrian streets. However, in the Reguliersbreestraat, two tram tracks exist in the middle of the street with functioning trams passing them but the whole street is a pedestrian zone were no cars and bicycles are allowed. In this chapter, each street is first presented through its history, morphology and attractors. Then, the results of the countings, trackings and surveys are presented.
Kalverstraat

History, morphology and attractors

The earliest trace of activities known from Kalverstraat is the story of a farmer and his calves (Emeis 1950). The farmer used to sell his calves in a street next the Dam square. The street later on became a marketplace for selling calves and that is how the street got its name Kalverstraat which means calves street. Even though the name remains the same, the street has gone through many changes throughout history. During the 18th century, when Kalverstraat had completely risen from its ashes due to a great fire, the calves market were once again held in the street. After the market was moved to another location, all the related shops such as butcher’s shops were closed down as well. Nowadays, there are no traces of these shops in the street. The street then became known as a center of trade and wealth. In pictures from middle ages, many different trades have been observed in Kalverstraat such as Barber, brewer, goldsmith, blacksmith, cutler, furrier, oil-miller, carpenter, fishmonger, etc. . This identity stayed with Kalverstraat until 19th century. Before that period, the street was known to provide goods and services of high quality and price. By that time, most of the people in Amsterdam had difficulties making a daily living. Therefore, they couldn’t afford to purchase anything in Kalverstraat. The shops would host customers with high socio-economic status and they would try to keep the lower class away from the shops. Mailmen for instance were not allowed to enter the shops to deliver a letter or a package. They had to wait outside for a shopkeeper to receive the items. It was therefore popular for youngsters and people from lower classes to visit Kalverstraat after office hours or on Saturday nights just to look at the luxurious activities that were taking place in that street (van der Tol 1993). In the 19th century, the street had to adapt to mass production. Shops such as H&M and Marks and Spencer appeared in the street to fulfill the needs of the young and tourists. The change was so clear that media was complaining about the “French-fries culture” that had taken over the previous identity of the street.

Nowadays, Kalverstraat is still the busiest and best known shopping street in the Netherlands (van der Tol 1993). Looking at the street’s evolution, it clear that one part of the identity of the street always stayed intact and that was the shopping and entertainment identity. From calves market and butcher shops to luxurious boutiques and restaurants to cheaper mass produced clothing, Kalverstraat has always fulfilled the needs of the spectator and the buyer.

“She is not the only street in Amsterdam where prospective buyers can satisfy their needs. In all quarters of the town societies of shopkeepers try to induce customers to buy in their local shops. But that indefinable atmosphere that has grown through the centuries, that genuine Kalverstraat-atmosphere is unique. And that is why Kalverstraat will remain Kalverstraat for many generations to come.”, (Emeis 1950, p.31)
The shops in Kalverstraat are considered as attractors that attract certain group of people. Direct observations show that the main pedestrian movement in Kalverstraat corresponds perfectly with the opening hours of the shops. The image below shows Kalverstraat on a Monday morning before the opening hours of the shops (See figure 11.).

![Figure 11 Kalverstraat before opening hours of shops (Own material)](image)

Even though that time of the day is considered rush hour, and that there is an important transportation node at the end of the street, no through-movement was seen in the street. This noticeable absence of pedestrian movement before opening hours of the shops shows that the main pedestrian movement that occurs in Kalverstraat is to-movement. The only pattern that could be found in that hour was the traffic of delivery trucks and renovation trucks for some stores. Otherwise, cars are not allowed to enter the street.

As explained in the theory chapter, movement can be influenced by both morphology and attractors. Therefore, besides the history of Kalverstraat, a number of attributes related to the street’s morphology and attractors have been studied through direct observations and countings.

Kalverstraat is the longest shopping street in the Netherlands with a length of approximately 670 meters. The width of the street varies from approximately four to ten meters. The street is covered by cobblestone which is suitable for walking. Considering the length of Kalverstraat, there are many small alleys that cross the street and create blocks with different sizes. Kalverstraat is crossed by nine streets, one back alley and the Spui square. These interruptions have created 22 blocks. Five blocks along the street are around 100 meters long which is relatively longer than the other blocks. The size of the other blocks varies from approximately 20 to 70 meters. There are 11 blocks in total that are shorter than 50 meters. In other words, half of
the blocks in Kalverstraat are relatively short. According to Hillier (2005), smaller block sizes result in less distance to all the buildings in the block. Therefore, pedestrians will have to walk shorter distances in order to reach what the block has to offer. As a result, both real and experienced distance to different parts of the block become lower. This characteristic is expected to increase the sociability of the public space in terms of its accessibility.

In terms of the attractors in the street, facade categorization, types of functions and attractors close by have been studied in detail. The facades in Kalverstraat can be ranked as friendly according to Gehl’s (2013) facade categorization. There are 10-14 doors per 100 square meters. There is a slight variation in function in the street. However, there are no blinds or passive units in this street. Most of the businesses in Kalverstraat are dedicated to clothing, cosmetics, Jewelry and watches. There are a few small businesses that offer food or snacks and one McDonald’s. The shopping identity and the friendly and sometimes active facades attract people to slow down and watch the windows, stop or even go in a shop. These characteristics lead to a long staying time in the street and maybe even slower walking speeds. These attributes will be studied in the next stage of the case study. Regarding the attractors close by, Kalverstraat leads to Dam square in the north which is the main square in Amsterdam. The street also leads to the Munt square in the south which is the meeting point of several touristic streets. Another attractor close by is the Spui square with shops and restaurants that meets Kalverstraat somewhere close to its southern end.

Results of countings and trackings

The counted pedestrian flow in Kalverstraat is presented in the table below (See table 1.).

Table 1 Pedestrian flow in Kalverstraat (Own material)

<table>
<thead>
<tr>
<th>Date</th>
<th>Tuesday 09-04-2017</th>
<th>Wednesday 10-04-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>9:00-9:30</td>
<td>10:00-10:30</td>
</tr>
<tr>
<td></td>
<td>10:30-10:40</td>
<td>11:30-11:40</td>
</tr>
<tr>
<td></td>
<td>11:30-11:40</td>
<td>12:30-12:40</td>
</tr>
<tr>
<td></td>
<td>11:30-15:40</td>
<td>15:30-15:40</td>
</tr>
<tr>
<td>Pedestrian flow</td>
<td>8.6</td>
<td>10</td>
</tr>
<tr>
<td>(person/minute)</td>
<td>14.8</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>29.7</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

According to these two samples, the average pedestrian flow in Kalverstraat during weekdays, outside peak hours and during opening hours of shops is approximately 38 pedestrians per minute.
The distribution of genders in Kalverstraat is presented in the following charts (See figure 12 and 13.).

As seen from the charts above, the number of female pedestrians is usually higher than male pedestrians. According to these samples, 54 percent of pedestrians in Kalverstraat are females and the remaining 46 percent are males.
Pedestrians in Kalverstraat are either walking alone or in small and large groups. The distribution of individuals and pedestrians in group is shown in the charts below (See figure 14 and 15.).

As seen in the charts above, there is a significant difference between the number of people walking alone and in groups. According to these samples, 67 percent of pedestrians walk in groups while the remaining 33 percent walk alone.
The percentage of people stopping in the street is presented in the table below (See table 2.). The stops were usually made for reasons such as taking a break, waiting for someone who is in a shop, looking at a map for directions and having a short conversation with their pedestrian partners.

Table 2 Percentage of people stopping in Kalverstraat (Own material)

<table>
<thead>
<tr>
<th>Date</th>
<th>Tuesday 09-04-2017</th>
<th>Wednesday 10-04-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>9:00-9:30</td>
<td>10:00-10:30</td>
</tr>
<tr>
<td>Percentage of people stopping</td>
<td>1 7 10 7</td>
<td>8 9 9 6</td>
</tr>
</tbody>
</table>

There are two main walking directions that take place in the street. These walking directions are along the street and in opposite directions. In addition to these two directions, there are pedestrians who cross the street as well. The percentage of pedestrians crossing the street is presented in the table below (See table 3.).

Table 3 Percentage of people crossing Kalverstraat (Own material)

<table>
<thead>
<tr>
<th>Date</th>
<th>Tuesday 09-04-2017</th>
<th>Wednesday 10-04-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>9:00-9:30</td>
<td>10:00-10:30</td>
</tr>
<tr>
<td>Percentage of people crossing</td>
<td>0 8 4 6</td>
<td>0 0 8 3</td>
</tr>
</tbody>
</table>

The measured walking speeds in Kalverstraat are presented in the graphs below (See figure 16 and 17.). In order to calculate an average walking speed, the walking speed of 50 people has been measured during each time period.
As seen from the graphs above, the walking speed tends to decrease slightly throughout the day. According to these two samples, the average walking speed in Kalverstraat is 1.16 m/s.
During the countings of these two samples, a total number of 3 collisions were noticed. These collisions occurred between moving pedestrians and pedestrians stopping in the middle of the street. During these collision, there was no sign of apology or recognition.

Results of surveys
In this subchapter, results of the surveys are presented. Firstly, general information about the respondents in terms of nationality, place of residence, gender and age are presented and later on, the responses to the other questions will be presented.

General information
The table below includes general information about the respondents (See table 4.).

<table>
<thead>
<tr>
<th>Table 4 General information about the respondents in Kalverstraat (Kalverstraat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dutch</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Number</td>
</tr>
</tbody>
</table>

The age range of the 40 respondents varies from 16 years old to 74 years old.

Why are you visiting this street?
When asked about the reason why the respondents are visiting the street, all the answers that were given fit into three categories of shopping, passing by and no reason. The following table presents the distribution of these categories (See table 5.).

<table>
<thead>
<tr>
<th>Table 5 Reason for visiting Kalverstraat (Own material)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason</td>
</tr>
<tr>
<td>Number</td>
</tr>
</tbody>
</table>

Based on the way people are walking in this street, do you think this street can be similar to a train station, art exhibition, playground, grocery store, bus terminal or airport gate area?
The table below shows how many people chose the given options (See table 6.). More than one option could be chosen by one respondent.

43
Table 6 Experienced similarity with other places in terms of movement in Kalverstraat (Own material)

<table>
<thead>
<tr>
<th>Place</th>
<th>Train station</th>
<th>Art exhibition</th>
<th>Playground</th>
<th>Grocery store</th>
<th>Bus terminal</th>
<th>Airport gate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>17</td>
<td>9</td>
<td>3</td>
<td>8</td>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

_When you arrive to this street, do you feel that you need to walk differently?_

When asked this question, most of the respondents focused on walking speed and cooperation with other pedestrians. Their answers fit into four categories of walking slower, faster, watch out for people and no need to walk differently. The table below shows the number of each answer (See table 7.).

Table 7 The need to walk differently in Kalverstraat (Own material)

<table>
<thead>
<tr>
<th>Type of change</th>
<th>Walking slower</th>
<th>Walking faster</th>
<th>Watch out for people</th>
<th>No change is needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>14</td>
<td>2</td>
<td>23</td>
<td>7</td>
</tr>
</tbody>
</table>

_How do you perceive the following attributes?_

The table below shows the average grade that each attribute received from the respondents from the scale of one to five (See table 8.).

Table 8 Place evaluation in Kalverstraat (Own material)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Crowdedness</th>
<th>Noise</th>
<th>Walking (general)</th>
<th>Walking (in terms of obstacles)</th>
<th>Other people’s behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>3.4</td>
<td>3.9</td>
<td>3.7</td>
<td>3.5</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Results of observations

A noticeable phenomenon that happened repeatedly in Kalverstraat was pedestrians stopping in the middle of the street. Despite the high pedestrian flow and density, most of the pedestrians that stopped in the street felt that it’s appropriate to stop in the middle of the street and it’s not necessary to move to the sides of the street instead.
Reguliersbreestraat

History, morphology and attractors

Reguliersbreestraat has gotten its name from the medieval monastery, Reguliersklooster which used to be located near the street (Cinematic city 2014). The city has gone through some main expansions throughout history. After one of the city expansions in 1586, Reguliersbreestraat became the main connection between the dairy market which is now known as Rembrandtplein and the old Regulierspoort which is now the Munt tower. Even though all streets are meant to connect spaces to each other, Reguliersbreestraat has always been defined by its transient nature due its surroundings and its architectural construction. The approximately 160 meters long street is relatively short and is completely straight all along. These characteristics of the street invite traffic flow seeing how it makes destinations easily visible. In other words, this street can be referred to as a monumental axis. Standing at either end of the street, one can have a clear view on either the Mint tower or the Rembrandtplein (See figure 18.). Due to the streets design and location, the street has caused a pattern of through-movement in it.

According to the historical magazine Ons Amsterdam (1996), during the 1950’s, Reguliersbreestraat used to be a shopping street. In addition to the Tuschinski cinema, the street used to have a chic set of shops and jewelers and handcrafted clothing. Nowadays, the bottom floors of the buildings in Reguliersbreestraat are all shops and restaurants. But what is different now compared to the 1950’s is the characteristics of the activities. The shops and food places still attract people but in a transit manner. The shops that are currently existing in that street offer fast or to-go services. The restaurants are mostly fast food restaurants, the grocery store is a to-go store and so on.
Another feature that adds to the through-movement of this street are the trams. There are two tram tracks that go along the street with three tramlines passing them. However, none of these trams stop in Reguliersbreestraat. In other words, there is no transportation stop in that street which strengthens the through-movement characteristic of the street.

The lack of public space furniture such as benches, flowers vases and greenery has created an unattractive space for the pedestrians.

In addition to the history of the street, the morphology and the attractors in the street have been studied in a more detailed way. Regarding the morphology of this street, street width, pavement, block size and view had been studied. The street is approximately 12.5 meters wide. This pedestrian street is relatively wide in comparison to most other pedestrian streets in Amsterdam seeing how two parallel tram tracks pass in the middle of the street. The pavement of the street is made of cobblestone which is not troublesome to walk on. As mentioned previously, the doesn’t have many alleys crossing it. To be exact, there are in total two narrow alleys that cross the street, Regulierssteeg and Schapensteeg. These two alleys have created four blocks in total in an approximately 160 meters long street which means the block sizes are bigger than the ones in Kalverstraat. The blocks are approximately 38, 53, 85 and 112 meters long which can lead to less attraction experienced by the pedestrians. According to Hillier (2005), smaller block sizes mean that the pedestrian is closer to all the buildings that make up the block compared to bigger blocks and less experienced distance by the pedestrians creates a more sociable perception of the place. And finally, this relatively short street offers a clear view of the both ends of the street. According to Gehl (2011), it is more tiring for pedestrians to walk if the destination is in sight because that means that the whole distance that needs to be walked is in sight.

Regarding the attractors in this street, facade categorization and types of functions have been studied in detail. Following the facade categories introduced by Gehl (2013) the facades in Reguliersbreestraat belong to the mixture category. There are 6-10 doors per 100 square meters belonging to large and small units with a few details designed into the facades. According to Gehl’s (2013) categorization, the more active the facades, the more they attract pedestrians and make them walk slower to watch or even stop. Since Reguliersbreestraat has facades with a mixture of active and passive characteristics, it attracts the pedestrians less than a street like Kalverstraat. Another important aspect regarding the attractors in the street is the type of functions that they provide. There are currently 39 businesses in Reguliersbreestraat. About half of these businesses have a clear fast/ take-away nature. Examples of these businesses in Reguliersbreestraat are fast food chain stores such as Subway, Burger King and McDonald’s, a to-go branch of Albert Heijn which is the premium supermarket chain store in the Netherlands (Albertheijn, n.d.), Shabu Sushi and grill to-go, Wok to Walk and Febo which is a snack bank that provides quick snacks in exchange of coins. The image below shows a few examples of fast and take-away businesses in Reguliersbreestraat (See figure 19.).
The rest of the businesses in Reguliersbreestraat are shops such as drugstores, tours and tickets office, bike rentals, tattoo shops and casinos. With the exception of two restaurants and one cafe, all the other businesses in the street either have a fast and transient nature or they don’t contribute to the street life. Businesses such as the tattoo shops and the casinos didn’t provide clear view on the inside activities which leads to less interaction between pedestrians and the facade.

There are a number of main attractors close to the street. The more western end of Reguliersbreestraat is the Mint square with the Mint tower and the Kalverstraat connected to it. The more eastern end of the street leads to Rembrandtplein which is a busy square in terms of cafes and restaurants. In the Rembrandtplein, there are two tram and bus stops that in total serve 8 lines. These attractors at both ends of Reguliersbreestraat contribute to the through-movement in the street.

Results of countings and trackings

Pedestrian flow in Reguliersbreestraat is presented in the table below (See table 9.).

<table>
<thead>
<tr>
<th>Date</th>
<th>Thursday 11-04-2017</th>
<th>Tuesday 16-04-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>9:00-9:30 10:30-10:40 11:30-11:40 15:30-15:40</td>
<td>10:00-10:30 11:30-11:40 12:30-12:40 15:30-15:40</td>
</tr>
<tr>
<td>Pedestrian flow (person/minute)</td>
<td>8.9 10 24 37</td>
<td>11 18 30 45</td>
</tr>
</tbody>
</table>

According to these two samples, the average pedestrian flow in Reguliersbreestraat during weekdays, outside peak hours and during opening hours of shops is approximately 25 pedestrians per minute.
The distribution of genders in Reguliersbreestraat is presented in the following charts (See figure 20 and 21.).

As seen from the charts above, the proportion of female and male pedestrians varies throughout the days. According to these two samples, 52 percent of pedestrians in Reguliersbreestraat are male while the remaining 48 percent are females.
Pedestrians in Reguliersbreestraat are either walking alone or in small and large groups. The distribution of individuals and pedestrians in group is shown in the charts below (See figure 22 and 23.).

![Figure 22 Number of people walking in groups and individuals in Reguliersbreestraat on Thursday (Own material)](image1)

![Figure 23 Number of people walking in groups and individuals in Reguliersbreestraat on Tuesday (Own material)](image2)

As seen in the charts above, there is a significant difference between the number of people walking alone and in groups. According to these samples, 60 percent of pedestrians walk in groups while the remaining 40 percent walk alone.

The percentage of people stopping in the street is presented in the table below (Table 10.).
Table 10 Percentage of people stopping in Reguliersbreestraat (Own material)

<table>
<thead>
<tr>
<th>Date</th>
<th>Thursday 11-04-2017</th>
<th>Tuesday 16-04-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>9:00-9:30</td>
<td>10:30-10:40</td>
</tr>
<tr>
<td>Percentage of people stopping</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Time</td>
<td>11:30-11:40</td>
<td>15:30-15:40</td>
</tr>
<tr>
<td>Percentage of people stopping</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Time</td>
<td>10:00-10:30</td>
<td>11:30-11:40</td>
</tr>
<tr>
<td>Percentage of people stopping</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Time</td>
<td>12:30-12:40</td>
<td>15:30-15:40</td>
</tr>
<tr>
<td>Percentage of people stopping</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

There are two main walking directions that take place in the street. These walking directions are along the street and in opposite directions. In addition to these two directions, there are pedestrians who cross the street as well. The percentage of pedestrians crossing the street is presented in the table below (See table 11.).

Table 11 Percentage of people crossing Reguliersbreestraat (Own material)

<table>
<thead>
<tr>
<th>Date</th>
<th>Tuesday 09-04-2017</th>
<th>Wednesday 10-04-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>9:00-9:30</td>
<td>10:30-10:40</td>
</tr>
<tr>
<td>Percentage of people crossing</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Time</td>
<td>11:30-11:40</td>
<td>15:30-15:40</td>
</tr>
<tr>
<td>Percentage of people crossing</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Time</td>
<td>10:00-10:30</td>
<td>11:30-11:40</td>
</tr>
<tr>
<td>Percentage of people crossing</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Time</td>
<td>12:30-12:40</td>
<td>15:30-15:40</td>
</tr>
<tr>
<td>Percentage of people crossing</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

The measured walking speeds in Reguliersbreestraat are presented in the graphs below (See figure 24 and 25.).
Figure 24 Average walking speed in Reguliersbreestraat on Thursday (Own material)

Figure 25 Average walking speed in Reguliersbreestraat on Tuesday (Own material)
As seen from the graphs above, the walking speeds in Reguliersbreestraat are quite consistent throughout the day. According to these two samples, the average walking speed in this street is 1.35 m/s.

During the countings of these two samples, no collision or surprises were noticed.

Results of surveys
In this subchapter, results of the surveys are presented. Firstly, general information about the respondents in terms of nationality, place of residence, gender and age are presented and later on, the responses to other questions will be presented.

General information
The table below includes general information about the respondents (See table 12.).

Table 12 General information about the respondents in Reguliersbreestraat (Own material)

<table>
<thead>
<tr>
<th></th>
<th>Dutch</th>
<th>Non-Dutch</th>
<th>Living in Amsterdam</th>
<th>Not living in Amsterdam</th>
<th>Tourist</th>
<th>Visitor</th>
<th>Female</th>
<th>Male</th>
<th>Average age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>24</td>
<td>16</td>
<td>22</td>
<td>18</td>
<td>12</td>
<td>6</td>
<td>17</td>
<td>23</td>
<td>32</td>
</tr>
</tbody>
</table>

The age range of the 40 respondents varies from 18 years old to 81 years old.

Why are you visiting this street?
When asked about the reason why the respondents are visiting the street, all the answers that were given fit into four categories of using take away activities, shopping, passing by and no reason. The following table presents the distribution of these categories (See table 13.).

Table 13 Reason for visiting Reguliersbreestraat (Own material)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Take away services</th>
<th>Shopping</th>
<th>Passing</th>
<th>No reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>6</td>
<td>2</td>
<td>28</td>
<td>4</td>
</tr>
</tbody>
</table>

Based on the way people are walking in this street, do you think this street can be similar to a train station, art exhibition, playground, grocery store, bus terminal or airport gate area? The table below shows how many people chose the given options (See table 14.). More than one option could be chosen by one respondent.
Table 14 Experienced similarity with other places in terms of movement in Reguliersbreestraat (Own material)

<table>
<thead>
<tr>
<th>Place</th>
<th>Train station</th>
<th>Art exhibition</th>
<th>Playground</th>
<th>Grocery store</th>
<th>Bus terminal</th>
<th>Airport gate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>18</td>
<td>6</td>
<td>0</td>
<td>8</td>
<td>13</td>
<td>14</td>
</tr>
</tbody>
</table>

*When you arrive to this street, do you feel that you need to walk differently?*

When asked this question, most of the respondents focused on being cautious, walking speed and cooperation with other pedestrians. Their answers fit into four categories of walking slower, faster, watch out for trams and people and no need to walk differently. The table below shows the number of each answer (See table 15.).

Table 15 The need to walk differently in Reguliersbreestraat (Own material)

<table>
<thead>
<tr>
<th>Type of change</th>
<th>Watch out for trams</th>
<th>Walking slower</th>
<th>Walking faster</th>
<th>Watch out for people</th>
<th>No change is needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>10</td>
<td>4</td>
<td>7</td>
<td>2</td>
<td>18</td>
</tr>
</tbody>
</table>

*How do you perceive the following attributes?*

The table below shows the average grade that each attribute received from the respondents from the scale of one to five (See table 16.).

Table 16 Place evaluation in Reguliersbreestraat (Own material)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Crowdedness</th>
<th>Noise</th>
<th>Walking (general)</th>
<th>Walking (in terms of obstacles)</th>
<th>Other people’s behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>3.4</td>
<td>3.5</td>
<td>3.2</td>
<td>2.8</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Results of observations

Same phenomenon that occurred in Kalverstraat regarding where people stop in the street was noticed in Reguliersbreestraat as well. The difference in this street compared to Kalverstraat was that most of the pedestrians that wanted to stop would move to the sides of the street and close to the buildings and stop there.

Another noticeable pattern that was observed in the street was the hardly noticeable existence of the tram tracks. Many pedestrians were surprised when they heard the tram behind them and
many were pulled away from the tracks by their walking partner who had noticed the tram behind them.
Analysis and discussion

The first two steps of the case studies are identifying the type of movement and reasons behind it and identifying the characteristics of the movement. These two steps have partly been completed in the results chapter. However, here, they will be analyzed based on the studied literature in order to create a more comprehensive understanding of the two movements. The third step of the case studies is identifying the effects of the movement. This step will be fully completed in this chapter.

Identifying the type of movement and reasons behind it

In the beginning of the research, Kalverstraat and Reguliersbreestraat were chosen based on an assumption that they play two different roles for pedestrians. In other words, it was assumed that Kalverstraat mainly hosts to-movement while Reguliersbreestraat mainly hosts through-movement. In order for the research to be proceeded, this assumption needed to be proven. Hillier (1993) explains that movement can be influenced by both physical configuration of the streets and attractors. Therefore, the configuration and attractors of Kalverstraat and Reguliersbreestraat were studied in the beginning of the research.

When it comes to configuration, some characteristics such as location, street width and length and block sizes were studied. Kalverstraat reaches Dam square on its northern end. The Dam square has always been an important attractor in the city due to its various functions such as distribution of news, entertainment and public gatherings (Emeis 1950). Seeing how Kalverstraat neighbors this square, it created a suitable space for hosting attractors. The reason behind this can be explained by the high level of accessibility that the street offers. According to Hillier (1993), accessibility of a destination plays an important role in choosing the destination. Being neighbors with one of the main city squares provides a high level of accessibility in terms of distance and sight. The factor of accessibility is also emphasized by Mehta (Mehta-1 2013) in his definition of sociable streets. According to him, accessibility is a key factor in creating sociable spaces. Other configurational characteristics such as dimensions of the street also play an important role in the way they are used. Kalverstraat is a relatively long and narrow street. These dimensions create a suitable space for a hub of attractors that can functions close to each other. The high length of the street allows more attractors to use the same infrastructure and the relatively low width of the street and the smaller block sizes increase the sociability of the space in terms of less walking distance to different parts of the street. These configurational characteristics of Kalverstraat have all in all created a suitable space for establishing attractors such as markets that later on invite people to the street.

The attractors in Kalverstraat were also studied during this research. The results show that Kalverstraat, throughout history, has been home to different kinds of attractors that invite people
to the street for a longer stay. The main identity of Kalverstraat is defined by its shopping nature. From calves market, to high-end boutiques, cafes and restaurants to the currently existing international mass-production stores, Kalverstraat has always fulfilled the needs of shoppers. Even though the types of goods offered on Kalverstraat have changed throughout history, it has maintained its shopping identity.

Reguliersbreestraat has different characteristics when it comes to configuration and attractors. This street has always connected two important attractors to itself. Currently, the street connects the Muntplein and the Rembrandtplein. The dimensions of the street have also played an important role in creating the identity of the street. Reguliersbreestraat is a relatively short and completely straight street. The combination of these two dimensions has enabled clear sight on both ends of the street which increased the accessibility of both ends in terms of distance and sight. The attractors in this street have taken advantage of its connecting identity. In other words, the attractor in this street provide services in a transient matter. Most of the businesses in this street offer fast and take-away services for people who are just passing by.

By looking at the configuration and the attractors in Kalverstraat and Reguliersbreestraat, a clear difference becomes visible. Kalverstraat has always been an accessible space that is ready to be a destination while Reguliersbreestraat has always aimed to make other destinations more accessible through itself.

Now that a clear understanding of the configuration and the attractors of these two streets has been created, the results of the surveys can be analyzed in order to confirm the type of movement that occurs in the streets. A relevant question regarding types of movement was asking the pedestrians about their reason for being there. Of total 40 pedestrians who answered the survey, 33 of them were in Kalverstraat for shopping while in Reguliersbreestraat, 28 pedestrians were just passing to reach a destination outside the street and 6 were there to use the fast or take-away functions such as taking away lunch on their way to their destination.

Hillier’s (1993) categorization of street usage can help clarify the main difference between Kalverstraat and Reguliersbreestraat. According to Hillier (1993), streets can either be used as a system of origins and destinations or a system of routes. If the network of streets is perceived as a system of origins and destinations, the type of movement that occurs in the network will be to-movement. And if the network of streets is perceived as a system of routes, then the movement that occurs in the network is through-movement. In the case of Kalverstraat, due to the configuration and attractors, the street is used as a destination. It has become one the most well-known streets in the Netherlands. Based on the studies on configuration, attractors and current users of the street, it is confirmed that Kalverstraat has to-movement. On the other hand, Reguliersbreestraat has proven to be used as a route. Many of the respondents mentioned that
they are passing through this street and not another one because this street is familiar. It’s a route they often take in order to reach their destination.

**Identifying the characteristics of the movement**

Comparing the type of movements that take place in Kalverstraat and Reguliersbreestraat, clear differences were noticed in terms of walking speed, gender distribution, groups and individuals and number of pedestrians stopping.

The measured walking speed of the to-movement in Kalverstraat in average is 1.16 \( m/s \) while the average walking speed of the through-movement in Reguliersbreestraat is 1.36 \( m/s \). The average walking speed in the case of through-movement is higher than the average walking speed in Amsterdam which is 1.2 \( m/s \) (City of Amsterdam 2017). So when it comes to walking speed, through-movement has a higher walking speed compared to to-movement. The reason behind this difference is discussed below.

Gender distribution is a key parameter in understanding some characteristics of a movement such as speed. Therefore, it is important to have an understanding whether a movement is done mostly by females or males. According to the countings in the case studies, 54 percent of pedestrians in Kalverstraat are females and the remaining 46 percent are males. This distribution is the opposite in through-movement. According to the case studies, 52 percent of pedestrians in Reguliersbreestraat are males and the remaining 48 percent are females.

The shopping street Kalverstraat has shown to host more female pedestrians than men. According to Dholakia (1999), women consider shopping as a pleasure more than men which is why they visit places that offer shopping more often than men. Another study on pedestrian movement by Timmermans et al (2009) focuses on patterns of pedestrian movement in the main shopping street of Antwerp, Belgium. The results of this study also confirm that the number of female pedestrians in shopping streets is higher than men. Therefore, it can be concluded that the shopping identity of Kalverstraat attracts female pedestrians more than men. According to Gehl (2013) and Zanlungo et al (2016), women tend to walk slower than men. Therefore, the shopping identity of Kalverstraat which generates to-movement leads to a slower average walking speed.

On the other hand, Reguliersbreestraat is not a shopping street and as explained before, it’s primarily a connecting street. As shown in the results of the countings of this research, the average number of men passing the street appears to be higher than women. Based on the previous argument, it can be concluded that the higher the number of male pedestrians in a street with fluid movement, the higher the average walking speed becomes.
The number of pedestrians walking alone or in groups is another key parameter in understanding basic characteristics of a movement such as speed. According to the case studies, the number of pedestrians walking in groups are higher than the number of pedestrians walking alone in both streets. However, the number of people walking in groups in Kalverstraat (to-movement) is 7 percent units higher than in Reguliersbreestraat which means than even more pedestrians walk in groups in the case of to-movement compared to through-movement. In Kalverstraat, 67 percent of pedestrians walk in groups and in Reguliersbreestraat, 60 percent of pedestrians walk in groups.

Same analysis applies for pedestrians walking in groups. According to the same study by Timmermans et al (2009), 55 percent of pedestrians walk in groups in the shopping street of Antwerp. In general, pedestrians in groups are responsible for almost 85 percent of the walking population (Zanlungo et al 2016). However, depending on the type of movement, the number of people walking in groups can vary. According to Gehl (2013) and Zanlungo et al (2016), pedestrians walking in groups tend to walk slower than pedestrians walking alone. So it can be concluded that the higher the number of pedestrians walking in groups, the lower the average speed becomes.

Based on the nature of pedestrians in to/through-movement, it can be concluded that the average walking speed of to-movement is slower than through-movement.

The last characteristic that has been identified during the case studies is the clear difference between the number of people that stop while having to/through movement. According to the case studies, seven percent of the total pedestrian flow in Kalverstraat made a stop in the street while only three percent of pedestrians in Reguliersbreestraat made a stop. According to these results, the percentage of people making stops while having to-movement is higher than through-movement. How can this difference be explained?

As mentioned previously, the facades in Kalverstraat can be categorized as friendly while the the facades in Reguliersbreestraat offer less attraction to the pedestrians and can be categorized as mixture facades. According to Gehl (2011), when outdoor areas are of high quality, the street invites people to stop, sit, eat, play and so on. On the contrary, when outdoor quality is low, only the bare minimum of activity takes place in the street and people tend to hurry to their actual destination. This explanation corresponds with the results of the countings in this research. Therefore, it can be concluded that more stops occur during to-movement compared to through-movement.
Identifying the effects of the movement

This subchapter aims to identify the effect of the general movement on pedestrian behaviour through studying people’s perception of the movement and how this perception influences their choices as pedestrians. The results of the surveys and observations have shown that people’s perception of the general movement in a space can be a conscious perception as well as a perception in their subconscious. These two perceptions will be discussed below.

When answering the surveys, the respondents had to explain whether or not they feel the need to walk differently when they enter the two streets under study. The reason behind asking this question was to understand whether pedestrians directly recognize the type of movement happening in a street and whether or not they feel the need to adapt to that movement.

In Kalverstraat, 83 percent of the respondents explained that they either need to watch out for people in order to avoid collision or walk slower or both. As explained in the previous chapters, walking speed in Kalverstraat is relatively lower than a connecting street. However, the low walking speed in the street and the fact that pedestrians feel the need to walk slower doesn’t provide sufficient proof that people’s choice in walking slower is simply due to imitating the others in the street. Kalverstraat is a relatively narrow street with a high pedestrian flow that passed through it. By counting the number of pedestrians that pass through a certain area, the walking density of the street was measured to be $1.4 \text{ m}^2/\text{pedestrian}$. According to Fruin’s level of service table (see figure 8.), this number belongs to the level of service B and C which provides crowded but fluid movement, speed and passing restrictions as well as difficulties in crossing. Already here, it can be seen that people’s choice of walking slower in Kalverstraat can be a result of the insufficient area per pedestrian that is available in the street. In other words, pedestrians in Kalverstraat simply don’t have enough space to maneuver. According to a study done on self-organizing pedestrian movement, people prefer to walk with their own desired speed (Helbing 2001). But in cases where the spatial dimensions don’t allow freedom of speed, pedestrian become forced to walk slower or even faster, depending on the type of street. This conclusion can be proven from another perspective as well. Kalverstraat hosts to-movement throughout the whole day. Most of its visitors are there for the shops. So the type of movement remains the same during the opening hours of the shops. However, in the early mornings, the number of visitors is significantly lower than afternoons and the average walking speed in the mornings is higher than afternoons. This slight difference in walking speed can be explained by the same previous explanation. Lower pedestrian flow corresponds with bigger areas for each pedestrian which provides freedom of speed for the pedestrians.

Same test was done in Reguliersbreestraat. In this street, approximately half of the respondents said they either don’t feel any need to walk differently and/ or they need to watch out for the trams. Opposite to Kalverstraat, only 2 respondents said they need to watch out for people. And when it comes to walking speed, seven respondents said they feel that they need to walk faster
and four said they need to walk slower. So in Reguliersbreestraat, most of the respondents didn’t feel any need to change their walking speed even though the average walking speed in the street is even higher than city’s average walking speed. Reguliersbreestraat is a relatively wide street with a pedestrian flow that is less than Kalverstraat. The average area per pedestrian in Reguliersbreestraat is measured to be $2.8\, m^2/\text{pedestrian}$. This number belongs to the level of service B which is supposed to result in less passing and speed restrictions compared to level of service C. Even though the pedestrian flow increases in the street throughout the day, the walking density doesn’t become high enough to reduce freedom of speed significantly. The results of the countings also show that the walking speed in this street remains quite constant throughout the day.

Another question the respondents had to answer was whether or not they see similarities between the street they were walking in and places such as a train station or a playground just based on the way people walk in these places. Before the surveys were answered, it was expected that the respondents in Kalverstraat would choose places with to-movement and respondents in Reguliersbreestraat would choose places with through-movement. However, the results were different.

In Kalverstraat, most of the respondents said that the street is more similar to a train station, airport gate area or a bus terminal. When asked why, usually they would explain that they chose these answers due to the two main walking directions in the street. Almost half of the respondents who chose these places would explain further that the movement in Kalverstraat is more relaxed compared to these places. On the other hand, 23 respondents said that Kalverstraat is more similar to a grocery store or an art exhibition where the movement is more free and less organized in terms of directions. Three respondents even chose playground as an answer. When asked why, they would mostly refer to the freedom of walking, stopping and looking around that is allowed in these places.

In the case of Reguliersbreestraat, none of the respondents thought that the place looks like a playground when it comes to the movement. The majority of the respondents thought that the street looks like a train station, airport gate area or bus terminal and only a few chose grocery store and art exhibition.

According to a study done on people’s perception of the identity of a behavior setting in a space (Heft 2014), people tend to recognize the do’s and don'ts of a place. In this study, in order to test this statement, people were shown videos of a group of cylinders that represented humans. Each cylinder had a dot on it that showed the direction of the human and then the participants had to watch these cylinders move in a black screen. So in this study, the only thing visible was the movement. No information was given on the people, who they are, how old they are and so on. And no information was given about the space either. Therefore, the answers from the
respondents were completely based on the movement they were seeing. In the case of Kalverstraat and Reguliersbreestraat, the respondents had difficulties taking the movement out of its context. In other words, their answers were influenced by other factors than the movement such as the space, the people, the sounds and so on which is why the results are not completely reliable. However, there are still noticeable differences between the answers from Kalverstraat and Reguliersbreestraat. None of the respondents thought that Reguliersbreestraat is similar to a playground. To sum up, the number of people choosing playground, art exhibition and grocery store in Kalverstraat was higher than in Reguliersbreestraat. This shows that the pedestrians in Kalverstraat identify a level of freedom in movement when it comes to directions, stopping and looking around. This level of freedom is lower in Reguliersbreestraat. In other words, even if the speed is restricted due to lack of space, to-movement still manages to provide a certain level of freedom in terms of walking direction, stopping and looking around.

The mentioned difference in the level of freedom in maneuvering leads to different pedestrian choices. According to Bierlaire et al. (2009), pedestrian choices can be influenced by many factors, such as individual speed and direction and the environment. For example, in a straight large sidewalk, the number of possible directions will become limited due to the dominating directions (Bierlaire 2009). In the results chapter, it was presented that the number of people stopping is more than in Reguliersbreestraat. However, the phenomenon that is related to the movement in the street is not the number of people stopping rather than where they stop. In Kalverstraat, most of the pedestrian who made a stop, did it in the middle of the street. Despite of the high pedestrian flow and lack of space, the pedestrian still found it appropriate to stop in the middle of the street. One explanation for this choice is the level of freedom that the to-movement offers to the pedestrians. This choice can be directly related to the fact that some people though the place is similar to a playground. The pedestrians stopping in the middle of the street felt comfortable there. However, they became obstacles for the moving pedestrians seeing how they had to go around this standing obstacle. In other words, the freedom that to-movement provides can decrease the level of cooperation between pedestrians in higher densities.

In Reguliersbreestraat, the results of the observations were opposite of Kalverstraat. The pedestrians who wanted to stop would in most cases stop very close to the buildings. Same explanation can apply to this case. Due to lack of freedom in maneuvering, pedestrians found it inappropriate to stop in the middle of the movement. Therefore, they would cooperate with the moving traffic by stepping aside. The results of these two case studies showed that the level of cooperation is higher in through-movement compared to to-movement.

The respondents were given a few parameters that they could rate from a scale of one to five with one representing the most negative rate. Crowdedness in both street was rated 3.6 which represents neutral towards lively. Noise, walking in general and walking in terms of obstacles were all rated higher in Kalverstraat which means that they are experienced in a slightly more
positive way. Other people’s behaviour was rated more friendly in Reguliersbreestraat than in Kalverstraat. In general, the ratings given by tourists were much more positive than the ratings from Dutch respondents. The perception of these respondents does not only depend on the type of movement or the physical attributes of the space. According to Canter (1987) and Tsuji (2005), pedestrian’s perception of whether a street is lively or hustle, or their general perception of the place highly depends on several different factors such as age, gender, residence, reason for street usage, frequency of visit and so on. As seen from the results of the surveys, tourists rated all the attributes in a more positive way compared to the Dutch respondents. However, seeing how the distribution of Dutch and non-Dutch respondents in both streets was more or less equal, there are significant similarities and differences in the answers. Crowdedness was rated the same in both streets despite the fact that Kalverstraat has a noticeably higher walking density compared to Reguliersbreestraat. However, the walking speed in Kalverstraat is lower than Reguliersbreestraat which according to Gehl (2013) can result in a more positive perception of place in terms of its liveliness. Same explanation can apply to the more positive perception of Kalverstraat when it comes to noise and walking. Finally, other people’s behaviour was the only thing that was perceived in a more negative way in Kalverstraat. The lower level of pedestrian cooperation in Kalverstraat can be the reason behind the general annoyance experienced in that street (Wolfinger 1995).

In general, both streets can be considered welcoming and friendly seeing how approximately 12 percent of the respondents in both streets were there for no specific reason. According to Gehl (2013), reasons for being in public spaces aren’t always there. Errands and pleasure can be combined together and form a movement done by pedestrians. In other words, pedestrian may be in public spaces simply for the sake of being outside their home, watching other people and hearing different sounds. And since people tend to be attracted by spaces with more people (Whyte 1980), it’s a logical choice to walk in the busy streets such as Kalverstraat and Reguliersbreestraat for no specific reason.

The level of social interaction observed in the two streets were completely different. Having conversations in Kalverstraat occurred more often than in Reguliersbreestraat. The high level of interaction in Kalverstraat had also negative effects on the pedestrian flow. Seeing how many of these conversations took place in the middle of the street, interaction became an obstacle and lead to lower level of walking cooperation. Another sign that indicates the higher level of social interaction in Kalverstraat was experienced directly during the surveys of this research. The required time to obtain answers from 40 respondents in Reguliersbreestraat was much higher than in Kalverstraat. The pedestrians in Reguliersbreestraat were simply not willing to stop for a moment seeing how they didn’t consider that street as a place where stationary activities are appropriate. In Kalverstraat however, the to-movement already included slower walking speeds, stops, conversations and so on. Therefore, it was much easier for the pedestrians to stop for a few minutes and have a chat with the researcher.
Suggested strategies

In order to design strategies that improve the quality of walking in both streets, it is necessary to identify the main problem that needs to be tackled. In the case of Kalverstraat, lack of cooperation in walking was the main issue. Due to the lower walking speed and the freedom that to-movement offers leads to many positive walking attributes such as a general positive perception of the place and high social interaction possibilities. However, all these have been made possible by having less cooperation with the others in the street. This lower level of cooperation is primarily a result of groups of people stopping in the middle of the street and also, the mixture of different walking directions that sometimes form an unorganized and problematic walking situation, especially in and around intersections. Therefore, the main walking issue in Kalverstraat is lack of walking organization.

In the case of Reguliersbreestraat, the general annoyance experienced by people was mainly due to the surprises from the trams. Seeing how the streets walking density is low enough to allow less passing and speed restrictions, the pedestrians were generally satisfied with the movement that takes place in that street. However, both tourists and residents expressed their annoyance towards the trams. The pedestrians in the street were often surprised by the trams which means that the existence of the tram tracks is not visible enough to inform pedestrians about it. Another issue resulted by the trams is the unpleasant noise they cause in the space. Therefore, the main issue that needs to be tackled in Reguliersbreestraat in order to increase walking quality is primarily to make the tram tracks more visible and address the other resulting issues by the trams.

Kalverstraat

As mentioned above, lack of walking organization is the main issue in Kalverstraat. The walking issues in this street are results of natural pedestrian movements that fail to create a fluid crowd dynamic. Helbing et al (2005) have studied the logic behind natural pedestrian movements in order to develop some design elements to increase the efficiency of pedestrian facilities. According to this study, pedestrian crowd problems often are results of counterflows, bottlenecks and intersecting flows. In the case of Kalverstraat, counterflows and intersecting flows are the main targets. The to-movement that this street hosts is by nature slightly unorganized. Seeing how shoppers can easily get distracted by shop windows on both sides of this relatively narrow street, it is quite common for them to switch from one side of the street to the other side. However, according to the results of the countings, there is also a visible pattern of two main walking directions that each take place on the right side of their direction.

To-movement by nature requires a certain level of freedom in order for the pedestrian to be able to utilize the street as they want. In other words, they should be able to cross to the street anytime
they desire to stop and look at something that interests them. However, this doesn’t mean that the main movement taking place in the street cannot be more organized. According to Helbing et al (2005), a series of obstacles in the middle of the street can support separation of the counterflows. These obstacles can be trees, columns, flowers vases, benches, trash cans and so on. Even though these solutions are permeable, they have strong psychological and physical effects, much like a separating wall (Helbing et al 2005). These solutions can prevent pedestrian form taking advantage of gaps in the other flow and therefore they can prevent risk of physical blockage of the other flow. In addition, this series of obstacles in the middle of the flows still allows the pedestrians to cross the street wherever they want and in case the other side of the street is rarely being utilized, this permeable solution allows pedestrians to use the other side as well. Another advantage of having a set of obstacles in the middle of the street is that the gaps between these obstacles become safe spaces for pedestrians who want to stop. This way, the stopping pedestrians in the middle of the street will become less of an obstacle for the moving pedestrians seeing how the space in the middle is not frequently used for movement.

Kalverstraat is a relatively narrow street with a high pedestrian density. Therefore, the obstacles that are designed to be put in the middle of the street must not take too much space. The obstacles should also be flexible enough to either be removed or change form in order to make more space in days when the pedestrian density is higher than usual. In addition, they should be useful for the pedestrians. An example of these types of obstacles can be the pop-up street furniture in the Dutch city, Utrecht (See image). These benches/tables can be pulled up or pushed down by the users. However, the furniture Kalverstraat should be controlled by the municipality in order to make sure the obstacles exist in the times of need.

Figure 26 Pup-up furniture in Utrecht (Popupcity 2010)
In the case of Kalverstraat, pop-up narrow benches are a suitable solution since they provide sitting places for people who want to make a stop, sit or wait for someone who is visiting a shop. These benches should also be designed as narrow as possible in order to occupy as less space as possible.

Same study by Helbing et al (2005), describes patterns of movement in intersection areas as chaotic and inefficient. According to this study, an obstacle in the middle of the intersections improves the efficiency of the movement by creating a natural roundabout movement. This way, the intersections area gets divided into four parts and as a result, only two flow directions can intersect at one place. The obstacle in the middle of the intersections can be a flower pot (see image) or even a bin. The possible problem with having a bin in the middle of the intersection is when the bin gets full until a point when the bin get surrounded by trash. In this case, it will create an unpleasant space in the intersection. Therefore, a flower pot is more suitable.

Reguliersbreestraat

The visibility of the tram tracks can be achieved by having a different type of pavement on the surface that belongs to the tracks. The idea here is to make the tram tracks visible in a way that still allows the pedestrians to cross the street. According to a study done on pedestrian interactions with trams (Khambata et al 2009), there are different methods that can make the existence of trams more visible to the pedestrians. Some of these methods are having clear color differences in the pavements that belong to the tram tracks, adding ground lights along the tram tracks and having pavement contrast between tram areas and pedestrian sidewalks. However, these methods only improve the level of visibility of the trams while other issues such as noise from the trams remain unaddressed.

The suggested strategy for Reguliersbreestraat is having green tram tracks. However, the type of greenery is suggested to be artificial, i.e. artificial grass. There are several reason behind this choice. Firstly, natural grass can easily get destroyed by the slightest vehicular activity (Amende et al 2009). Even though Reguliersbreestraat is a pedestrian street, many delivery trucks drive through the street in order to deliver goods to the shops in the street. Therefore, natural grass on the tram tracks will not last for a long time in that street. Secondly, artificial grass can provide a high level of water drainage. By placing drainage concrete under the grass and choosing the suitable type of artificial grass, the dry paved street of Reguliersbreestraat can turn into a street with sponge effect. Sponge effects refers to Amsterdam’s aim of increasing greenery throughout the city in order to increase the level of water absorption on rainy times. Additionally, there are certain concrete materials (See figure 25.) that have a noise absorbing function (Amende et al 2009).
As a conclusion, by choosing the correct material, the artificial green tram tracks in Reguliersbreestraat will not only make the tram tracks more visible to the pedestrians, but they will increase the sponge effect of the street and reduce noise level from the trams. An additional effect of the grass is similar to the effect of the obstacles in the middle of Kalverstraat. The grass in the middle of Reguliersbreestraat can function as a psychological barrier when it comes to crossing the street without taking away the freedom to cross the street. Therefore, the general movement in the street becomes more organized than its current state. Additionally, by reducing noise pollution in the street, the place can become more suitable for social interactions and short conversations and in general, the improved aesthetics will make the street more attractive to the users (See figure 26.).
Figure 28 Before and after having artificial green tram tracks in Reguliersbreestraat (Own material)
Conclusions

In order to conclude the findings of this research, the research questions together with their answers will be summarized in this chapter.

*What is sociability in the context of movement?*

The focus of this research was to understand the relationship between pedestrian movement and sociability of public spaces. Since the concept of sociability has mostly been practiced on domains other than movement, this research required a framework that shapes the concept of sociability in the context of movement. Therefore, with inspiration from previous definitions of sociability by urbanists such as Gehl and Mehta, and by studying the framework of PPS, this research concluded that there are three main parameters that can define sociability in the context of movement. These three parameters are walking cooperation between pedestrians, possibilities for social interaction and a general perception of being friendly and being welcoming.

In order to understand how sociability is influenced by pedestrian movement, sociability in the context of movement has been studied through the lens of two main types of movement, namely to-motion and through-motion. This research found a number of differences and one similarity between to/through movement. To-motion in Kalverstraat results in a lower level of walking cooperation, higher level of interaction and similar level of friendliness and being welcoming compared to the through-motion in Reguliersbreestraat.

*How does to-motion affect the sociability of public space?*

The nature of the to-motion in Kalverstraat provides a certain level of freedom in walking, stopping and looking around. This freedom has positive and negative effects on the sociability of the movement. It increases the possibilities for social interaction and generates a more positive perception of crowdedness compared to Reguliersbreestraat. However, it also allows pedestrians to stop in the middle of the street because they don’t feel the necessity of moving to the side. As a result, they become obstacles for the moving pedestrians which reduces the level of cooperation in the street.

*How does through-motion affect the sociability of public space?*

The nature of the through-motion in Reguliersbreestraat has made it unsuitable to have social interactions in the street. However, the freedom of movement existing in Kalverstraat does not exist in Reguliersbreestraat. Pedestrians mainly move to the side of the street when they want to stop. This phenomenon increases the level of cooperation in the street. Friendliness and being welcoming was experienced in the same way in both streets. Even though Reguliersbreestraat has a higher level of service, it was rated to be equally friendly as Kalverstraat. This can be due to annoyance caused by other factors such as the passing trams.
How can knowledge of different types of pedestrian movement help the discipline of urban planning and design create sociable places for pedestrians?

The above explained relationship between different types of pedestrian movement and sociability can further be used in designing strategies that can possibly increase the sociability of a space in the context of movement. Therefore, based on the analysis done on the two streets, the main issues of these streets in terms of their pedestrian movements were highlighted. The through-movement in Kalverstraat lacks walking cooperation between the pedestrians which is why there is a need for a row of useful obstacles such as benches and bins. These obstacles create mental and physical barriers for the pedestrians which leads to a higher level of separation of counter-flows. At the same time, the gaps between these obstacles offer the freedom of crossing the street at any point. In other words, the freedom of movement does not get taken away from the pedestrians.

The through-movement in Reguliersbreestraat suffered from a general annoyance due to the surprises from the trams. Therefore, making the tram tracks more visible can create awareness about the existence of the trams. Having artificial green tram tracks not only makes the trams more visible, but with a suitable foundation, it reduces the noise caused by the trams and it increases water drainage in the street. Additionally, the artificial green will last longer against passing cars and trucks while it creates a more attractive environment in terms of aesthetics.
Future research

The results of this research are based on a case study conducted on two Dutch streets in Amsterdam. As mentioned in the methodology chapter, the results of this research are therefore not generalizable. Due to limited timing, more streets per type of movement could not be studied in this research. Therefore, future research can focus on only one type of movement in multiple places. By doing so, the gathered data becomes much more suitable for generalization.

According to Gillham (2000), triangulation is a suitable method for reaching results that can possibly be generalized. If every evidence agrees on the same point, then the researcher has reached a confirmatory triangulation. Therefore, future research can focus on one of the two types of pedestrian movement in different contexts. For example, to-movement occurs in streets that offer activities that invite people to stay for a longer time period (Gehl & Svarre 2013). These activities can be clothing shops, cafes, restaurants and markets. In this research, the one street that was chosen to represent to-movement was a shopping street which is unique in terms of the characteristics of its visitors. It is stated in the research that more females visit shopping streets than males and females generally walk slower than males. Therefore, to-movement, by nature, can have a slower walking speed compared to through-movement. However, the proportion of males and females in streets with restaurants and cafes might not be the same as shopping streets. Therefore, each type of pedestrian movement has to be studied through different cases in order to reduce the role of cultural, geographical and functional factors that might alter the final conclusions.
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Appendix 1 - Surveys

**Gemeente Amsterdam**

**Walking experience in this street**

I am...

- Dutch or Not Dutch
- Living in Amsterdam or Not living in Amsterdam
- Tourist or Visitor
- Female or Male

--- years old.

Name of this street ------------------- Reason for visiting the street -------------------------------

Why did you choose to walk in this street and not another one? -------------------------------

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How does it feel to walk here compared to other streets? Why? ----------------------------------

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Do you feel that you need to walk differently when you step into this street? ---------------

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**How do you experience the following?** (From a scale of 1-5)

- Crowdedness: Annoying-1--2--3--4--5-Lively
- Noise: Disturbing-1--2--3--4--5-Pleasant
- Walking: Annoying-1--2--3--4--5-Enjoyable
- Walking: Many obstacles-1--2--3--4--5-Easy
- Other people's behavior: Aggressive-1--2--3--4--5-Friendly

Based on how people are walking here, I think this street is similar to a:

- Train station
- Art exhibition
- Playground
- Grocery store
- Bus terminal
- Airport gate area
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<th>Date:</th>
<th>Day:</th>
<th>Time:</th>
<th>Location:</th>
<th>Weather:</th>
<th>Time-slot:</th>
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<td>Group or individual</td>
<td>Group</td>
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<td>Individual</td>
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<td>Walking speed</td>
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<td>Number of people stopping</td>
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<td>Pedestrian flow</td>
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<td>Gender</td>
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<td>Number of smiles</td>
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<td>Number of collisions and surprises</td>
<td>Collisions</td>
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<td>Surprises</td>
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<td>Density</td>
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<td>How many walking directions</td>
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<td>Noticeable difference in pace</td>
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