WALKABILITY AS AN URBAN DESIGN PROBLEM

Understanding the activity of walking in the urban environment

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Abstract

The planning and design of the walkable environment is receiving more and more attention for its various benefits related to public health, sustainability, economy, or social life. Therefore, there is a growing need for knowledge about the walkability of the built environment. While urban planning, design, and transportation research have also examined walking in urban environments, a recently growing field of research usually referred to as walkability research have been actively investigating the relation between the built environment and walking behavior through correlation analysis. Although one must acknowledge the value of current walkability research to be used as the framework which can make significant contributions to urban design research and practice, it also has a few shortcomings in terms of applicability. There is also a problem that the design factors that are often discussed as promoting walking or creating ‘pedestrian-friendly environments’ in urban design theories and discourses are often based on little evidence and that these factors have been shown to be insignificant in the quantitative analyses on the amount of walking. This project aims to support urban design knowledge and practice and to contribute to the broader field of “walkability” by refining the methods and measures used to analyze the relation between walking behavior and physical environment. Its goal is to integrate knowledge from the medical field of walkability with urban design research and provide new empirical knowledge about the concrete level in which urban design and architectural practice operates.

What has been done during the earlier part of this PhD research project and is presented in this licentiate thesis is producing knowledge for a better understanding of the complexity behind the relationship between the built environment and walking. Through literature review from different fields and also through an empirical study, this project tried to investigate the concept of walkability by trying to understand the different ways/aspects in which the built environment influences walking, e.g. directly influencing the quantity of walking through providing destinations, or enhancing the experiential quality
of walking by determining the condition as a walking environment. It also investigated the different aspects of walking by partitioning walking activities in understanding how they are influenced by different properties of the built environment. By partitioning both the influence of the built environment on walking and walking activity, the knowledge that this thesis tries to produce is not only on whether or not, but more on how and why the built environment influences walking behavior. Three residential areas from Stockholm were selected for the empirical study. The results of the empirical study show how the various factors and condition of the built environment influence walking with different effects and leverage and the importance of investigating the factors on different levels and from different aspects. Also, it seems that the different types of walking are related to how they are influenced by the built environment, and the different conditions of the environment also seem to influence the presence and characters of the walking activities of their inhabitants. The findings from this project provide insights into how we can better understand the interaction between the built environment and walking behavior in influencing each other.
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1 Introduction

The issue of pedestrian-friendly urban environments has been of increasing importance lately in urban planning and design, be it for reasons of social life, experiential quality, sustainability, economy, or health. For instance, in terms of the health benefits of walking which are supported by scientific evidence, changes in the built environment may help people reach their physical activity goals in addition to individually oriented behavior-change interventions, by promoting sustainable and healthy life style choices. Therefore, there is a growing need for knowledge about the walkability of the built environment. While urban planning, design, and transportation research have also examined walking in urban environments (Gehl, 1980; Hillier, 1996; Kockelman, 1997), what is usually referred to as “walkability” research is a multidisciplinary form of research which has been initiated from the preventive medicine field with the health beneficial aspect of walking as the most significant motivation (Saelens et al., 2003a). Walkability studies have provided evidence through statistical analysis that walking behavior is related to the condition of the built environment, as well as regarding the health benefits it may bring. Walkability research aims at identifying walkability factors of the environment, most often through correlation analyses between different attributes of the built environment and the amount of time spent on walking by individuals.
However, although the value of current walkability research to be used as a framework which can make significant contributions to urban design research and practice must be acknowledged, it also has a few shortcomings in terms of applicability. This has to do with, first, a set of measures that in the design process are too vague to give support, or could support almost any solution, and second, a way of studying urban form which lacks specificity, leading to some conclusions being in need of re-examination. The quantitative research which tries to prove correlation between properties of the built environment with either the amount of individuals’ walking or the amount of pedestrian movement on given segments is having difficulty in showing consistent results and also often lack the applicability in the design and planning process. There is also the problem that the design factors which are often discussed as promoting walking or creating a ‘pedestrian-friendly environment’ in urban design theories and discourses are often based on little evidence and that some of these factors have been shown to be insignificant in the quantitative analyses on the amount of walking. In order to obtain knowledge about how to deal with these differences, limitations, contradictions which exist in the theories and research on walking, a better understanding of the relationship between the built environment and walking is crucial.

This project aims at supporting urban design knowledge and practice and contributing to the broader field of “walkability” by refining the methods and measures used to analyze the relationship between walking behavior and physical environment. Its goal is to integrate knowledge from the medical field of walkability with urban design research and to provide new empirical knowledge at the concrete level in which urban design and architectural practice operates. In order to integrate knowledge from theories and research on walkability from different fields and of different perspectives, it is crucial to first build a broader view and a more comprehensive understanding of how the built environment influences walking. What has been done during the earlier part of this project, and will be shown in this thesis, is to provide a better understanding of the complexity of the relationship between the built environment and walking and also the complexity that lies in both of these entities, the urban form and walking activity. Such an insight would allow different studies and discourses to be positioned within the broad research field of walking according to which aspect of the built environment and walking relationship each of them captures and also a better understanding of the scope and the degree they may contribute to.
Therefore, through literature review from different fields and also through an empirical study, this project tries to investigate the concept of walkability by trying to understand the different ways/aspects the built environment influences walking, e.g. directly influencing the quantity of walking through providing destinations, or enhancing the experiential quality of walking by determining the condition as a walking (route) environment. It also investigates the different aspects of walking by subdividing walking activities according to how they are influenced by different properties of the built environment. By partitioning both the influence of the built environment (on walking) and walking activities, the knowledge that this thesis tries to produce is not only whether or not, but more on how and why the built environment influences walking behavior. The Swedish context of the empirical study assisted the investigation of these issues. While the majority of the walkability studies are from a setting where the conditions of the built environment often impede walking, such as North America or Australia, the Scandinavian urban context offers the possibility of exploring a broader range of walkability. As well as the better conditions of the built environment, other factors, such as cultural factors or the provision of public transport provided at a more desirable level, may support the investigation of the walkability factors at urban design level.

The empirical study

Three residential areas from Stockholm were selected for the empirical study. Two areas are located in the inner city of Stockholm and the other is a suburban neighborhood situated in the southern part of the city (Figure 1.1). The two areas in the inner city are situated close to each other in the center of Södermalm, where one is a traditional urban area and the other is a more recently redeveloped area. The area with the traditional urban blocks is often referred to as the SoFo area (meaning “South of Folkungagatan” and a pun on SoHo in New York), as it will also be in this thesis. In contrast to the other two areas, SoFo is an area created prior to the 20th century. In recent years, the area has begun to function as a center of creative and innovative fashion and retailing, which offers a wide selection of restaurants, bars, coffee shops, and art galleries. The area is described as consisting of publicly exposed and well-used spaces, and, compared to the rest of Södermalm, the area is quite distinct and has a lot more movement than most areas. The area is shown to have a strong connection to the rest of the city in its spatial analysis, which
characterizes the area as a part of the inner city of Stockholm, rather than as a localized sub-area (Marcus, 2000).

The other selected area in Södermalm, which will be called Södra Station area in this thesis, is a redeveloped area planned in the 1980s, where over 3000 flats were newly built after the renovation of the Södra Station, which is the southern railway station of Stockholm. In this area, the Folkungagatan street was transformed into a treed avenue and the area was given a series of urban open spaces surrounded by groups of buildings, which in size and shape tried to follow the pattern of the central part of the city. In the design of the area, it was intended that one side of a group of buildings always opens onto a network of parks and planted areas, which was considered a unique feature in this central location in the city (Andersson, 1997). This area is a highly fragmented area and somewhat segregated from the rest of Södermalm, to such a degree that it can even be described as disurbanism (Marcus, 2000). The spatial analysis of the area implies that the area is not part of the general movement pattern of Södermalm, instead creating an enclave through which not many people pass unless they have direct errands there. It is analyzed that there is a possibility that the area differentiated categories of movement into different spaces, e.g. separating inhabitants from visitors. Therefore it seems to segregate many of its
spaces, often directing them towards very localized usages and characterizing the area as of a rather domestic character (Marcus, 2000).

Hökarängen, the third area, is a suburban neighborhood planned in the 1940s, inspired by neighborhood unit planning. The area was designed to have access to a planned neighborhood shopping center, centrum, in which the first pedestrian street in Sweden was designed. Most of the housing is from the years around 1950 and the Hökarängen centrum was built in 1953, close to the subway station. The idea was that the car-free shopping street would have the character of a city street, like that of the inner city. While this neighborhood center was designed and anticipated to be populated by the residents, serving as a living room of the area, the actual use of the place nowadays is far less than the desired level (Borén & Koch, 2009). Around the centrum, there is a mixture of narrow lamellar blocks and medium high point blocks, and the area has a slightly idyllic character (Andersson, 1997). In large parts of Hökarängen, the buildings have three to four stories, being widely spaced with green spaces and yards. The preference for yards in which the entrances to the residential buildings are often located was an intention of the architect who planned the area, David Helldén, and also includes a degree of separation from the traffic (Helldén, 1951: 430). While the population numbers are similar in the three selected areas, the population density in Hökarängen is significantly lower than in the areas in the inner city.

Being an explorative study, the observation study in the selected neighborhoods investigated the walkability of the study areas and the walking behavior of the pedestrians in the areas by observing the perceived subjective measurement of pedestrian density and its patterns, the route choices made for the walking trips by tracking pedestrians, the details in the walking behavior during the walking activity tracked, and the presence of different types of walking activities taking place in the area. It aimed at observing the study areas, not only in the detailed condition of their physical environments, but also how the areas function as the setting for walking activities by observing who walks where and when, what kind of walking activities occur, what patterns could be found in them over different times, days, and seasons, what happens during the walking activities tracked and observed, and how the condition of the built environment seems to have influenced them. The issue of partitioning walking activities was one important aspect which the observation study on walkability tried to capture. While current research does not yet provide systematical knowledge about how the categorization of walking activities can best be done, in this observation study, the walking trips observed were documented with their specific purposes, e.g. walking to the
public transit, walking to school, walking the dog, walking to a specific kind of retail outlet, etc.

The results of the empirical study are analyzed through comparison between and within the neighborhoods and also through comparison of the observation data with the spatial analysis of the areas. The results are described and discussed mainly around the major factors that the existing walkability studies have identified, such as land-use diversity, density, and connectivity, and also consider other pedestrian-friendly urban design factors and programs often discussed in urban design literature. The description of the different purposes and aspects of walking activities is also an important part. The results of the empirical study confirm the significance of the major walkability factors. More importantly, they provide insights into how the factors function in close relation to each other, and how the various factors and the condition of the built environment influence walking with different effects and leverage. The importance of investigating the factors on different levels and aspects is also suggested, with discussions on how urban design seems to work as and with the various factors of walkability. As well as the understanding of the different effects of the built environment factors on walking, the importance of acknowledging the different aspects of walking activity is also elaborated. The different types of walking seem to influence how the built environment influences walking, and the different conditions of the environment also seem to influence the presence and character of the different walking activities of the inhabitants. The findings from this project provide insights into how the interaction between the built environment and walking behavior in influencing each other can be better understood.

The structure of the thesis

Following this introduction, Chapter 2 introduces and discusses different theories and research on walkability and walking. First, the walkability research initiated by public health benefits which often conducts statistical analysis between the amount of walking and the built environment factors are described and discussed. Following this, examples of studies and guidelines on urban design for pedestrian-friendly or walkable environments are introduced. The theories and discourses on walking and the pedestrian-friendly environment from the field of architecture, urban design and planning, other than the quantitative research on walkability, are also described. While research and theory from the urban design field regarding walking activity and pedestrians provide knowledge focused primarily on the built environment,
there are works from anthropology which also deal with walking behavior and the urban environment. Although these works do not discuss the specific characteristics of the built environment, they provide insight into how walking as an individual behavior is conducted in the urban environment. Some example of these works, such as the ones by Michel de Certeau, Marcel Mauss, and Grosz, are also discussed. Based on the review of the various literature from different fields, some reflections on how to view and investigate the relationship between the built environment and walking is presented. At the end of the chapter, the research questions, method, and aim of the project are described.

In Chapter 3, the empirical study is presented. The description of how the observation study was conducted and how the data was collected and documented is given. To describe the content of the observation data, a general description of the walking behavior patterns and the walking conditions in the study areas follows. Examples of individual walking trip data are also provided here. In the analysis of the result of the observation study, comparison of the data with the quantitative spatial analysis of the areas is first presented. The results and their analyses are then discussed in relation to the major walkability factors (e.g. land-use diversity, connectivity, and density). As well as the major factors from the correlation studies on walkability, the results and analysis regarding other urban design attributes often discussed in literature are also discussed. One example is how the car-free design functions and influences walking in the studied areas. Lastly, results regarding the different types of walking activities and their route choices are described and discussed.

The discussion chapter follows Chapter 3, presenting reflections and arguments on how to understand and investigate the relationship between walking and the built environment. How to understand and acknowledge the different aspects of influence the built environment has on walking is discussed. Also, the importance of acknowledging the different types or aspects of walking activities in understanding walkability is described. Insights into how and why urban design influences walking based on the results of the empirical study are discussed here. The thesis will then end with the conclusion.
2 Walking and the Built Environment

2.1 Walkability Research

Walkability research & public health

While urban planning and design research and transportation research have examined walking in urban environments (Frank & Pivo, 1994; Handy, 1996; Kockelman, 1997; Hillier, 1996; Gehl, 1980), a more systematic body of research focusing on the “walkability” of the built environment has appeared rather recently. This growing field of research on walkability is a multi-disciplinary research subject, which was first initiated by preventive medicine (Saelens et al., 2003b; Leslie et al., 2005; Heath et al., 2006). An alarming increase in obesity was one of the reasons walkability research was initiated within the medical field (Saelens et al., 2003a). The World Health Organization (WHO) has declared obesity a significant global epidemic, affecting the population of both industrialized and non-industrialized countries. An estimated 200,000 to 300,000 premature deaths occur each year in the US due to physical inactivity (McGinnis & Foege, 1993). Although obesity is less prevalent in most European countries than in the United States, the International Obesity Task Force indicates that the prevalence of obesity has increased during the last decade in
Europe as well (Skidmore & Yarnell, 2004). Although obesity is leveling off in
many countries (Sundquist et al., 2010), there are few to no signs of a decline.
Because of the increasing prevalence and costly consequences, obesity can no
longer be considered as a purely medical issue, but rather as a threat to public
health, requiring national and global strategies for prevention and management.

To combat obesity and promote physical health, “walkability” research
has focused on how the built environment can serve to assist reaching these
goals of physical activity. The reason for this field to investigate walking is that
physical activity improves long-term health, and that walking is the most
common form of adult physical activity. Because moderate intensity physical
activity – acquired from walking, for example – significantly improves health,
public health officials and policies recommend moderate intensity physical
activity, including walking and cycling, most days of the week (Saelens et al.,
2003a). However, despite the benefits of regular physical activity, it is
estimated that over 60% of the world’s population is not physically active
enough to achieve health benefits (Bell et al., 2002). Ecological models
emphasize that behaviors have multiple levels of influence that include
intrapersonal, interpersonal, environmental, and policy variables. Ecological
hypotheses suggest that the combination of psychosocial and environmental
policy variables will best explain physical activity (Saelens et al., 2003a).
Although psychosocial correlates of physical activity have been extensively
studied, psychological and social factors explain much less variance in
moderate intensity physical activity, compared to vigorous physical activity.
Unlike most vigorous physical activities engaged in for health-related or
recreational purposes, activities such as walking and cycling can be done for
multiple purposes, likely making them more susceptible to environmental
influence. Also, while other factors influencing walking behavior, such as
socio-demographic characteristics, lifestyles, and beliefs, differ for everyone,
urban form could affect many people on a relatively permanent basis. Based on
these ideas, walkability research, which is still at a comparatively early stage,
examines the influence of the built environment on walking behaviors.

Earlier findings from transportation & urban planning research

With the scientific evidence on how physical activity, such as walking, may
positively affect health, the multidisciplinary research on walkability started by
trying to prove a correlation between the condition of the built environment
and the amount of physical activity (walking). Many studies in transportation
and urban planning fields have examined the relationship between community
design variables and walking or cycling for transportation. They have
consistently shown that people walk and cycle more when their neighborhoods
have higher residential density, a mixture of land uses, and connected streets.
Other characteristics, such as the condition of sidewalks, presence of bike paths,
street design, traffic volume and speed, are hypothesized to be related, but
have not been systematically examined or proven to have significant influence.

Transportation research was considered to provide the best evidence that
environmental factors can contribute to low levels of lifestyle physical activity
(Saelens et al., 2003a). Transportation studies indicate that people living in
traditional neighborhoods (higher residential density, mixture of land uses,
grid-like street patterns with short block lengths) engage in more walking and
cycling trips for transport than do people living in sprawling neighborhoods.
More specifically, they have also explained that factors that influence the
choice to use motorized or non-motorized transport are based primarily on two
fundamental aspects of the way land is used: Proximity (distance) and
Connectivity (directness of travel). Proximity relates to the distance between
trip origins and destinations, whereas connectivity characterizes the ease of
moving between origins and destinations within existing street and sidewalk-
pathway structure. Connectivity is high when streets are laid out in a grid
pattern and there are few barriers to direct travel between origins and
destinations. With high connectivity, route distance is similar to straight-line
distance. In addition to direct routes, grid patterns offer the choice of taking
alternative routes to the same destination (Saelens et al., 2003a).

Using earlier findings from transportation and urban planning research as
a basis, earlier walkability studies have determined the main factors to be
examined, such as density, connectivity, and land use. Existing studies have
found positive associations between physical activity and the presence of
mixed land uses (Cervero, 1996; Moudon et al., 1997; Saelens et al., 2003b),
better connectivity (Boarnet & Crane, 2001; Crane & Crepeau, 1998; Kitamura et
al., 1997), and higher density (Cervero, 1996; Frank & Pivo, 1994; Messenger &
Ewing, 1996). Studies that have examined neighborhood characteristics related
to walking rates and their result indicate that population density is among the
most consistent positive correlates of walking trips (Frank & Pivo, 1994). Land
use mix — especially the close proximity to shopping, work, and other
nonresidential land use to housing — appeared related to greater walking rates
among residents (Kockelman, 1997).
The research field of ‘walkability’

Existing walkability studies have used mainly two methods which also seem to have been influenced by the research method of transportation studies: neighborhood comparison studies and correlational studies. The neighborhood comparison studies examine differences in walking rates between residents of neighborhoods with respect to environmental characteristics. Earlier walkability studies led by preventive medicine have frequently used this method of selecting high and low walkable neighborhoods in order to provide evidence on the influence of the built environment on the amount of walking (Saelens et al., 2003b; Leslie et al., 2005). Also, since it is not feasible to conduct controlled intervention trials manipulating neighborhood built design, some researchers have relied on quasi-experimental designs (Wells & Yang, 2008; Shadish et al., 2002). The other commonly used method, correlational studies, use analyses and regression models which provide continuous measures of neighborhood characteristics that can quantify the relation between neighborhood characteristics and non-motorized transport, while controlling either or both individual and neighborhood sociodemographic variables known to be associated with walking.

While the earlier walkability studies were led more by preventive medicine with the aim of providing evidence that the built environment does affect the rate of walking of individuals, in order to develop the research in producing more specific knowledge in how different attributes of the built environment influences walking, the input of knowledge from the urban planning and design field has become essential. Therefore, the involvement of urban planning and design research in walkability studies is increasing and studies trying to prove correlation between different factors of the urban form with walking are being actively conducted. Recent studies also address the combined effects of ‘bundles’ or ‘packages’ of environmental factors (Wineman et al., 2009). Also, regarding factors other than the major factors which have been most consistently proven, some studies suggest that neighborhood design features may not sufficiently affect walking when these features do not work in connection with accessibility afforded by land-use mix and street-network patterns in a broader context (Wells & Yang, 2008). Still, the existing evidence raises many questions regarding characteristics that seem to be related to physical activity and we need additional evidence regarding the magnitude of the relationship between micro-level measures of the built and natural environments and physical activity (Rodriguez et al., 2006).

To fully complete this type of inquiry and also, equally importantly, to be able to provide useful urban planning and design guidelines which encourage
physical activity, more specific knowledge about urban form and the conditions of urban design is required. This is not meant to invalidate the research done in the medical field. Rather, walkability studies provide a number of findings and a framework which can significantly contribute to urban design research and practice, but which also has a few shortcomings in terms of applicability; however, once these shortcomings are dealt with, such an approach may strengthen walkability research. These shortcomings are the result of broad measures that support almost any solution, so such approaches to urban form lack the clarity and specificity that could support concrete solutions.

**Limitations and challenges of walkability research**

Research from the medical field provides valuable data which links the built environment to individuals’ physical activity, as well as to the effect it has on promoting health. However, there are limitations to this research, especially in dealing with the built environment and walking behavior. Although existing studies discuss the limitations of current walkability research, they often fail to identify the questions and factors of importance at the design level for the human-environment relations they are investigating, due to lack of knowledge on the urban environment and its design. For example, existing studies on the environmental determinants of physical activity behavior mostly use cross-sectional designs (Saelens et al., 2003b). What is often written in existing articles is that, since cross-sectional studies do not establish causal linkage, the key challenge for research is to demonstrate that the associations of environmental attributes with physical activity behavior are actually causal and that future studies require the use of prospective or intervention designs (Boehmer et al., 2006). However, this is an inevitable limitation in studying the built environment, since it is seldom possible to conduct a true experiment. This would always remain a challenge. In addition, the cause-effect relation in a more rigid sense may not be what is most important; rather, establishing interrelations is not only what is possible, but is what is important (e.g. Foucault, 2000 [1982]; Tschumi, 1996). In more pragmatic terms, the challenge is to find factors that affect walking positively rather than cause people to walk more. Walking behavior will always emerge through interplay between conscious decisions, habits, social and cultural traditions and situations, and the various properties of the built environment. These factors may also differ for different walkers or types of walking; a focus that will be examined later in this study.
The reason why medical studies focus on proving the causal relationship between the built environment and walking activity may be due to the fact that walkability research is at an early stage, and it is necessary to first provide evidence on whether or not walking behavior is affected by the built environment. Medical research has actually played an important role in this task, and this is quite understandable as the medical field specializes in investigating health benefits, and the nature of medical research requires large populations to be investigated to establish scientific evidence. In these investigations, the medical field is well developed. However, when it comes to providing design guidelines, the kind of investigations and the factors provided are weak; specifically, they are imprecise due to lack of knowledge about how the factors can be realized in built form. In the end, this also questions their significance: although it has been clearly established that enhancing walkability as described by the medical field improves long-term health – and this is important in itself, as it provides the data and the advocacy needed to make neighborhoods more conducive to physical activity – this effort would be meaningless unless the urban environment was actually designed by urban planners and architects so as to encourage walking. Current walkability research lacks systematic information about what may be the most effective approach to guide population-wide interventions, and this is the task for the urban design field. Knowing that the built environment is associated with walking behavior alone is insufficient. In order for walkability research to have a positive influence on walking habits through urban design, future studies may need to keep in mind that what is more necessary at this point is trying to build knowledge about providing intervention guidelines.

To produce findings that could contribute to urban design guidelines, it is important to deal with the limited variability of possible environmental features in current studies. More comprehensive identification of various factors is required. As well as better identification of factors, it is necessary to improve the measurement of built environment attributes. Within the medical field, measurement tools for the data on environment were defined a priori, on the basis of previous findings, a conceptual model, and specific hypotheses rather than empirically by factor analyses (Saelens et al., 2003b). Accurate and efficient measurement of the built environment is a key challenge in walkability research. With the existing studies lacking comparability and transferability in their results, better identification and measurement of the built environment is an urgent task for future research.

Thus, existing evidence raises many questions, and we need additional knowledge regarding the magnitude of the relationship between micro-level
measures of the built and natural environments and physical activity (Rodriguez et al., 2006). Possible assistance in this development comes from the urban design field. However, while there are attempts to develop lists or indexes of walkability (Stonor et al., 2002; Ewing & Handy, 2009), perhaps more can be gained from widening the scope to research into walking, although care must be taken as to what contributions it can make. While research on walking within the field dates (at least) back to Benjamin (2002), it can be argued that works by Gehl (1980), Jacobs (1961), and to some extent Hillier (1996) are more topical within the concurrent Nordic urban planning context. These studies deal primarily with the question of urban design as support for collective patterns of behavior. Of these, especially Hillier uses an empirical-quantitative approach in a similar tradition to the medical field, whereas Gehl and Jacobs come from traditions more reliant on qualitative methods. While these suggest a number of factors that are important for pedestrian behavior, they do not quite correspond to questions raised by walkability research. Refinements and further studies (e.g. Ståhle, 2005; Klasander, 2003; Westford, 2010) have also addressed other questions, and in a wider context the environmental design research (as overviewed by Rapoport, 2008) offers many possibilities for providing knowledge, questions, and answers. In addition, studies that use GIS tracking devices, a comparatively new technique to gather and aggregate individual walking behavior, can provide both material and knowledge of importance (e.g. van Schaick, 2008).

Developing the field: measuring the environment

To conduct studies on the relationship between the attributes of the built environment and physical activity more effectively, it is essential to improve the measurement of environmental variables. There are different ways in which these environmental factors are measured in current studies. The survey method, for example, allows the researcher to measure how the built environment attributes are perceived. The other main source of environmental measure is unobtrusive indicators or measures where data can be collected without the awareness of an individual or a community. They include examining physical conditions, archival records, institutional records, and other personal documents. Systematic direct observations of features of the physical environment within communities have often been used as a reliable method for collecting data and the use of GIS technologies helps in the mapping and analyzing of data regardless of how it is collected (Boehmer et al., 2006).
Current research indicates that both perceived and observed environmental indicators are associated with physical activity behavior and obesity (Brownson et al., 2004), yet it is unclear whether there is agreement between measurement methods or whether one method is better for evaluating the suitability of neighborhood environments for physical activity. Although there is a need to evaluate the relationship between observed environment measures and perceived environment measures in order to identify accurate assessments of neighborhood environments, defining the best method may not be necessary at this point. What is more necessary is improving the measurement of the built environment, whether it is observed or perceived data. For example, the observed data for the factors associated with physical activity should be further studied and developed, as well as the methods with which they are observed, and the items of the questionnaires used in the survey methods. The method for how to measure the built environment, for which specific kind of observed data needs to be developed, and, in the case of perceived data, the composition of the questions in the survey method, also need to be more sophisticated in order to best obtain the necessary data.

Another key issue in measuring the built environment is the issue of ‘boundary’, or the area of a defined environment. Walkability research suffers from the Modifiable Area Unit Problem (Openshaw, 1984). This is due to the fact that walkability studies often compare properties and restrictions of an area defined for other purposes than walking. The defined area of an individual’s environment for physical activity is unknown, as is whether individuals are influenced by the environmental characteristics of entire neighborhoods or by the specific areas around residences or whether it is route choice or general characteristics. This issue of setting the boundary of the area for study is a key challenge, since it requires methods for aggregating street-level data that take into account individual perceptions of neighborhood boundaries and can re-define the area using more precise locations in the urban fabric. Also, if objective data measurements are performed only within the study area boundaries, environmental data for respondents, whose buffers extend beyond the measured study area, may be left out. Recent technological developments enable aggregation of street level data based on distances from an individual point (e.g. a plot or a building entrance), re-defining the area of influence for each point (Stähle et al., 2008).

There are potentials and problems with integrating walkability research into urban design and urban design research. While urban design research does provide tools and understanding that are important, there are methodological and theoretical problems in how to translate these into the
kind of questions walkability research tries to answer. This is the case since urban design research often focuses on other aspects of walking than those more considered by the field of walkability. This primarily requires translation and development rather than new models and methods. These problems and potentials will be illustrated and discussed in the following paragraph using somewhat caricatured descriptions of investigations into walking behavior within the field.

One focus of urban design research which shares the empirical-quantitative approach with the medical field deals primarily with collective patterns of behavior and their relation to the physical environment. Such approaches tend to focus on flows and degrees of presence, numbers of walkers, and how these affect space or place. Typically, these approaches are targeted observational studies which often examine the pedestrian flows in given parts of the built environment. Although much has been learned about the different factors that influence pedestrian behavior in terms of where people walk, it has severe limitations: it fails to capture the meanings of the rates or flows, since it seldom captures many of the qualitative aspects of these flows, and it has little to nothing to say about individual routes or lengths of walks and walking routines. These kinds of studies range from more qualitative studies, such as Gehl (e.g., 1980; 2010), to the more rigorously statistical ones, such as in the ‘space syntax’ field (e.g., Hillier, 1996). While providing much important knowledge regarding walking behavior, there are inherent problems in these methods when it comes to key questions about walkability research, such as distances, recurrences, and routes of walking. Relations between individual behavior and collective patterns are complex and not always apparent (see Hayles, 1991; Lefebvre, 1996; Johnson, 2002; Koch & Sand, 2010). Although there are indications and preliminary results that show some of these relationships, it is a question that deserves more investigation.

While these studies are the ones that at first glance seem to provide most direct input into walkability research, other parts of urban design research characterized mainly by qualitative studies of walking offer more indirect, yet highly significant input. These studies tend to focus on the experience of the walker: how walking constructs narratives, generates impressions, (re)produces habits and identities, or how walking formulates lived experiences or life practices in a broader sense (e.g., Augoyard, 2007; Cardiff & Shaub, 2005; Grillner, 2000; Lefebvre, 1996; de Certeau, 1984). Although not always specifically from within the urban design field, these tend to be more readily adopted, or at least accepted, by many designers, as they account for individual choice and experience. These approaches provide rich opportunities
to question, nuance, and refine the methods and findings of the quantitative research and, to some extent, the normative research that focuses on ‘walkability’. Often, but not always, when they are translated into design guidelines, the aim is to examine how walking can be made a richer experience. While at times it is expected to increase the amount of walking, this is often neither the purpose nor the claim. Also, providing walkability research findings are correct, this research seems to focus on walking activities which are less influenced by urban form and its long-term health effect in terms of physical activity than sociodemographic and other factors. Such research deals less with ‘utilitarian’ walking and more with ‘walking for pleasure’. The question can be raised, however, whether or not these walking experiences have more impact outside the specific activity itself than other kinds and thus would more strongly support walking rates indirectly.

Within this quite broad field of qualitative research, research on walking habits and how these formulate lived experience or life in a broader sense (e.g. Augoyard, Lefebvre) seems to be of direct importance. Such qualitative research may be closer to ‘walkability’ research, since it reveals everyday behavioral patterns, yet it is also different in that it deals with walking once people are actually walking rather than the choice of walking over either other modes of transport or to not walk at all. This, however, is a rough characterization of a highly nuanced and rich field. Similar to the targeted observational studies, these studies are not directly applicable to walkability research, due to the nature of the questions and methods used; they provide knowledge that the methods traditionally applied would never reach. The translation from these primarily qualitative studies into urban design factors is complex and also necessitates a number of judgment calls, prerequisites that make it valuable in the design process but difficult to adapt for walkability research. Yet, actively using this sort of research and the findings from it in the development of walkability research can provide valuable information, while acknowledging that there are differences and conflicts in both methods and purpose. This melding of approaches requires recognizing both as equals when it comes to the interchange between them (Koch & Sand, 2010).

Walking behavior is thus an area where urban design research both excels and has significant shortcomings, where the shortcomings tend to be in the areas that would contribute most to walkability research. This seems to suggest that there are methodological and theoretical problems with how to translate urban design knowledge into the kind of questions walkability research tries to answer, and the other way around. A richer understanding should better integrate the knowledge from the urban design field in the rather blunt
measurements and methods of walkability research, while taking the knowledge gained in the latter into account when developing the former. Urban design research will benefit from adapting methods and findings used by medical research that focuses on walkability, but for this to become true measurements, factors, and guidelines need to be more refined in order to be applicable in the design process. Also the guidelines need to be sensitive to the local situations and conditions, as well as to different aims and intentions, as compared to normative policies, in order to be of more value in the design process. Hence these approaches – the medical approach and the urban design approach – can be seen as complementing one another. In addition to the direct input of the relationship between built environment and behavior, fields that in one way or another have managed to bridge the gap between research and design input may also be helpful. Here, there seems to be a lot to learn from environmental design studies as these, while not unique in claims regarding this relation, do provide an interesting perspective: “[…] moves beyond those to consider design as part of organizational, behavioral, and social systems, and – even more importantly – because it applies the results, theories and techniques, and methodologies of behavioral and social sciences to address design problems and improve the quality of the resultant product” (Wener, 2008: 283; see also Szczepańska & Skorupka, 2010), but also from Gehl (1980) and the space syntax field (Hillier, 1996; Stonor et al., 2002).
2.2 Studies and Writings on Walking and the Urban Environment

Studies and guidelines on urban design for pedestrian-friendly / walkable environment

This section will introduce some of the recent studies and guidelines from the urban design field which discuss the design qualities that are argued to be supporting pedestrians. Although the walkability studies initiated from public health interests are also ultimately aiming at generating knowledge for guidelines on walkable environment, the guidelines and theories on urban planning and design currently available are not yet reflecting the results of these correlation studies, partly due to the field being at a relatively early stage, with inconsistent results. These studies and guidelines include the factors which are considered most central in walkability studies, based partly on results from transportation research, such as density, land-use diversity, and connectivity, but also, to a major part, include other design qualities which often operate at a detailed level. While there are guidelines discussing the design that is considered ‘pedestrian-friendly’ in specific details, there are also studies and guidelines which discuss the more abstract qualities of the environment that may support walking. Some examples from these various studies and guidelines will be presented here.
Pedestrian and Transit-friendly Design: a Primer for Smart Growth (Ewing, 1999)

Pedestrian and Transit-friendly Design: a Primer for Smart Growth (Ewing, 1999) offers a design checklist for pedestrian-friendly features. This primer and manual draws primarily on classic urban design literature and other transit-oriented design manuals and studies. The checklist consists of features at urban design level and sorts the features into three categories: Essential features, highly desirable features, and nice additional features.

**Essential Features**
- #1 Medium-to-High Densities
- #2 Mix of Land Uses
- #3 Short to Medium Length Blocks
- #4 Transit Routes Every Half-Mile
- #5 Two- or Four-Lane Streets (with Rare Exceptions)
- #6 Continuous Sidewalks Wide Enough for Couples
- #7 Safe Crossings
- #8 Appropriate Buffering from Traffic
- #9 Street-Oriented Buildings
- #10 Comfortable and Safe Places to Wait

**Highly Desirable Features**
- #11 Supportive Commercial Uses
- #12 Gridlike Street Networks
- #13 Traffic Calming along Access Routes
- #14 Closely Spaced Shade Trees along Access Routes
- #15 Little Dead Space, or Visible Parking
- #16 Nearby Parks and Other Public Spaces
- #17 Small-Scale Buildings (or Articulated Larger Ones)
- #18 Classy Looking Transit Facilities

**Nice Additional Features**
- #19 Streetwalls
- #20 Functional Street Furniture
- #21 Coherent, Small-Scale Signage
- #22 Special Pavement
- #23 Lovable Objects, Especially Public Art
A Healthy City is an Active City: a physical activity planning guide (Edwards & Tsouros, 2008)

A healthy city guidebook, published by the World Health Organization’s Regional Office for Europe, is a planning guide which provides tools for developing a comprehensive plan for creating a healthy, active city by enhancing physical activity in the urban environment. The strategies at urban design level suggested here are as follows.

*Action Strategies in Urban Design*

# Reduce urban sprawl by embedding workplaces, shops, schools and health care facilities within integrated neighborhoods that facilitate walking and cycling.
# Provide easy access to seashores, rivers, lakes and forests on the periphery of the city.
# Conserve and develop green spaces. Provide incentives for developing vacant lots and run-down areas into green and/or open spaces. Work toward an urban green network accessible to all residents complemented by a network of squares and other small outdoor places for active living.
# Provide convenient and visible stairs and signage for public spaces that encourage people to take the stairs. Design buildings that encourage the use of stairs and ensure that stairwells are unlocked in office buildings and health care facilities.

This guideline is for the purpose of encouraging physical activity in general and therefore may be different from the strategies that aim specifically at encouraging walking activity. However, although guidelines such as these share the aim of enhancing public health with the walkability research initiated by the preventive medicine, some of the suggestions made here contradict the existing findings from the correlation studies on walkability. Since these guidelines are often based on existing literature, they share more similarity with the theories and guidelines on pedestrian-friendly design from the urban planning and design field, such as the one presented above (Ewing, 1999). However, some of the design features encouraged here have failed to be proven as valid in the statistical studies.
Research Project on Walkability Index by Space Syntax Limited (Stonor et al., 2002)

Transport for London (TfL), the regional transport authority for Greater London, conducted a project to develop a monitoring framework for walking, and defined the requirement for an analytic toolkit, with which they could index walkability. It was decided to base such an index on ‘space syntax’ techniques of pedestrian movement analysis. Using these techniques, forecasts are made on the basis of ‘spatial integration’ calculations, where the accessibility of individual pedestrian route segments is calculated based on their position in the overall movement network. This project investigated the development of a ‘walkability’ index for London and the aims were a) to identify the factors that influence the degree of usage of a particular piece of footway, b) to establish which of these factors can be controlled and affected by walking policy, design and implementation, c) to rank the various factors according to their degree of influence and d) to form a walking policy that responds as far as possible to various factors, and prioritizes those factors which affect walkability more. This research work tried to quantify the degree to which different factors influence pedestrian flows (Stonor et al., 2002).

As a result, the following factors were identified:

- Presence or Absence of Other Moving People
- Presence or Absence of Other Stationary People
- Footway Quality
- Footway Width
- Footway Accessibility
- Proximity to Road Traffic
- Gradient
- Pedestrian Crossing Design
- Traffic Signal Phasing
- Ground Level Activity
- Movement Generators (e.g. Transport Nodes and Tall Buildings)
- Others

Among these factors, the ones with greater importance were Footway Accessibility, Ground Level Activity, Pedestrian Crossing Design, Traffic Signal Phasing, and Time of Day.
Measuring the Unmeasurable: Urban Design Qualities Related to Walkability (Ewing & Handy, 2009)

A recent study from the urban design field has attempted to measure subjective qualities of the urban street environment, with the purpose of providing researchers with operational definitions which they can use to measure the street environment and test for significant associations with walking behavior (Ewing & Handy, 2009). Arguing that physical features individually may not capture people’s overall perceptions of the street environment, this study investigated numerous perceptual qualities that may affect the walking environment to which the urban design literature points (Ewing, 1996). While the urban design literature has not attempted to objectively measure these perceptual qualities with few exceptions, this study tries to objectively measure seemingly subjective qualities of the walking environment. The conceptual framework presented here, shown below, is an interesting analysis of the relationship between the perception of the environment, physical features of the built environment and walking behavior.

![Conceptual framework for the influence on walking behavior](image)

*Figure 2.1 Conceptual framework for the influence on walking behavior (Ewing & Handy, 2009)*
The approach is to link specific physical features to urban design quality ratings by a panel of experts for a sample of commercial streets. Of the 51 perceptual qualities, eight were selected for further study based on the importance assigned to them in the literature: imageability, enclosure, human scale, transparency, complexity, legibility, linkage and coherence. Among these, the first five were successfully operationalized. The operational definitions are based on ratings made by the expert panel of video clips of 48 commercial streets from across the United States (Ewing et al., 2006). The consensus qualitative definition of the urban design qualities will be briefly described here, followed by a table showing the significant physical features of each quality.

# Imageability is the quality of a place that makes it distinct, recognizable and memorable. A place has high imageability when specific physical elements and their arrangement capture attention, evoke feelings and create a lasting impression.

# Enclosure refers to the degree to which streets and other public spaces are visually defined by buildings, walls, trees and other vertical elements. Spaces where the height of vertical elements is proportionally related to the width of the space between them have a room-like quality.

# Human scale refers to a size, texture, and articulation of physical elements that match the size and proportions of humans and, equally important, correspond to the speed at which humans walk. Building details, pavement texture, street trees, and street furniture are all physical elements contributing to human scale.

# Transparency refers to the degree to which people can see or perceive what lies beyond the edge of a street and, more specifically, the degree to which people can see or perceive human activity beyond the edge of a street. Physical elements that influence transparency include walls, windows, doors, fences, landscaping and openings into mid-block spaces.

# Complexity refers to the visual richness of a place. The complexity of a place depends on the variety of the physical environment, specifically the numbers and types of buildings, architectural diversity and ornamentation, landscape elements, street furniture, signage and human activity. (Ewing & Handy, 2009).
The following table shows the significant physical features that have been defined for each urban design quality.

<table>
<thead>
<tr>
<th>Urban design quality</th>
<th>Significant physical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imageability</td>
<td>people (#)</td>
</tr>
<tr>
<td></td>
<td>proportion of historic buildings</td>
</tr>
<tr>
<td></td>
<td>courtyards/plazas/parks (#)</td>
</tr>
<tr>
<td></td>
<td>outdoor dining (y/n)</td>
</tr>
<tr>
<td></td>
<td>buildings with non-rectangular silhouettes (#)</td>
</tr>
<tr>
<td></td>
<td>noise level (rating)</td>
</tr>
<tr>
<td></td>
<td>major landscape features (#)</td>
</tr>
<tr>
<td></td>
<td>buildings with identifiers (#)</td>
</tr>
<tr>
<td>Enclosure</td>
<td>proportion street wall—same side</td>
</tr>
<tr>
<td></td>
<td>proportion street wall—opposite side</td>
</tr>
<tr>
<td></td>
<td>proportion sky across</td>
</tr>
<tr>
<td></td>
<td>long sight lines (#)</td>
</tr>
<tr>
<td></td>
<td>proportion sky ahead</td>
</tr>
<tr>
<td>Human scale</td>
<td>long sight lines (#)</td>
</tr>
<tr>
<td></td>
<td>all street furniture and other street items (#)</td>
</tr>
<tr>
<td></td>
<td>proportion first floor with windows</td>
</tr>
<tr>
<td></td>
<td>building height—same side</td>
</tr>
<tr>
<td></td>
<td>small planters (#)</td>
</tr>
<tr>
<td></td>
<td>urban designer (y/n)</td>
</tr>
<tr>
<td>Transparency</td>
<td>proportion first floor with windows</td>
</tr>
<tr>
<td></td>
<td>proportion active uses</td>
</tr>
<tr>
<td></td>
<td>proportion street wall—same side</td>
</tr>
<tr>
<td>Complexity</td>
<td>people (#)</td>
</tr>
<tr>
<td></td>
<td>buildings (#)</td>
</tr>
<tr>
<td></td>
<td>dominant building colours (#)</td>
</tr>
<tr>
<td></td>
<td>accent colours (#)</td>
</tr>
<tr>
<td></td>
<td>outdoor dining (y/n)</td>
</tr>
<tr>
<td></td>
<td>public art (#)</td>
</tr>
</tbody>
</table>

*Table 2.1 Urban design qualities related to walkability (Ewing & Handy, 2009)*

**Some Reflections**

The different guidelines and papers presented here list various urban design factors that contribute to creating a pedestrian-friendly environment. They try to identify and classify the factors with the aim of informing the practitioners and researchers about how walking may be encouraged through urban design practices. However, although the factors listed in these sources may be positively related to supporting pedestrians, they seem to lack systematical investigation and identification of the factors in terms of their scale and detail of implementation, and also in terms of the significance to walkability. The
urban design factors discussed here differ to a considerable degree in the scale at which they are measured or implemented. While the details regarding the pavement or small street furniture or detailed design of the buildings are at a fine scale, there are also factors such as density, connectivity, and land-use diversity that may be managed at larger scales. Also, while there are factors that may be identified in the detail of implementation and measurement in different scales, such classification in terms of scale is rarely provided. Some of the sources also show that, while the factors that are at the finest scale are discussed in detail (e.g. sidewalk width, pavement condition), the factors for which identification of how they can be measured and managed on different scales is more complicated tend to not yet have been investigated and discussed in detail. Another issue with the list of the factors provided here is that, while some of these guidelines also share the aim of enhancing walkability for individuals with the health benefit oriented walkability studies, some of the factors listed here as central have been excluded from being significant factors in the results of the correlation studies in relation to the amount of walking. As mentioned earlier, other than factors such as density, connectivity and land-use diversity, the design factors which are related to the condition and aesthetic of the walking facilities (i.e. of the street and the design of the buildings) have not been consistently proven as valid in statistical analysis.

The reason for the difference between the lists of factors in the urban design guidelines and the statistical analysis of the walkability studies may be the difference and inaccuracy in the evidence underlying the identification of factors. This concerns the context of the urban environment and walking and also the data or argument behind claiming the significance for supporting walking. While the correlation walkability studies have mostly been conducted in residential neighborhoods, many of the urban design guidelines and studies deal in large part with main streets in city centers, such as shopping streets. Therefore, they often deal with urban contexts with significantly different conditions and potentials, and also with different types of pedestrians. Also, while the correlation studies are comparing the factors with the amount of time spent on walking, the urban design guidelines and studies are more dependent on knowledge from existing literature and expert experience and judgments. Some of the studies test the factors based on the degree of use, or the amount of pedestrian movement (such as Stonor et al., 2002), but in most cases, setting up the preliminary or the final list of factors is based on existing literature, which often lack empirical evidence.
Discourses on walking, pedestrians, and the street from the architecture, urban design and planning field

Although a systematic investigation of the relationship between walking behavior and the condition of the urban form, as in the public health-initiated walkability research, is a relatively recent phenomenon, there have been numerous works of literature and practices in the urban design and planning field exploring the use of street design and planning that supports pedestrians. In this part, the discourses related to walking and the urban environment from different times and perspectives will be discussed. These works of literature have also provided a basis for the recent works attempting to provide guidelines for a walkable environment, such as those introduced in the previous section. While the issue of pedestrian-friendly design is continuing to receive increasing attention, there are writings which have been central to supporting the importance of considering the pedestrian and providing understanding about the use of streets, such as the work of Appleyard, Whyte, Lynch, and Jane Jacobs. As mentioned in the discussion regarding the guidelines for urban design that support walking, the discourses and theories from the urban planning and design literature are somewhat weak in their evidence comparing to the statistical analysis of the recent walkability studies. They are mostly based on expert knowledge or simple, not very systematic observations, and therefore some of the details regarding pedestrian-friendliness contradict each other among different works of literature, and also partially contradict the findings of the recent walkability studies. However, compared to the statistical analysis on walkability, these works of literature offers more insights on why and how the urban environment may support walking. Some of the main ideas and arguments from these works which provide knowledge that may assist the understanding of walkability will be briefly introduced here.

Appleyard, in the book *Public Streets for Public Use* (Ed. Moudon, 1987), describes how streets have always been scenes of conflict (Appleyard, 1987). Streets are and have always been public property, but power over them is ambiguous, for the street has an open and easily changeable nature. Unlike buildings, with their defined activity areas and controlled entrances, the street is open to all. Its detailed design, however, can subtly favor one group over another. Appleyard argues that it should be the policy of public agencies and their representatives to support the weaker users of the streets – pedestrians,
residents, children, old people, the disabled, and the poor (Appleyard, 1987). Streets that are friendly to pedestrians and livable for residents are the key issue discussed in this book. Healthy streets, according to Appleyard, are used by different people for a variety of activities. A lively and successful street demands a balanced mix of different user groups and activities. It does not exclude motorists, but provides space for vehicles by striking a more equitable balance with other street users (pedestrians, bicyclists, etc.). User diversity exists when a variety of age groups and social classes can interact in a place, or at least tolerate one another without major physical or social controls (Appleyard, 1987). The well-known works by Jane Jacobs have also provided a strong argument for and the understanding of a lively street. Terms such as ‘eyes-on-streets’ are widely used to demonstrate the importance of making a safe, livable street that may also contribute to enhancing the walkability of the streets as well (Jacobs, 1989).

Similarly, Whyte (1980) has pointed out that people-watching is one of the primary activities shared by different classes of people in public spaces. Simple amusements, such as walking, talking, eating, and sports, also give a street diverse life. Whyte describes that, in democratic streets, a social connection links ground floor building uses to the adjacent street space, and that a truly public street has a healthy relationship between the private or semi-public life inside buildings and the public world outside. Whyte argues that “dead” uses, such as businesses without display windows, banks, offices, parking garages, and storage areas with blank walls, should not be placed along the public street. On the other hand, uses such as news-stands or restaurants can enhance street life. In residential neighborhoods, the placement of kitchen windows and other lived-in spaces overlooking the street, as well as of building elements, such as ledges and stoops that encourage sitting, can enhance the social life of the street and improve the sense of safety for residents. Whyte’s recommendations for providing “sittable space” (1980) have also been considered useful to the design and management of the streets.

While the writings above focus more on the use of streets in general, Rapoport describes how walking in particular is supported by the urban environment. He argues that it is done, other things being equal, by maintaining high levels of interest and that this is achieved through high levels of perceptual complexity (Rapoport, 1987). It is argued that the perceptual characteristics increase the pleasure of walking by stimulating exploratory activity and is related to the latent functions of pleasure, delight, interest, exploration, ludic behavior, and the like. According to Rapoport, while environments are not determining but supportive, they can also be seen as
catalysts. Furthermore, the perception of the city is dynamic and sequential. The city is experienced over time and its image is made up of the integration of successive partial views, each of which, however, must be noticeably different, and never wholly predictable. The integration of partial views is affected by speed and the nature of the environment, both of which influence the rate of noticeable differences. Assuming that the environment provides potential noticeable differences, speed influences how often noticeable differences occur, how long they are seen, and hence, whether they are observed. Pedestrians thus have a much better awareness of places and clearer ideas of the meaning and activities in the city than have either drivers or users of public transport. Because of the lower speed and lower criticality of their movement, pedestrians can perceive many more differences in form and activity. Rapoport also argues that, at the scale of the city, the existence of many levels of complexity and their appropriate relationship to the context is important. For example, designers could modulate complexity levels to reflect the nature of areas and their activities, their importance in the urban hierarchy, and the speed at which they will be perceived. It has also been noted that pedestrians rarely look above eye level in enclosed urban spaces, where perception of detail is almost inevitable (Rapoport, 1987).

Jan Gehl’s works (Gehl, 1980; Gehl, 2010) are also one of the most cited works of literature concerning designing the city for pedestrians. Gehl discusses issues in urban design which may contribute to creating urban environments that support and enhance walking activity. Similar to the other literature that emphasizes the design at the street and ground level, Gehl also describes how the treatment of the city’s edges, particularly the lower floors of buildings, has a decisive influence on life in the city space. In explaining what he refers to as soft edges, he describes how pedestrians experience ground floors closely and intensely. Walking in the city leaves ample time to experience everything that ground floors have to offer, and to savor the wealth of detail and information. An ideal “soft edge” would be a street with shops lined up, transparent facades, large windows, many openings and goods on display, where there is much to see and touch. Gehl argues that the city at eye level is the most important scale for city planning, and that the battle for quality is on the small scale. In his book, Cities for People, Gehl presents details for how to design good cities for walking. He discusses in specific detail the urban design issues related to walking, such as the acceptable walking distance, providing room to walk freely and unhindered, avoidance of stairs, pavements, straight sightlines, and interesting things to see at the eye level (Gehl, 2010).
Gehl emphasizes that in lively, safe, sustainable and healthy cities, the prerequisite for city life is good walking opportunities. He explains that a multitude of valuable social and recreational opportunities naturally emerge when you reinforce life on foot. There is direct contact between people and the surrounding community, experiences and information. Gehl argues that where conditions for life on foot are improved, the extent of walking activities increases significantly and that even more extensive growth in social and recreational activities can be seen. He explains that by improving conditions for pedestrians, not only is pedestrian traffic strengthened, but also city life. Gehl emphasizes the importance of diversity in the activities taking place on the streets. One of Gehl’s ideas frequently referred to is his classification of activities in the city. He categorized activities into three types: necessary activities, optional activities, and social activities. Necessary activities are an integrated, non-optional part of everyday. Here we have no choice. Optional activities are recreational and fun. City quality is a decisive prerequisite for this important group of activities. Social activities include all types of contacts between people and take place everywhere people go in city space (Gehl, 2010).

Other works from the field of architecture

While the literature introduced above includes writing by architects on how the design of the built environment may support walking, the discussion in this part is about how walking is reflected and depicted in discourses and theories of architecture. Two doctoral dissertations will be introduced, the first being Ramble, linger, and gaze by Katja Grillner (2000). This work explores a method of architectural research based on narrative dialogue and examines the garden theories and literary garden representations of Thomas Whately and Joseph Heely. It has the form of a narrated dialogue between these two writers and the narrator, and it is located at Hagley Park, Worcesteshire, England. Through its fictional character, the author tries to show how the landscape garden provides an opportunity to move within interpretative layers and spiraling horizons and how it celebrates a point of view on the move, literally, physically, and imaginatively (Grillner, 2000).

In the text which presents the dialogues from the landscape garden, as the title of the book shows, the three characters ramble, being on the move, while continuing to linger, gaze, reflect and discuss. Walking through different spaces is how the characters explore the given world, which leads to the experiencing, reflecting, and sharing of the reflections. In this text, a rich description of the walk in its nature and value as an activity with experiential
quality is an interesting point. The characters describe not only the spatial path of their walk, but also its more innate nature as an experience. For instance, Heely describes how a walk within the text was sometimes gay and light and sometimes more quiet and contemplative (Grillner, 2000: 54). Moreover, the narrator translates Heely’s description of the walk into a verbal representation of a piece of music, trying to capture the rapid succession of emotions and the rhythmical composition. In this representation the various details of how the walk is depicted shows the complexity and the richness of walking in its experiential quality:

“We begin by the house in a scanning tempo. We are taking in the landscape and are pleased with it. Gradually the happiness increases as we form our perceptions of it. But on leaving the house the tones darken as we approach the church. The tempo slows down and we have time to reflect on the memory of the dead. Melancholy we walk on and are confronted with the gay sound of a pebbly rill. The still contemplative tempo fades out and is replaced by that of a continuous walk. … When we climb the bank to discover the view the voices again unite into a strong and happy accord. … We are gazing, exclaiming our admiration in sudden crescendos. After a silent moment we continue on a new tone. …” (Grillner, 2000: 62)

In another doctoral dissertation by Åsa Dahlin, walking is also described by experiencing the space and architecture. On Architecture, Aesthetic Experience, and The Embodied Mind is a dissertation consisting of seven essays colored by the conviction that the aesthetics-ethics of architecture is deep and rich, and that it is ultimately grounded on experiential values (Dahlin, 2002). In one of the seven essays, Pompeii in my Mind x 2, the author has used the form of imaginative literature. This essay describes the private experiences from two occasions of encounter with the excavated classical city of Pompeii. The author explains that the aim was to illustrate something of the ways in which a person utilizes her or his capacity for experience to create relations with places and architectural objects. Here, again, walking is the means of experiencing the space and architecture. The author describes how walking around the city is the act of using one’s own body in the physical encounter with the place, registering sense impressions, proportions, emotions, and thoughts which emerge (Dahlin, 2002: 129). An interesting point is that for the experiment on the experiential dynamism which emerges in relation to the body emotionally and intellectually, an extreme case of an unearthed city from antiquity has been chosen. The author argues that the described situations are extreme and not comparable to common architectural experience, but this fact may also
challenge everyday views, since extraordinary events in our lives are evaluated with reference to common situations (Dahlin, 2002: 12).

In these writings from architecture research, walking is an activity for experiencing the environment which stimulates emotions and reflections. The walks described in them are more than an activity for everyday chores, but a contemplative activity involving observing and experiencing the environment. Another term which focuses on a similar aspect of walking activity is the flâneur. Introduced by Baudelaire, the flâneur is “a person who walks the city in order to experience it” (Ferguson, 1994). Walter Benjamin describes the flâneur as an uninvolved but highly perceptive bourgeois dilettante, making social and aesthetic observations during long walks through Paris (Shaya, 2004). The title of Benjamin’s unfinished “Arcades Project” comes from the covered shopping streets of Paris. For Benjamin, the experience of walking through the arcades was a Proustian exercise in involuntary memory, except, instead of personal memories, the arcades were a storehouse of collective memories (Benjamin, 2002). The flâneur has been portrayed as a well-dressed man, strolling leisurely through the Parisian arcades of the nineteenth century - a shopper with no intention to buy, an intellectual parasite of the arcade. He strolls to pass the time that his wealth affords him, treating the people who pass and the objects he sees as texts for his own pleasure. As a member of the crowd that populates the streets, the flâneur participates physically in the text that he observes, while performing a transient and aloof autonomy with a "cool but curious eye", which studies the constantly changing spectacle that parades before him (Rignall, 1989: 112).

Just as “flâneur” describes a particular type of pedestrian conducting a specific kind of walking activity, the literature from the field of architecture, urban design, and planning often focuses on certain aspects of walking activity or types of pedestrians. Although terms such as flâneur may specify the aspects being focused on in the discourse, in most cases the same simple term walking is used to discuss the activity in various contexts by various types of pedestrians. While the literature from these fields often provides a specific, in-depth knowledge on walking and the built environment, the specification of such detail is mostly vague. This may be a partial reason for the inconsistency or contradiction among urban design guidelines on pedestrian-friendly design and also with the correlation studies on walkability.
From the field of Anthropology

While research and theory from the urban design field concerning walking activity and pedestrians provide knowledge focused primarily on the built environment, there are works from anthropology that also deal with walking behavior and the urban environment. Although these works do not discuss the specific characteristics of the built environment, they provide insight into walking as an individual behavior conducted in the urban environment. They may be of useful assistance in understanding how individuals interact with the built environment in their walking behavior. Some example of these works, such as those by Michel de Certeau, Marcel Mauss, and Grosz will be presented here.

Walking in the City – Michel de Certeau

*The Practice of Everyday Life*, a book by Michel de Certeau, is one of the key texts in the study of everyday life behaviors. "Walking in the City", one of the chapters in *The Practice of Everyday Life*, offers a persuasive theoretical framework for understanding the ways in which bodies, subjects and built environments are interlinked and enmeshed (Morris, 2004). In this chapter, Certeau describes "the city" as a "concept" generated by the strategic maneuvering of institutional bodies, which produce things like maps that describe the city as a unified whole, as it might be experienced by someone looking down from high above. By contrast, he argues that the walker at street level moves in ways that are tactical and never fully determined by the plans of organizing bodies, taking shortcuts or meandering aimlessly in spite of the utilitarian layout of the grid of streets. He describes that people walk their own way through the grid of city streets, zigzagging, slowing down, preferring streets with certain names, making turns and detours - their own "walking rhetoric" (Certeau, 1984: 99).

Certeau’s central argument is that space and place are not merely inert or neutral features of the built environment; instead, they must be activated by the ‘rhetorical’ practices of users and passers-by. He comments:

“If it is true that a spatial order organizes an ensemble of possibilities (e.g. by a place in which one can move) and interdictions (e.g. by a wall that prevents one from going further), then the walker actualizes some of these possibilities. In that way, he makes them exist as well as emerge. But he also moves them...
about and invents others, since the crossing, drifting away, or improvisation of walking privilege, transform or abandon spatial elements.” (Certeau, 1984: 98).

For Certeau, the rhetoric and performativity of walking “affirms, suspects, tries out, transgresses, respects, etc., the trajectories it speaks”. The walker’s selection, rejection, manipulation (and so on) of spatial elements are described by Certeau as the “chorus of idle footsteps”. It is the “turns” and “detours” of the walker that transform place into space, according to Certeau. He gives a characterization of the dynamic relationship between the practices of individual walkers and the “official” urban landscape and discourse with which they interact. He explains that the bodies of walkers “follow the thicks and thins of an urban ‘text’ they write without being able to read.” According to him, walking is a process of multiple bodily inscriptions of “the city” where “the networks of these moving, intersecting writings compose a manifold story that has neither author nor spectator, shaped out of fragments of trajectories and alterations of spaces: in relation to representations, it remains daily and indefinitely other” (Certeau, 1984: 93). However, some criticism can be made about the limits that stem from Certeau’s opposition between “the official” and “the everyday” and his subsequently rigid differentiation between strategies and tactics. Practices of walking rarely conform to this either/or model. It is never simply a case of “us” and “them”, or individual walkers versus the city authorities who seek to organize the movement and dispositions of bodies in urban space, as Certeau’s model implies (Morris, 2004).

Mind-Body-City: Certeau, Mauss, and Grosz

Certeau’s account of walking in the city is considered to assume “a general dialectical relation between attributes that might be identified as bodily or mental” (Hunter, 1993). This means that Certeau’s account implies a universal relationship between the body and subjectivity, the body and society. Such assumptions emerge in particular in the way Certeau repeatedly figures the walking body as existing in a singular, psychoanalytic relationship to subjectivity (Morris, 2004). However, there also exists criticism about how universal, or general, Certeau’s account of walking can be. This criticism is associated with the issue of different types of walking. Cultural geographer Steve Pile, in his commentary on Certeau, argues that while Certeau provides a useful partial account of aspects of the psychodynamics of place that essentially follows in the specialized footsteps of the flâneur, he cannot, however, account for other practices of walking, such as the routines of going
to work, picking up children from school, and shopping (Pile, 1996: 228). For instance, according to Certeau:

“To walk is to lack a place. It is the indefinite process of being absent and in search of a proper. The moving about that the city multiplies and concentrates makes the city itself an immense social experience of lacking a place ... a universe of rented spaces haunted by a nowhere or by dreamed-of spaces.”

(Certeau, 1984: 103).

It may be easy to think of pleasurable walking practices that exemplify this poetic and rather romantic sense of being unconsciously taken wherever one’s footsteps lead. However, it seems that the metaphors of “absence” and “presence” are not so helpful when considering a range of more regimented or functional instances of walking.

A useful corrective to the limits of the mind-body dialectic in Certeau’s account of walking is the work of the French sociologist Marcel Mauss, and his notion of mind and body techniques. Mauss points to the fact that the most basic and transparent of bodily actions and dispositions, including walking, have no neutral or natural form but are always culturally and socially produced, often through mimetic processes (Mauss, 1973). Mauss’s key point is that there are separate domains of socially transmitted techniques of “the body” and “the self”, and that these techniques are assembled together in different social formations. Mauss’s work suggests that habitual bodily attributes, such as walking, are not necessarily “unconscious” bodily performances. Instead, “they fall neither within nor beyond the reach of knowledge, because they belong to another department of existence”, one identified as that of “training”, a social process whose distinguishing trait is “not scientific circumspection but habitual virtuosity” (Hunter, 1993). Mauss’s understanding of walking as a habitual practice, organized and transmitted through different forms of social authority, offers a useful corrective to Certeau’s more restricted dialectical understanding of the relation between the subject and the body (Morris, 2004).

Another issue that lacks explanation in Certeau’s work is the way how the techniques of walking are articulated with formations of subjectivity within particular urban contexts. Certeau’s account of walking puts the emphasis on the actions and choices of the embodied walker, and it seems that the walker acts on a quite static urban territory. However, the possibility of the relationship between body-subject and city being more of a two-way process needs to be considered. Anthropologist Elizabeth Grosz, in “Bodies-Cities” (1992), argues for a “two way linkage which could be defined as an interface” between body and city. Her article criticizes what she calls the "body politic" and "political bodies", two pervasive models of the interrelation of bodies and
cities. In the first model, the city is viewed as a "product or projection" of the body. Humans make cities and cities develop according to the needs and designs of people. In this model, cities and bodies are binary opposites which have a contingent or causal relationship. In the second model, there is a "parallelism or isomorphism" between the body and the city, where the two are seen as "analogues...in which the features...of one are reflected in the other". The city reflects the "natural" organization of the body, where hierarchical relationships are "justified and naturalized" as for the "good of the whole" (Grosz, 1992).

Grosz proposes an alternative to the causal and representative relations described above by combining the two. She writes, “Like the causal view, the body (and not simply a disembodied consciousness) must be considered active in the production and transformation of the city. But bodies and cities are not causally linked and the body does not have an existence separate from the city, for they are both defining. Like the representational model, there may be an isomorphism between the body and the city. But it is not a mirroring of nature in artifice. Rather there is a two-way linkage which could be defined as an interface, perhaps even a cobuilding" (Grosz, 1992). Her proposed model sees bodies and cities as "assemblages capable of crossing thresholds" or a "fundamentally disunified series of systems and interconnections, a series of disparate flows, energies, events or entities, and spaces, brought together or drawn apart in more or less temporary alignments."

According to Grosz, the city is made and made over into the simulacrum of the body, and the body, in its turn, is transformed, “citified”, urbanized as a distinctively metropolitan body. This notion of complex feedback relation between body and city moves away from a dialectic model where one term (either body or city) is privileged over another. Instead, Grosz’s “interface” offers a way of thinking about mind/body/city relations that is not “symptomatic” or limited to a psychoanalytic framework as in the case of Certeau. Moreover, Grosz directs towards the idea that “there is no natural or ideal environment for the body, no ‘perfect’ city judged in terms of the body’s health and well-being, and that if bodies are not culturally pre-given, built environments cannot alienate the very bodies they produce.” (Grosz, 1992).
2.3 Reflections on Walkability

- Discussions on how to view and approach
  the relationship between walking and the environment

As presented so far, walkability, or the pedestrian-friendliness of the built environment, has been discussed from different approaches with different methods in various fields. The discussion presented here consists of reflections on how to view the built environment and walking. By trying to understand the nature of the relationship between the built environment and walking, the discussion made here may assist the understanding of the different aspects, the value, and the applicability of the different studies, theories, and discourses on walkability. The ideas presented in the discussion here have stemmed from the reflections from the critical literature review of various studies and writings from different fields, and also to a large part from the contemplations that have been made during and after conducting the empirical study of this project. The reason for introducing these discussions in this part is that it allows understanding about how to position and evaluate the different approaches and theories on walkability, and also because the view on the relationship between the built environment and walking presented here will be the conceptual framework for how the results of the empirical study are analyzed and presented in this thesis.
The built environment’s influence on walking: encouraging vs. discouraging

The walkability research initiated by the field of preventive medicine has made a contribution by proving that the built environment is one of the factors affecting walking behavior through correlation studies. Earlier works from this recent body of research, such as the neighborhood comparison studies (e.g. Saelens et al., 2003b; Leslie et al., 2005), provide statistical evidence of the validity of the built environment’s influence on the amount of walking activity. However, although it may have become evident that the built environment affects walking behavior, very little has been made clear about specifically how and to what degree it influences walking. The discussions presented here are some reflections on how to view and approach walkability, the relationship between the built environment and walking.

In walkability studies which analyzed the condition of the built environment against the amount of individuals’ time spent on walking, the definition of “walkable” is often described as “encouraging walking” or more specifically “increasing the amount of walking activity”. This is from the reason that many of these studies have been initiated with the aim of increasing individuals’ amount of physical activity for health benefits. In literature and studies that deals with the “pedestrian-friendly” environment from the urban design and planning field also often seem to discuss the method in how to “support” and “enrich” walking activity. These definitions lead to the perception that they explore the built environment’s power to encourage walking. This is partially true, but thinking carefully, having the power to encourage means that it also has the power to discourage walking. The usefulness of such a reversal of the term is made clear when the background circumstances in which the field of the preventive medicine started to initiate walkability research are understood.

While a large part of these studies are from the North American context, the settings of these studies are often the problematic suburbs created by severe urban sprawl, which are highly dependent on automobiles. They are where the urban development has led to the creation of an environment that does not allow walking to be included among the options as a possible or realistic mode of travel. In other words, these studies are investigating urban environment that hinders or disallows walking activity. Many of the neighborhood comparison studies from these contexts, where neighborhoods with high walkability and low walkability have been compared, demonstrate, not how the neighborhoods with high walkability encourage walking, but rather how neighborhoods with low walkability disallow walking. They
investigate the conditions of the built environment that hinders walking activity and provide arguments about why and how these conditions should be avoided. It shows the seriousness of the possible ‘discouraging’ power the built environment has on walking activity. The results of these studies are valuable in themselves also for investigating the minimum conditions that should be preserved in the environment in order to make it possible for walking to be included in people’s choice of mode of traveling. Many of the walkability studies often investigate, not how walkable the given environment is, but how unwalkable it is. They teach us what not to do.

From the reversal of the term between ‘encouraging’ and ‘discouraging’ walking, the influence of the built environment on walking can be viewed as being divided into these two effects, which are the same, but also the opposite. And if these two effects are compared, it could be argued that the discouraging or disallowing effect has a stronger influential power and also can be investigated and proven more easily. The reason for this may be easier to understand if we consider the larger framework for the process of making the choice whether to walk or not to walk. There are various intra- and extra-personal factors influencing an individual’s choice whether to walk or not, such as individual motives, demographic factors, or the social context, and the built environment is one of these. Therefore, in terms of the power to encourage an individual to choose to walk, the built environment has a rather limited leverage, because of the existence of many other competing or simultaneously functioning factors. The individual behavior is determined by diverse and complex factors, and the convenience or the attractiveness of the built environment may not always function as the dominant factor.\(^1\) However, when it comes to hindering walking, the built environment can and often does become the determining factor. If the built environment is of a condition where the walkability factors are at the level where the environment disallows walking, walking activity would not occur, regardless of the other factors influencing the individuals’ decision-making process (e.g. an individual’s willingness to walk).

Since the built environment is the setting in which the walking activity takes place, if a sufficient condition is not provided, it may deprive the individuals of any opportunity for the activity to occur at all. This is why it is important to study the built environment as a factor of walkability and develop

\(^{1}\) And this may be one of the reasons that explain why the existing walkability research has difficulty in obtaining statistically significant results to prove the correlation between some of the built environment factors and the amount of walking activity.
knowledge about how to prevent creating *unwalkable* urban environments. Also, compared to other intra-personal factors, such as the motive for walking or willingness to walk, the condition of the built environment is a factor over which the decision-making (i.e. the decision to walk or not) individual does not have control, and, as often described in walkability studies, a factor which influences a large population over a long period of time.

**How the built environment influences walking: the quantity & the quality of walking**

The significance of the environment in influencing walking in terms of allowing or not allowing walking is mainly concerned with the role of the built environment in the process of making the choice to walk or not. As most of the correlation studies on walkability are measuring and analyzing, this concerns the *quantity*, and very often the total amount of walking activity. However, such an approach may have limitations in terms of capturing the full aspect of the built environment/walking relationship. If the view of the influence of the built environment on walking activity is broadened, there are aspects of the urban environment that can be described more accurately in terms of affecting the ‘*quality*’ of the walking activity.

The *quantity* of walking may be more related to how often the walking activity takes place. Therefore, the number of occurrences of walking determines the quantity of walking, so the decision making process of choosing to walk or not becomes the main concern when considering this aspect. And as discussed above, the allowing or disallowing influence of the built environment captures the role of the environment in this decision-making process which occurs before the actual walking activity takes place. However, as mentioned, the built environment is the scene in which the walking activity takes place. Therefore, the significance it has on walking activity is that, once the walking activity takes place, the condition of the built environment is often the dominant factor that influences the *quality* of the walking activity, determining how convenient, pleasant, interesting, and safe it becomes. Regardless of how influential the condition of the built environment is among the different intra- and extra-personal factors in an individual’s decision-making process, once the walking activity takes place, it is inevitable that the quality of walking is heavily determined by the condition of the built environment, since it constitutes the physical setting of the activity.

Therefore, it may be suggested that the various ways in which the built environment influences walking behavior could be differentiated into whether
it has a more direct influence on the amount or the quantity of walking or a more indirect influence on the behavior by affecting the quality of the activity. Factors more directly involved in strongly influencing the quantity of walking activity are the ones identified by the correlation studies from walkability research based on public health interests. In terms of this quantity aspect, the dominant factors are those that contribute more directly to providing destinations (e.g. through high level of land-use diversity and density) and those that contribute to possible and convenient access to these destinations (e.g. through good connectivity). However, there are also attributes of the built environment that do not have such strong effects, but influence the quality of the walking activity more directly. They include urban design qualities (e.g. the pedestrian-friendly design interventions often discussed in urban design literature and factors related to aesthetics, etc.), and since they have been shown as being less significant in the correlation studies on walkability, they have been less investigated in the recent walkability studies from the difficulty in relating them to the quantity of walking. Therefore, while the urban design conditions that are better described as influencing the quality of walking are more often discussed with focus and details in the literature and guidelines from the field of urban design and planning, these factors have been considered as less significant in the correlation studies on walkability. However, although these factors may be less influential in affecting the quantity of walking than the major walkability factors identified in these studies, they may also indirectly influence the quantity of walking. The level of quality of the walking activity experienced in previous walking activities may influence the individuals in making the choice to walk, especially when the perceptions are accumulated.

The aspect of the built environment as a dominant factor determining the quality of the walking activity may be related to understanding the importance of developing better knowledge about how the built environment influences walking, regardless of the issue on promoting or increasing the amount of walking. Even if the discussion about if and to what degree the built environment could influence the amount of walking is put aside, since the urban environment is the setting where walking occurs, it could be argued that almost all aspects and conditions of how the built environment is designed would affect the quality of walking activities, either enhancing or decreasing it. Therefore, it is important to develop knowledge that investigates and explains how various conditions and design qualities would affect walking.

Although the various ways the built environment influences walking activity may be described differently by emphasizing either the quantity or the
quality of walking, this does not mean that the different attributes of the built environment can be strictly classified according to this division. Some factors may influence the walking activity strongly in both aspects, but others factors may be strong at functioning in one aspect but not as much in the other. For example, although factors such as land-use diversity and density are defined as the dominant factors directly affecting the quantity of walking, they seem to be important factors also in relation to the experiential quality of the walking, (as the results of the observation study from this project indicates).

On the other hand, this classification of the ways in which the built environment influences walking could be useful in understanding the different stages of how the built environment influences walking. This is related to how individuals conduct the decision-making process and the actual walking, during the different stages throughout the walking activity. The factors influential in the process of making the choice to walk or not, whether they are directly generating the occurrence of walking activity or promoting the choice of walking over other modes of travel, are the factors described as related more to the quantity of walking. These factors are influential in the decision-making process before the actual walking activity takes place, functioning together with other intra- and extra-personal factors influencing the choice. The built environment’s influence more related to the quality of the walking has a more important function on the stage following this decision process. It comes into effect once the individual starts walking. And, as described in the previous paragraph, the result of the later stage may again become one of the factors influencing the choice of walking during the previous (decision-making) stage as a feedback process.

Walkability at the urban design level

How the built environment influences walking behavior can be understood and examined on different levels or scales. Walkability factors related to the physical environment discussed in different studies and literature range from the regional planning level, such as the provision of public transit, through the urban planning and design level, such as density and land-use diversity, and down to the micro-level of urban design and architecture. This shows both in the measurement of the built environment attributes related to walkability and in the intervention suggested for improving walkability. The most relevant factors identified from the correlation studies that deal with the quantity of walking, such as density, land-use diversity, and connectivity, are mostly measured at the urban planning and larger-scale urban design level in their
analyses. The measurement and the suggested improvement for these factors often operate at the neighborhood scale. And as far as dealing mainly with the amount of walking, it may be true that this level best captures the most influential factors.

Although this research project discusses also the walkability factors at the urban planning level, one of its main aims is to explore walkability factors at the urban design level. In both the walkability research dealing with the amount of walking and urban design theories on pedestrian-friendly design, the urban design level is where it has, relatively speaking, not yet been thoroughly investigated. While the major factors mentioned above are usually measured and discussed at the neighborhood scale, when it comes down to the micro-level of urban design and architecture, the attributes measured or discussed are often limited to design qualities such as street width, aesthetics, landscape design (e.g. presence of trees), or street furniture. And, as discussed in the previous chapter, these factors are often the ones mainly discussed in urban design literature, although the evidence behind the recommended guidelines for these factors needs to be carefully reflected on, as well as the validity of their influence on walking behavior and applicability.

What seems to be insufficient in current research on walkability is the investigation of the built environment attributes at the more detailed urban design scale (i.e. at the street and building level), and the provision of better evidence for design qualities, including both the ones mentioned above and others less explored. The major walkability factors should be measured and investigated more thoroughly at the street level as well as the neighborhood level, which would contribute to a better understanding of how and why they influence walking behavior. Also, the investigation of these factors at the urban design and architectural level is important, since how they are implemented at this detailed level by design could influence to what degree they could be effective in influencing walking behavior. For example, in cases where the degree of land-use diversity or density measured at the area or neighborhood level is the same, the effectiveness of their influence on both the quantity and the quality of walking activity may differ slightly, according to how they are designed at the street and building level in accordance with the qualities, such as design of the ground level, number and position of building entrances, design related to sidewalk-ground level interaction, building types, etc. As Jan Gehl argues, the provision of possibilities is provided at the macro level, but the battle is fought at the micro level (Gehl, 2010).
2.4 Research Questions, Aim, and Method of this Project

Challenges and tasks for research on walkability

Research on walkability is at an active but still rather early stage, strongly requiring better insight and knowledge about the relationship between the built environment and walking. In terms of the limitations and the research challenge and tasks for current research, some of the earlier studies have been discussing and focusing on issues that are practically inevitable. For example, existing studies on the environmental determinants of physical activity behavior mostly use cross-sectional designs (Saelens et al., 2003b). What is often written in existing articles is that, since cross-sectional studies do not establish causal linkage, the key challenge for research is to demonstrate that the associations of environmental attributes with physical activity behavior are actually causal, and that future studies require the use of prospective or intervention designs (Boehmer et al., 2006). However, this is an inevitable limitation in studying the built environment, since it is seldom possible to conduct a true experiment. In addition, the cause-effect relation in a more rigid sense may not be what is most important; rather, establishing interrelations is not only what is possible, but is what is important (e.g. Foucault, 2000 [1982]; Tschumi, 1996). As the correlation studies on walkability have been testing various factors of the built environment, trying to develop the measurement of
built environment attributes and analyzing their correlation to amount of walking, recent studies are increasingly addressing the necessity of understanding the complexity behind the relationship of the built environment to walking, which they point to as the main reason behind the difficulty in obtaining significant or consistent results in statistical analyses on walkability (Cervero & Duncan, 2003; Crane, 2000; Forsyth et al., 2008).

**Better exploration of the walkability factors of the built environment**

In addition to developing the statistical analyses of the correlation between built environment attributes and walking, when it comes to providing design guidelines, the kind of investigations and the factors provided in current research on walkability are also limited. They lack both the knowledge of how the factors can be realized in built form, and systematic information on what may be the most effective approach to guide population-wide interventions. To produce findings that could contribute to urban design guidelines, it is important to deal with the limited variability of possible environmental features in current studies. More comprehensive identification of various factors is required. Also, in order to conduct studies on the relationship between the attributes of the built environment and physical activity more effectively, it is essential to improve the measurement of environmental variables. There are different ways in which these environmental factors are measured in current studies. In the earlier walkability studies initiated from the preventive medicine, measurement tools for the data on environment were defined a priori, on the basis of previous findings, a conceptual model, and specific hypotheses rather than empirically through factor analyses (Saelens et al., 2003b). Specifically, there is a strong need for additional knowledge about the magnitude of the relationship between micro-level measures of the built environments and physical activity (Rodriguez et al., 2006). Accurate and efficient measurement of the built environment is a key challenge in walkability research.

With the existing studies lacking comparability and transferability in their results, better identification and measurement of the built environment is an urgent task for future research. However, in order to conduct these tasks, better insight into and understanding of the how walkability works, the complexity behind how the built environment influences walking. Trying to investigate this relationship as an interrelation, rather than focusing on identifying causal relationship, we need to understand that the influence of the built environment on walking can have different aspects according to the context of the walking
environment and the condition of the urban form. The discussion about distinguishing the notion between ‘encouraging’ and ‘discouraging’ walking would be one aspect of acknowledging the complexity of walkability. Also, in exploring various attributes of the built environment, we should perhaps also consider the difference in leverage of the factors that might exist. The factors of the built environment might vary in how strongly they influence walking and at which stage or what effect they have on walkability. Another practical challenge for walkability studies is to identify and measure the built environment factors at different scales. The factors identified and labeled under a single term may be explored and investigated more in detail at different scales, which would allow better understanding of how they function in relation to walkability, and also how they could be more accurately measured.

The complexity of walking: partitioning walking in investigating walkability

As well as understanding the complexity behind how the built environment attributes influence walking, in order to develop the knowledge on walkability, it is also important to acknowledge and understand the complexity behind walking behavior. Walking behavior will always emerge through interplay between conscious decisions, habits, social and cultural traditions and situations, and the various properties of the built environment. These factors may also vary for different walkers or different kinds of walking. In Culture: A Reformer's Science, Tony Bennett notes that, “if we are to understand how cities are used by ordinary people in their everyday lives, we need to pay attention to the differentiated ways in which their relations to urban space are organized by the urban trajectories, maps, and itineraries that arise from their differential relations to a range of economic, social and cultural associations and forms of life” (Bennett, 1998). Furthermore, although social factors influence individual behaviors directly, they also influence the relationship between the individuals and the built environment. For instance, the way in which individuals are affected by or use the built environment may differ according to social factors such as gender, age, and income. Although dividing the individuals according to these standards could support better and more detailed understanding of the relationship between their walking behavior and the built environment, this is more of a challenge for the future, considering the early stage of our knowledge about walkability. While these factors concern the complex classification of individual users or pedestrians, what could be more beneficial and practical at this stage is perhaps to consider the classification of walking activity itself.
Walking behavior is very complex, as it involves different aspects and types of activities. As shown in the introduction of the theories, studies, and discourses on walking from different fields, there are differences between them in terms of the aspect of walking activity in focus. Walking can be seen as a physical activity behavior, as a travel behavior, as personal recreation, as a social activity, and so on. And the questions to be put forward depend on the purpose of the investigation. For instance, the travel behavior aspect of walking is what makes transportation research the basis for walkability research initiated from the preventive medicine, focusing on statistical analyses. Although much of the findings and research methods from transportation research have been adapted in building the ground for walkability research, the two fields have different approaches to walking behavior, because of different perspectives and goals. While public health research sees walking more as a physical activity behavior, transportation research considers walking as one of multiple modes of travel. This difference influences the perspective on the duration of walking. While walkability research considers additional time spent walking as a healthy activity, transportation research considers walking in terms of impedance, and additional time spent walking thus constitutes a problem with respect to using other modes of transportation. In short, more walking is preferable from a health perspective, while less walking is preferable from a transportation perspective (Lachapelle, 2009). These differences and different aspects of walking must be carefully considered in research. Transportation research could contribute to the understanding of how walking could be chosen in preference to other (motorized) modes of transport with respect to certain kinds of walking behavior, but many other questions should be raised as well outside of the issue of transport itself.

While the literature from the urban planning and architecture field seldom specifies which aspect of activity or the context of walking it is dealing with or focusing on when discussing walking, the walkability research with public health interest have been relatively better at acknowledging and investigating these differences in walking. In investigating walkability, it can be argued that different aspects of walking need to be explored, because the degree of association with the built environment and physical activity may vary according to the type of walking. While simplified and limited both in categorization and refinement, medical research has provided evidence for the usefulness of subdividing walking activities. In a neighborhood comparison study, where residents in neighborhoods with high walkability reported approximately two times more walking trips per week than residents of neighborhoods with low walkability, utilitarian trips, such as walking to work
and walking for errands, were the main source of overall differences in walking trips, while walking for exercise did not differ between neighborhoods with high and low walkability (Handy, 1996). In a recent study comparing the amount of walking between areas, the difference was due to walking more for utilitarian purposes rather than for leisure (Rodriguez et al., 2006). Furthermore, several studies focusing on walking for recreation/exercise found that socio-demographic factors show a stronger association than the built environment, and that the built environment has more influence on individual behavior in terms of walking for transport or for errands (Saelens et al., 2003a).

Separating walking types is important also because attributes of the built environment may influence walking behavior in different ways and to different degrees, since a walker’s disposition and attitude may vary according to the type of walking. For instance, compared to walking for exercise, utilitarian walking shows more associations with factors such as land use mix and diversity than with factors related to the existence and condition of walking facilities. According to a study on correlates of walking for transportation and recreation purposes (Lee & Moudon, 2006a), sidewalks were associated with frequency of recreation walking only. Walking for transportation had more to do with reaching a certain place along the shortest route rather than the quality of the route (e.g. having sidewalks), while recreational walking can be more flexible and people may choose certain routes based on route qualities.

Although partitioning walking behavior is crucial in walkability research, there are difficulties in systematically categorizing walking behavior, which also appear in existing categorizations. Some examples of defined walking types used in existing walkability research are general neighborhood walking, walking for transport, walking for exercise, walking for pleasure, walking the dog, and destination walking. These categorizations are not only incomplete, but are defined on the basis of a variety of different factors, which make the categories overlapping and contradictory without being constructive or contributing to the research. Although these small steps may have been adequate in the early stages of research, further understanding requires refined definitions. For instance, it is difficult to say whether ‘walking the dog’ is recreational, for pleasure, destination walking, walking for exercise, or simply a forced activity. Moreover, the walking activity would likely be different depending on which of those characters were important in a particular situation. With this in mind, the given tasks for urban design research in developing walkability would be to develop both a better definition and understanding of the kinds of walking involved, since “walking in general”
seems to be too imprecise and contains contradictory conditions, and also to develop a more precise understanding of the properties of built form that affect the given mode of walking. For instance, if the walking to be studied has a comparatively utilitarian character, then it must also be investigated in terms of whether both repetition and other modes of transport are also available as choices. When this has been specified, the investigation can be more precise, and thereby better answer the questions at hand and provide more precise information on the factors of the physical environment that affect this kind of walking, how they do this, and in what combinations.

The research question of this project

Based on the future task for the research on walkability discussed above, this research project aims to produce better knowledge about the relationship between the built environment and walking behavior. Especially in the earlier part of the PhD project that will be presented in this Licentiate thesis, the investigation focuses on understanding the complexity of how the urban form influences walking and also the complexity of the walking behaviors that should be acknowledged when examining their relation to the built environment. Better insights into how the factors of the built environment function in influencing walking and how walking activities should be identified, classified and examined should be obtained first, in order to properly deal with the issue of developing the identification and measurement of walkability factors of the built environment, both for testing their relationship with walking for researchers, and for providing urban design guidelines for practitioners.

Through literature review and empirical study, the more specific research question this thesis investigates is to understand the relationship between urban form and walking, by carefully understanding the context and condition of the given environment, and, based upon that context, to study in detail how the different factors of the built environment appears to influence walking. The major factors identified in correlation studies on walkability will be focused on in order to investigate in greater detail how and why they influence walking, but the urban design qualities that have been emphasized more in the urban design literature are also investigated. One aim of the study is to understand how the various factors function separately and together in influencing walking, and also if there are any differences among factors in their influential power in affecting walking behavior. Another main research question in this thesis is exploring the complexity of walking behavior which should be dealt
with in understanding walkability. As discussed above, there is little information available on how walking activities could best be classified and measured for effectively understanding and testing their relation to the built environment. In this thesis, through empirical study, the differences between walking activities are explored, both in terms of how they differ in their nature, and also in terms of how according to that difference, their relation to the condition of the built environment in being influenced may also be different.

The aim & method of this project

Aim & approach

While a large part of recent studies on walkability have focused on proving correlations between attributes of the urban environment with the amount of walking through statistical analysis, this project has taken a rather different aim, with a different methodological approach. While recent studies have often experienced difficulty in proving such correlations and, even more importantly, in developing productive policy due to lack of understanding of the complexity underlying this relationship, this project aims to gain knowledge about and insight into this complexity through an explorative study of walking behavior. Based on the existing findings on the built environment’s influence on walking activity, it aims to investigate not only whether or not different attributes of the built environment influence walking, but also, and more importantly, why, how, and when they do so. This is done through detailed investigation of both the built environment and the walking behaviors with regard to their complexity.

What this project aims at contributing to is not a direct suggestion for the best possible quantification or the practical measurement of built environment attributes that leads to calculating the walkability of an area/neighborhood. While many walkability studies (such as Lee & Moudon, 2006b; Forsyth et al., 2007 and many others that deal with the amount of walking) are searching for ways to simplify the built environment-walking relationship, so that it can be easily measured, this project, especially the observation study combining also a qualitative method, tries, conversely, to subdivide the built environment-walking relationship. Although it may seem to go in the opposite direction compared to the existing walkability studies, it may be argued that through investigating these details, the knowledge gained here could contribute, both directly and indirectly, to assisting the development of a measurement of walkability as well. Considering the lack of knowledge about the complexity underlying the built environment-walking relationship and how the current
research is pointing it out as the reason for the difficulty in quantifying the walkability factors, we may first need better understanding of the complex relationship between built environment and walking before we can simplify them, in order to either prove a correlation or measure walkability.

Also, another important reason for the method and content this study has chosen is that it not only aims at contributing to the development of the existing (quantitative/statistical analysis) walkability studies, but also aims at producing knowledge that may be useful in the planning and design process, where the current walkability study findings often lack applicability, especially when it comes to the scale at which urban design operates. Although the attempts to suggest a rather simple and practical way of measuring the built environment which can reflect an overall walkability of an area may be useful as an easy assessment of significance of the built environment conditions that disallow or hinder walking (which is often the case in the North American urban context), they are weak in capturing exactly how and why certain conditions of the built environment influence walking behavior, especially different kinds of walking behavior. This is critical knowledge if we wish to build and design the built environment with awareness of the potential influence it may have on walking activities.

**Method & methodology**

In order to investigate the research issues in walkability research discussed in the previous chapters and to deal with the research questions of this project, one important aim of this project is to provide a system for methodology criticism in conducting research on walkability. In order to deal with the weakness of the results of the existing studies, such as inconsistency in the statistical analysis results in proving correlation, this project has combined a qualitative approach with the existing quantitative research method of walkability studies. The qualitative method is combined in the collection of data relating to walking behavior through an observational field study. Dealing with both the built environment and the ‘people’, the empirical study from this project combines the observation method often used in studies on urban form with the anthropological approach in observing human behavior. In the treatment and analysis of the case and the data, the methodology from the existing walkability studies is also reflected. Therefore, this project has combined different approaches and methods in both collecting and analyzing data and deriving knowledge from the results in its empirical study. Added to the fact that the project is trying to develop a system of criticism of both the
ideals and the research method in walkability studies, the method this project has used may be called an explorative one.

The methods of the observation study were chosen to combine different approaches and perspectives. It includes the observation of the physical environment, as many of the studies from the urban design fields do, but the more important focus is in the observation of the walking behaviors. Being an explorative study on walking behavior, it is different from the more common studies on walkability in that it has not measured the objective amount of walking done by the residents living in the areas, usually measured by the time spent walking. Instead, at the stage where the project is currently at, by obtaining hard data on real behaviors of walking in different situations, it tries to provide a detailed description of the walking behaviors and their pattern in each area and to gain insight into the complexity of walking activities and their relationship to the built environment.

In the empirical study, the walking behaviors of the individuals of the areas were documented in detail, based on observation on site. Combining a qualitative and a quantitative method, it investigated the walkability of the areas and the walking behavior of the pedestrians in the areas by observing:

- the perceived relative level of pedestrian density and its patterns
- the route choices made for the walking trips by tracking pedestrians
- the details in the walking behavior during the walking activity tracked
- the presence of different types of walking activities taking place in the area

It aimed at observing the study areas, not only in their detailed condition of the physical environment, but also in how the areas function as the setting for walking activities, by observing who walks where and when, what kind of walking activities occur, what patterns could be found in them over different times, days, and seasons, what happens during the walking activities tracked and observed, and how the condition of the built environment seems to have influenced them. Also, the issue of partitioning walking activities was one important aspect the observation study tried to investigate.

The gathering of the data by observation on site over a period of time and the method of documenting the observation in the form of field notes is influenced by qualitative research method. In the collection of data, the methodology of the field of anthropology e.g. participant observation, has also had an influence. However, since the data relates to different aspects and details, the data itself is both qualitative and quantitative. It is similar to the data from the quantitative research as well, e.g. the data on the perceived amount of pedestrians, the degree of use of street sectors, etc. Then, the
analysis of the (observation field study) data combines different methods, and the influence of the quantitative method is found in the analyses, being similar to existing walkability studies. These include the analyses regarding the perceived relative amounts of pedestrians or walking activities and the use of street segments. Also, the design and the analysis of the data through comparing the data between the three neighborhoods is similar to the neighborhood comparison studies often used in the statistical research in existing walkability studies.

Since this project includes different methods and aims (regarding research questions), the analysis or the generalizations from the case study are not statistical, but more analytical and based on reasoning. In deriving knowledge from the results of the field study, the principles used in the generalization in this project is also not limited to a single one, but have combined and used different ones, according to the type of knowledge or the research question it tries to seek and answer. Such a combination of different strategies is similar to what is often done in architectural research. One example is the Grounded Theory, a case study methodology which merged qualitative field study methods with quantitative methods of data analysis (Glaser & Strauss, 1967). As this project does, different modes of generalization are often combined in research. In the book Sociological Practice by Derek Layder (1998), Layder argues that theory testing and theory generating are combined in practice. Such a combined approach is named “adaptive theory approach”.

Reflections on the observation study from an anthropological perspective

In the planning and conducting of the empirical study, the issue of how observation study is conducted in the field of anthropology has also had an important influence. By learning how field studies are conducted in anthropological studies and through the literature from the field dealing with the research issues in conducting anthropological field studies, valuable assistance was gained in how to deal with the delicate issues that may be faced in conducting an observation study. This relates to the awareness of the influence ‘I’, the researcher, have on the field study, which is related to the concept of ‘reflexivity’.

Although it may be an unrealistic aim to conduct “fieldwork with the ideal of objective observation”, “the personal cannot be so easily separated from intellectual endeavour” (Okely & Callaway, 1992). How “I” read others, which determines the result of my research, is dependent on who “I” am, what “I” know and think. Okely and Callaway explain that “the autobiography of
fieldwork is about lived interactions, participatory experience and embodied knowledge” (Okely & Callaway, 1992). In relation to this issue, I have reflected on how I am participating in the field, and whether the observation I am conducting could be considered a participant observation. If seen from the perspective that “in a sense...all social research takes the form of participant observation that it involves participating in the social world, in whatever role, and reflecting on the products of that participation” as described by Hammersley and Atkinson, it may be considered a participant observation in a sense (Hammersley & Atkinson, 2003).

Another issue that is related to the “I” in conducting fieldwork is the issue of description vs. interpretation. I may think I am ‘describing’ what I have observed, but at the same time, I am “interpreting” what has taken place. The interpretation is in the text that analyzes what I have observed, but also in the text that I might feel is objectively documenting the incidents that have taken place, since I am making the choice of what to be noted and what not. In any case, I would not be able to fully document everything that has happened in the field on the time of my observation, but I would be writing on events that I have “selected” as worth being noted.

And in dealing with the “field notes”, these may be seen as more of “raw” data, and “as a record that helps prevent bias and provides data that can be used for other ends” (Sanjek, 1990). However, they are also texts that have gone through selection and interpretation by the researcher. The field notes help me reconstruct the scene, and especially as time passes from the point of fieldwork, their role in this reconstruction would play a bigger role as my memory retreat. The interplay between the field notes and my memory may be a unique process, which is limited to myself to some extent. Sanjek describes the field notes saying: “It’s not a random sample, it’s much better designed. But because the design and values are in my head, it’s dead data without me.” (Sanjek, 1990). The literature from anthropology as presented here allowed reflection and awareness on both the importance and the limitation of the researcher as an individual conducting the empirical study.

**The “Swedish” context of the empirical study**

Since the empirical study was conducted in Stockholm, Sweden, it responds to one of the main aims of this research project, which is to translate the walkability research into the Swedish context, examining how it corresponds and rejects the findings from a mostly North American context, and
investigating what walkability in the Swedish context would be. This is related to the difference in the conditions of the urban form, as well the difference in the cultural and geographic context, which may also have a strong influence on life style, values, and walking behavior as well. From this perspective, this study is aiming at contributing to the knowledge and practice for Swedish urban planning and design in terms of walkability.

However, it could be argued that this empirical study based in the Swedish urban setting, with its rather distinct character, may in turn contribute also to the broader research field on walkability. One advantage of the Swedish context is that its urban form, generally speaking, creates rather good walkability conditions, compared to the North American context and many other places. Another advantage is that the cultural and social context supports a higher motivation for walking, once again speaking in general terms, than other more automobile-oriented cultures. Also, there is support for walking through the generally good infrastructure of the public transport system, including a good level of security and a cultural context that supports the use of it. Together, these settings allow good conditions for observing how the built environment, especially factors at the urban design level, influences walking, since other intra- and extra-personal factors are impeding walking to a lower degree. This is since urban design factors, especially in their aspect of influencing the quality of walking, would be difficult to examine if other factors, such as the infrastructure at the larger scale and other intra- and extra-personal factors that often have more influential power, affect walking, often by hindering walking. While the existing studies on walkability, mostly conducted in the North American context, have been examining the situation where the poor degree of the built environment factors have negatively influenced walking, a study such as this project makes it possible to examine the urban design factors on a detailed scale that could not be examined in those situations, and also examine the urban planning and design factors in terms of how they may actually have a positive influence on walking in a certain situation. With this project, it may be possible to, perhaps more easily than projects from other contexts, examine not only how walkability does not function but also how walkability actually functions by observing the case where it ‘works’.

This reason for examining the factors of urban form where other factors are supportive of walking may also be related to the seasonal context of when the observation study was conducted. Sweden may present a context where the season is a significant factor, as it has a long winter season with very low temperatures, few sunshine hours, and a high amount of snowfall, which
creates a difficult or unpleasant setting for walking. Since the observation was conducted mostly between May and June, it took place during the best weather conditions for walking, and all of the observations were carried out during sunlight hours. Since these months have the best weather conditions in terms of sunlight and temperature – compared to the long months of difficult winter – it may be estimated that it is the time of the year when the willingness to carry out outdoor activities, including walking, is the greatest. Although additional observation was conducted during a few occasions between October and February following the main part of the observation, it was not sufficient in quantity to enable discussion of the influence of seasonal variance. This may instead be more thoroughly examined at a later stage of the research project. However, varying weather conditions, both rain and sunshine, were investigated in this observation.
3 The Empirical Study
3.1 The Observation Study

- Description of the Method and Data

Here follows a detailed description of how the field study was conducted on site and how the results were documented. The observation study was conducted in three areas in Stockholm. Since an important aim of the field study was to observe the individuals’ walking activities in the urban environment immediately surrounding their residences in order to observe walking behavior as part of everyday life, the areas chosen are all residential neighborhoods, although there are differences among the areas in terms of urban morphology. Two of the three selected areas, SoFo and Södra Station, are located in the inner city of Stockholm, whereas Hökarängen is situated in the southern suburbs of the city. The selection of these areas allowed the opportunity to observe, through neighborhood comparison, the difference in walkability between a suburban area and inner-city areas and also between inner-city areas with different conditions and characteristics in the built environment.
For the three neighborhoods studied, some area boundaries were set prior to conducting the observation study in order to define the areas to be studied. These boundaries defined the area by its urban character, shaped by its planning, development or redevelopment and not necessarily by its size. The areas were selected in order to observe how the different areas are used as the setting for walking activities, but also to define the neighborhoods where the walking behavior of the individuals living there was investigated. Therefore, the areas were defined so that the population number in each area is similar. This is the reason why the boundary set for the suburban neighborhood of Hökarängen covers a much larger area than the other two neighborhoods in the inner city. The field study aimed at investigating the walking activities of the individuals in the area immediately surrounding their residences, mostly starting and ending from their home address points situated within the set boundaries. Therefore, the boundaries are not identical to the boundaries for the environment that affect the individuals’ walking behaviors. In this sense, they were rather loosely defined during the actual observation on the scene, especially in tracking the walking trips when the tracking often continued to a certain extent even outside the set boundaries.

The site observation was conducted by the author alone for more than 30 days in total. The main part of the observation was carried out intensively, every day including weekends between 11 May 2010 and 2 June 2010, and an additional 10, or slightly more, observations were conducted between June and September 2010 to further complement observations conducted on weekends/holidays and in different weather conditions, such as rain. The observation included both working days and weekends and holidays, and covered the hours between 7am and 8pm. Due to the season when the observation was carried out, the hours all fell between sun-rise and sun-set, and for the majority of the days of observation, the weather conditions were remarkably pleasant for walking. In terms of observation time spent within each area, Södra Station and SoFo were observed for a similar length of time, while both a higher number of occasions and hours were spent in Hökarängen, since the size of the area was larger and fewer walking trips were available for observation due to the lower pedestrian density.

The observation examined both the built environment and the walking activities as combined walking situations. That is, as well as observing the detailed condition of the physical environment at street and building scale, the amount and pattern of pedestrian movement in the given environment was simultaneously observed. Although a precise count of the number of pedestrians was not conducted, the relative amount of walking trips or
pedestrian density was documented. Relative level of pedestrian density here refers to the comparative amount between the areas, between different times of the day or days of the week, and also between different streets or segments within an area on a given occasion. Although these measurements are based on relative perceived amounts, since all of the observations were done by a single observer, the documentation of the relative amount of walking trips were sought to be carried out as reliable as possible. Thus, the observations examined the walking behavior based on the built environment, for instance comparing the different areas with different conditions of the urban form and also examined how the streets may accommodate or influence walking activities differently according to the condition of urban design factors. Since this method limits the investigation of the condition of the urban form to very local observations, quantitative analysis of the more structural properties of the areas urban form and built environment factors has been compensated for (see Section 3.3).

While the part of the observation described so far still resembles the investigation of walkability or pedestrian-friendliness in urban design research or walkability studies, the other main part of the field study was the tracking of walking trips on site, which is more unusual for a study of walkability. Since this project aims to develop a better understanding of walking behavior, and especially to classify walking activities, the more significant part of the field study was in the detailed observation of individual walking trips. Although the tracking of the pedestrians was not initially planned before the observation was actually conducted, during the observation on site, it became clear that tracking the walking trips was rather inevitable in order to make a thorough examination of individual walking trips, and this thus became a significant part of the observation study. In the selection of the walking trip to be tracked and observed, mainly pedestrians who seemed to be residents of the given area were chosen. In terms of age group and gender, the choice of the walking trips was made randomly, but with concern for allowing variety. However, tracking the walking trips of elderly persons and children was often not possible, for reasons of difficulty with slow speed or the possibility of psychologically offending the pedestrian. Instead, the walking activities of these age groups were documented based on the location in which they were observed.

The preferred case for observation was tracking a walking trip of a resident, starting from the home address point, but since this was not always the given possibility, many of the walking trips tracked and observed are partial. If the walking trip started from the home address point within the area, they were often tracked beyond the set boundaries to the destination point
(including transfer to another mode of transport), unless the destination was too far outside the set boundary. For walking trips returning to the home address, the tracking started more often from within the area, partially covering the walking trip as a whole. Therefore, approximately 25% of the walking trips that were tracked led from their origin to the destination, and the rest are partial. During the entire observation, approximately 2000 walking trips were tracked and observed in the three areas. Due to the significantly lower pedestrian density in Hökarängen compared to the other two areas, the trips tracked in Hökarängen are fewer in number (approximately 500) than in SoFo and Södra Station, despite the fact that more days and time were spent in Hökarängen. The number of observed walking trips in Södra Station is also slightly less than in SoFo, due to the difference in the pedestrian density between the two areas (with higher density in SoFo).

The on-site tracking of walking trips allowed not only recording of the data on the origin/destination points and the route taken, but also observation of details of the walking trip being tracked, including specific and detailed route choices at street-level, speed, facial expressions, attitudes, and other details. Combining these different data obtained during the tracking allows assumption and analysis of the purpose of walking, as well as the reason for the route choice and the possible influence of the condition of urban form on the given walking behavior. It allowed the observation of how, when, where, by whom, and why walking activities are carried out. Such an investigation not only supports better understanding of walking behavior in general, but also allows the comparison of different kinds of walking activities. From the field study on site, although a direct inquiry or interview was not conducted, the observation alone often produced rich material for determining or assuming the purpose or type of walking, e.g. the destination, the time, the attitude and speed, the dog accompanied, the grocery bag being carried, etc. How the walking activities differed in their route choices according to the purpose of the trip, for example, was one of the important parts of the data that allowed the classification of the walking. While current research does not yet provide systematical knowledge on how the categorization of walking activities can best be done, in this observation study, the walking trips observed were documented with their specific purposes or destination, e.g. walking to the public transit, walking to school, walking the dog, walking to a specific type of retail outlet, etc.

The documentation of the observations is mainly in the form of field notes. During the observation, since the tracking the pedestrians constituted a large part of the field work and required care in order to not offend the pedestrian
being observed, photographing or filming was avoided during most of the observation, and photographs of the site was taken on separate occasions following the main part of the observation. During the observation, simple, short notes were taken regularly (at least once every hour) on site regarding the condition of the area, both in terms of the built environment and pedestrian movement. The notes on the walking trips tracked and observed were also briefly noted after each occasion or after a few occasions, and for trips longer than a certain distance, the route was drawn on small maps prepared and carried during the observation for documentation on site. The notes and route maps taken in the field were mostly for the purpose of recollection of the observation, and the proper field notes were written up thoroughly to cover the observed data over several hours every day after returning from the site. Therefore, the field notes have become an extensive database with a lengthy text complemented by notes and routes drawn on maps.

![Figure 3.1 Example of the handwritten field notes and the route maps drawn on site](image-url)
3.2 Results of the Observation Study

– Summary and Examples from the Data

To further clarify what the result data from the observation contains, part of the data will be presented. First, a few examples of the observation records for the walking trips tracked and observed will be presented to show in detail what the observation data contains. After examples of individual walking trips from each area, the general content of the observation results from each area will be briefly described. This contains the information about overall walking behavior patterns and the use of the areas as a setting for walking in each area. The examples of data on individual walking trips consist of a direct presentation of the texts and route maps from the field notes, and the general description of the areas are a summary of part of the field notes. As discussed in the earlier parts about the method used in this project, the data from the observation study may inevitable include in part the interpretation of the observer. While what is presented here is more of a direct description of the results of the observation, the analysis of the data, especially in relation to the condition of the built environment, will be presented in the parts following this chapter. The description and a first-hand analysis of the data are presented in Chapter 3, and more reflective interpretations and discussion will continue in Chapter 4, the Discussion chapter.
Examples from the field notes on individual walking trips tracked and observed

Case #1 Hökarängen

May 27, 2010 Thursday around 4.30 pm. (from the subway station to an apartment)

From the south exit of Hökarängen subway station, a pedestrian coming out from the station was chosen and observed by tracking the walking activity. It was a young man (estimated age around 18-25), dressed casually, wearing a cap, and carrying a bag. He started walking towards the west, walking on the pedestrian-only path across the green area, which is the shortest route to the residential buildings in the southwestern part of the area. The walking speed during the first minute from the station seemed to be slightly faster than the average for other people at this time of day. Soon after starting to walk, he took out a mobile phone and started a call. The speed of walking decreased when the call started. There were a few other pedestrians (around six) walking on the same path in the same direction, who were mostly walking behind him (all of whom emerged from the subway station). As he started to walk more slowly, due to the call on the mobile phone, he moved slightly more to the side of the sidewalk in order to provide space for other pedestrians to pass by, and also looked behind 3-4 times while talking on the phone, to see if there were other pedestrians coming behind him. The looking back occurred in particular when
another pedestrian passed by him from behind, walking ahead at a faster speed in the same direction.

At the point where the pedestrian-only path meet the car street (Pepparvägen), he walked along the spontaneously developed trail on the lawn, instead of the properly paved path, which was also the route taken by the pedestrians walking ahead of him. There was no car passing on Pepparvägen at the time when he was crossing the street, which may be due to significantly less car traffic on Pepparvägen at this time caused by construction work at the north end of the street, partially blocking car traffic. He looked briefly in both directions, checking for car traffic, crossed the street and continued on the pedestrian path running through the green area between Pepparvägen and Tobaksvägen. He was still talking on the mobile phone, but the call ended soon after he started walking on this path. The walking speed slightly increased after ending the call. After ending the call, he did not look back or look to the side during the rest of his walk along the path, and seemed to only look straight ahead while there was no other pedestrian close to him at this point.

Although there is a paved pedestrian path that leads to Tobaksvägen, he walked on the spontaneously developed trail made by people walking on the green space towards the back of a building on Tobaksvägen. From there, he continued along a narrow pass between the building and some rocks, a pass that was observed to be used in several other walking trips as well (shown in the photograph in Figure 3.2). Since this area was covered by tall trees and had no lighting, it was rather dark in this narrow passage, even though it was still daytime, but the person seemed to be well acquainted with the path, and continued walking fast behind the building, making a turn towards Tobaksvägen on the trail developed next to the building. When arriving at Tobaksvägen, he looked out for car traffic, and while doing so, he also looked behind himself and noticed the author. Apart from this, the pedestrian did not look to the side during walking, neither at the green area nor by the residential buildings. There were cars passing on Tobaksvägen at this time, and he stepped down from the sidewalk in order to cross the street. There was a car passing and he stopped. The car seemed to have noticed the pedestrian, but passed first, and the pedestrian crossed (jaywalked) the street to the other side of Tobaksvägen. He continued at a fast speed for a few meters in direction south on Tobaksvägen, and then entered through one of the entrances of the residential building.
A walking trip of a person coming out of the large grocery store on Folkungagatan was chosen and tracked. It was a woman, estimated to be in her forties, dressed casually and carrying a bag of groceries. She continued along Folkungagatan eastwards, where there were many other pedestrians walking in both directions. She was walking at the average speed of the other pedestrians, which was not very fast, keeping pace with the others. She occasionally looked at other pedestrians and turned right at Östgötagatan without crossing the street. She was walking on the right side of the sidewalk and on the first block of the route on Östgötagatan, she looked at the window display of the store on the ground level while walking, which a few other pedestrians walking at the same time were also glancing at. She walked at a speed that was not slow, but there was a pedestrian walking at high speed in the same direction who passed by her. In doing so, since there were also other pedestrians walking in the opposite direction in this sector, the pedestrian passing her came very close to her, making her slightly tilt her body when noticing this.

She continued down Östgötagatan, crossing Kocksgatan, and, while crossing this one-way car-street, briefly looked to one side for cars passing, and seeing one that had already stopped at the intersection in order to let the pedestrians cross, she also crossed the street, maintaining the same speed she had when walking on the sidewalk. While crossing the street, she did not look for cars, but mainly looked forward, seemingly looking at other pedestrians coming in the opposite direction. When passing the block between Kocksgatan
and Åsögatan, she crossed the street (jaywalked), quickly watching out for cars. While continuing down Östgötagatan, she was looking at the window displays, and the products frequently displayed in front of the stores on the sidewalk, now walking at a slightly slower speed than other pedestrians passing by. She stopped once in front of one store that had products displayed on the sidewalk, looking closely at the goods displayed for about 15 seconds, and then continued to walk.

She took a left turn and continued eastwards on Skånegatan, walking on the northern part of the sidewalk. There were also many other pedestrians on this street at this time, and also many people sitting at the restaurants and cafés located here. She continued walking at a slightly faster speed, continuing to look to the side at the buildings on both sides, although the street is wide and the building on the other side is at a certain distance. There were parts, especially in front of the restaurant or the café where tables are put out on the sidewalk (with people sitting at this hour), where the space left for pedestrians on the sidewalk was too narrow, and the pedestrians walking in the opposite direction had to step aside or stop for her to pass by. On this street, there were also products displayed on the sidewalk belonging to the stores on the ground level, which she seemed to look at while passing. She continued to Nytorpsgatan and then turned left. She walked a few meters northwards on Nytorpsgatan, and went in through the entrance of one of the apartment buildings on this street.

Case #3 Södra Station

May 31, 2010 Monday around 7.30 pm. (from the apartment to multiple destinations)

Figure 3.4 Route choice map of the given example & photograph of the path
A walking trip starting from the entrance of a residential building on Fatburs Kvarngata was tracked and observed. The person was a man, estimated to be in his thirties, dressed casually and pushing a stroller with two very young children. He was also carrying a plastic bag. There were less than ten pedestrians on the entire street during this time. Emerging from the apartment building, he turned right and walked in a westerly direction on Fatburs Kvarngata. After approximately 50m, he arrived at a recycling container, where he stopped, took out some clothing from the plastic bag and put it in the container. Then he turned and walked back the same way he came, passing the entrance of the apartment he had emerged from. He continued walking all the way down Fatburs Kvarngata, which then becomes Fatburs Brunnsvägen. Since there were not many pedestrians at this time of day, he only passed very few pedestrians and, since the street is wide, the other pedestrians moving in the opposite direction passed by at some distance, and there did not seem to be any direct eye contact or any other interaction between the pedestrians. The person observed was walking in a purposeful manner, and the speed was not slow, but also not very fast, since he was pushing a baby stroller. Without looking to the side, but mostly looking straight ahead, he rapidly continued down to Swedenborgsgatan.

He crossed the street, watching out for cars in both directions, waiting for a bus in the opposite lane to pass, and then crossed the street, which had not many cars passing at the time. He turned left after crossing Swedenborgsgatan, and again turned right quite soon, walking in an easterly direction on the pedestrian street leading to and through Farbursparken. There were many more pedestrians walking on this pedestrian street in both directions than on Fatburs Kvarngata or Södermalmstorg. Since the path leading through Fatbursparken is rather narrow in relation to its high pedestrian density, there seemed to be a lot of eye contact and less distance between the pedestrians passing each other along this part of the walk. Since the pedestrians on this street were walking in a very purposeful attitude at a rather fast speed, the pedestrian being observed was also walking at a similar pace. However, at the end of this path at the steps leading up to Medborgarplatsen, the walking pace seemed to slow down. The Medborgarplatsen square was full of people at this time of day, partly due to the long hours of sunlight at this season and the pleasant weather conditions on this particular day. The person being observed seemed to have come to the square for a stroll, and continued to walk very slowly around the square, occasionally stopping to look at the activities going
on, or to talk to his children. This continued for more than 5 minutes, so the author returned to the area under observation.

About 20-30 minutes later, the same person happened to be observed again at the intersection of Swedenborgsgatan and Fatburs Brunngsgata, and was again tracked from that point. Using the same route as before, this trip was directed towards the entrance of the apartment building from which he had initially emerged. On Fatburs Brunngsgata, continuing on Fatburs Kvarngsgata straight ahead, he walked at a higher speed than he was walking on Medborgarplatsen. By observation, he did not seem to be carrying any additional items compared to when he was last observed at the square.

Summary of the Overall Observation in Each Area

Hökarängen

![Map of Hökarängen](image)

*Figure 3.5* Map of Hökarängen
Hökarängen had the lowest pedestrian density in the streets of the three neighborhoods. It is a quiet suburban neighborhood and the area is mainly residential, apart from the ‘shopping center’, centrum, where a small square, some shops, and the subway station are located. Even the centrum had a low amount of activity and few pedestrians, with the street where the shops are located often being empty. The grocery store attracted the most visitors among the few stores there, but the small square had only few visitors and users at most times. One reason for this central part of the area being quiet and empty may be that, although the subway station, which has users consistently during most hours, is close to the centrum, very few of the pedestrians emerging from the subway station visit or pass the centrum. While there are two exits from the subway station, the one that leads to the central square is used by relatively fewer people than the other exit, which is closer to most of the residential buildings. This exit is not directly connected to the centrum, but to the pedestrian paths that are the only or the shortest routes to the residential buildings from the subway station. While there is a limited number and variety of shops in the shopping center, compared to the areas in the inner city, the area is used for very few purposes other than residential, e.g. retail, service or office uses.

Figure 3.6 Hökarängen centrum (left) / Lingvägen (right)

The size of the area is the largest of the three, but the number of walking trips available for observation was the lowest. Because of this, it was difficult to both observe patterns in the pedestrian movement and find walking trips to be tracked and observed. The difficulty in tracking walking trips was partly due to the simple problem of finding pedestrians to track, especially during day
time when the streets in the area are largely empty, and partly due to the fact that since the number of pedestrians was very low during most of the hours, it happened several times that the pedestrian being observed became aware of being tracked and the observation had to stop in order not to offend the person being tracked. At the beginning of the observation in Hökarängen, most of the observation took place near the centrum and the main car streets (with sidewalks), as shown on the map of the area. However, these streets had very low number of pedestrians to be observed and tracked, and the number of cars passing in the street often outnumbered the number of pedestrians. As the observation proceeded and the tracking of the pedestrians accumulated, it was shown that the walking trips in Hökarängen took place relatively less often in the streets with cars, but was rather concentrated to the pedestrian paths that connect the areas between these car streets.

Hökarängen has a large amount of green areas, and green spaces of different kinds fill most of the space between the residential buildings. The pedestrian paths along which walking trips are concentrated either run through green areas with small woods or along the in-between green spaces, most often in the form of lawns. The pedestrian paths are not only car-free, but also usually separated from immediate contact with buildings, so that a park-like rather than an urban walking environment is created along these paths, which is reinforced by the low pedestrian density during most hours. Not only along these pedestrian paths, but also in most of the streets, there is space (usually in the form of a lawn) between the sidewalk and the buildings. Since the pedestrian paths and the sidewalks are often next to green space, spontaneously developed trails on the green spaces were observed in numerous locations throughout the area, made by people crossing over the lawn in order to make a shorter distance route. These were usually made on the corners of streets or near residential buildings, cutting across to the entrance of the buildings instead of following the route provided by the paved pedestrian paths. The use of these trails was observed very often, and for all of the different purposes of walking, e.g. walking to school, walking to the subway station, walking for pleasure, walking the dog.

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2 While this happened quite often in Hökarängen, during the observations in SoFo and Södrastation it happened only once or twice in each area.
Figure 3.7 Photographs of the pedestrian trails in Hökarängen

The general walking speed in Hökarängen was estimated to be slightly faster than in the other areas. The facial expressions and general attitude during walking was interpreted as more neutral and less open, and there was less direct interaction between pedestrians, such as eye contact, greetings, or verbal exchanges. Most of the walking activities were conducted in what was interpreted as a highly purposeful manner, and with very limited interaction with other pedestrians, activities or the built environment. The observed walking trips generally gave an impression of being more of an ‘inevitable travel activity’, especially compared to the walking trips in SoFo. One reason for the walking trips being made in a purposeful and unengaging manner may be due to the distribution of different walking purposes in the area. More than 90% of the walking trips observed in Hökarängen were utilitarian walking, such as walking to the grocery store, walking to the public transit, and walking the children to school or the daycare center. Among these utilitarian trips, walking to the subway station amounted to more than half of the walking trips. Other purposes of walking observed included some trips of walking the dog, but very few cases of walking for pleasure. Also, more than 90% of the trips were conducted walking alone.

In daytime, between commuting hours, the pedestrian density was significantly lower than during the morning and evening commuting hours, and children and elderly persons walking for pleasure or exercise made up the largest part of the walking activities during these hours. However, the walking trips of these age groups were for the most part not tracked, for reasons explained earlier, and therefore were only documented by the location in which they were observed. These walking trips, furthermore, were more
evenly distributed throughout the area than walking trips in general, which showed a strong pattern or concentration to and from the *centrum* and the subway station. As in the other two areas, there was an increased amount of walking trips by residents during commuting hours, especially in the morning. One interesting fact was that the peak hour for walking trips during the morning commuting hours was between 7 am and 8 am, one whole hour earlier than in the areas in the inner city, which may be due to its suburban location. The walking trips during these hours were also concentrated to the pedestrian paths leading to the subway station. However, the concentration was not as high as in the other areas in terms of pedestrian density relative to other areas, and this may be due again to the larger area size. Also, while many trips walking small children to school or day care center were observed during the commuting hours, these were relatively fewer than in the other two areas. Together with the fact that a large number of children being brought to school by car were observed in the area, something rarely observed in the other areas, this may indicate that this particular walking activity is more often replaced by car travel in Hökarängen than in the other areas.

During weekends, there was an even lower amount of walking trips than during weekdays. While there was a concentration of walking trips at least during commuting hours which created a lively environment in certain parts of the area during weekdays, during the weekend the area was generally very quiet, with very few pedestrians during most hours. In the afternoon at weekends, almost half of all walking trips were made by residents carrying grocery or similar items, and took place either from the shopping street or from the subway station. Therefore, just as on weekdays, trips to and from the subway station made up more than half of all walking trips. There were very few walking activities for pleasure observed. Also, in contrast to the other areas, even at weekends there was a lower ratio of walking trips in company than in the other areas. Furthermore, both during the weekend and weekdays, it was difficult to find a pedestrian who did not seem to be a resident of the area. Also, although this may be due to the area being larger in size than the other areas, there was almost no observed case of a walking trip that extended beyond the set boundary of the area.
Södra Station

Figure 3.8 Map of Södra Station

The area of Södra Station has a character of a quiet and calm residential area, despite its central location in the inner city of Stockholm. Being a redeveloped area, the area within the set boundary gives a feeling of being slightly separated from its surrounding context. The inner part of the area is mainly residential, with a park and schools and daycare center for small children. The area is designed to exclude most car traffic and also has a lay-out with streets on different levels as well as a general design that hinders visibility and orientation. The segregated feeling of the neighborhood is intensified by the absence of car traffic and the low pedestrian density in the area. Compared to the surrounding areas and the streets set as its boundary in this study (Swedenborgsgatan, Magnus Ladulåsgatan, Rosenlundsgatan), there were significantly fewer pedestrians in the inner part of the area during most hours of the observation. The streets set as the boundary of the area had high pedestrian density during weekdays, most probably since these streets had mixed use at ground level, including office buildings, and also Södra Station, an important commuter train station (giving its name to the area) and many bus routes passing by.
The inner streets of the area, such as Södermalmsallén or Fatburs Kvarnsgata, had relatively low pedestrian density, especially during daytime on weekdays. The average number of pedestrians in the entire sector was less than 10 at each moment during the daytime (between commuting hours, except lunch hours), and these streets were often observed to be entirely empty. The walking trips during these hours were mostly resident trips, which either started from or ended at the home address points within the area. Also, more than approximately 90% of them were trips walking alone, and the walking speed for the most part indicated a purposeful attitude. The route choices of these trips generally indicated a preference for the shortest route possible, and there was a low amount of direct interaction with other pedestrians, such as eye contact or greetings. One reason for this may be that since the main streets within the area are car-free, the space for pedestrians is generous, especially given the generally low pedestrian density in the area, creating distances between the passing pedestrians that may impede interaction between them.

Figure 3.9 Fatburs Kvarnsgata (left) / Södermalmsallén (right)

This area had the largest increase in pedestrian movement during morning commuting hours among the three areas. There were many observed walking trips to work or school, going in very different directions without any strong pattern. Among the commuting (walking) trips, there were relatively few trips going to the bus stops or the commuter train station within the area, but the majority was trips going beyond the set boundary of the area. There was a large number of trips observed taking small children to school or daycare center (the trip most often continued to go on to work afterwards), and, since these facilities were concentrated on Södermalmsallén, this street was where these walking trips were concentrated. The hour between 8 am and 9 am was when Södermalmsallén and Fatburs Kvarnsgata had the highest amount of
walking trips out of all the hours observed. It was also the hour when the walking trips of non-residents passing Södermalmsallén (which seemed to be commuting trips) were noticeable. Since the walking trips with children not only contributed to higher pedestrian density, but also often generated sounds of conversation within the family and also greetings between people near daycare centers and schools, the liveliness of the area increased significantly during this morning hour, a feature that could not be observed at other times, either on weekdays or at weekends.

During the weekends, the overall amount of walking trips was estimated to be lower than during working days. The inner streets of the area were quiet, with pedestrian density slightly lower than on weekdays, with the streets being occasionally empty. Most of the walking trips were walking to do grocery shopping or returning home, with many of the pedestrians carrying shopping bags. Walking trips for pleasure were relatively few in number. The walking speed was estimated to be significantly slower in general compared to weekdays, and trips conducted in the company with others were relatively more frequent. However, the facial expressions or the attitude during walking was not significantly different from weekdays, being quite neutral and not very interactive with other pedestrians. Another difference compared to weekdays was that the difference in pedestrian density between the inner streets of the area, such as Södermalmsallén and Fatburs Kvarnsgata, and the surrounding streets, such as Swedenborgsgatan, Magnus Ladulåsgatan and Rosenlundsgatan, significantly decreased at the weekend.

Södermalmsallén, compared to Fatburs Kvarnsgata - a parallel inner street of the area - had a greater decrease in pedestrian density during the weekend. Although the street is connected to a small park in the center and the design of the street is wide itself with green spaces, many trees, and seating places, there was not only few pedestrians, but also very few users and activities in this street during the weekend. During weekdays, it had more walking trips passing through, especially by non-residents, than Fatburs Kvarnsgata, but less than Magnus Ladulåsgatan, the two immediate parallel streets. During daytime on weekdays, this wide car-free street was used as a play and sports area for the small children from the daycare center and elementary school situated there. The low pedestrian density in Södermalmsallén was interpreted as partly being due to the fact that it was designed at a different level than surrounding streets for reasons of traffic safety. It is mostly connected to these streets by staircases and only a few ramps, and it was observed that many pedestrians took a detour in their choice of route, which was interpreted to be done in order to avoid passing Södermalmsallén and the extra effort of using
the staircases. There were also walking trips observed that made a detour resulting in a longer walking distance in order to use a ramp instead of a staircase. Walking trips with baby strollers or trips by elderly persons in particular seemed to have a strong tendency to avoid Södermalmsallén or the connecting staircases. Also, a spontaneous trail on the lawn right next to a stairway was observed to be used in several cases.3

Figure 3.10 Photographs of spontaneous pedestrian trails made next to a stairway (Left: Södra Station / Right: Hökarängen)

Perhaps this was one reason why, generally speaking, there were more people observed sitting on benches in Fatburs Kvarngata than in Södermalmsallén. The people sitting on benches, predominantly watching other pedestrians, in Fatburs Kvarngata were mostly elderly. In Södermalmsallén, there were many sitting places throughout the street, but during most of the observation time, most of them were empty. There was only one day (June 1, 2010) during the entire observation when the street attracted many people in daytime, especially around noon, both walking and staying and many of the sitting places were occupied by people enjoying the sun, having lunch or talking with a friend, etc. This was the day with perhaps the best weather conditions possible in Stockholm, and the many trees on the street was full of flowers, activating the potential the street has as an attractive, beautifully landscaped, wide, car-free and safe street to its full extent. However, within the entire observation, this occurred for only a very limited time. Although there were very few walking trips for pleasure observed in

3 Such an avoidance of the use of staircases, evidenced by a spontaneous trail next to a staircase, was also observed in Hökarängen, as shown in the picture to the right in Figure 3.10.
Södermalmsallén in general, one type of walking that seemed to be concentrated to Södermalmsallén was walking the dog. Walking with a dog was constantly observed in Södermalmsallén during all hours, and, apart from the commuting hours when there was a high number of other types of walking trips taking place, around one third to one half of the walking trips taking place in Södermalmsallén involved walking the dog. The proportion of trips walking the dog compared to other types of walking was the highest in Södra Station out of all the three areas.

In terms of the different purposes or destinations of walking, Södra Station had the most number of trips where the exact destination could not be identified. A distinction between walking for pleasure, walking the dog, and other utilitarian walking, could be made by the attitude and the context of the trip (time and location), as well as by other traits, but there were many trips that seemed to belong to the utilitarian trips where the exact (or final) destination could not be documented. This was because a large number of these walking trips originated and/or ended beyond the area boundary. For return trips to the area, it was by nature difficult to identify their origin, but for trips originating in Södra Station, even trips to grocery stores and to public transit continued a considerable distance beyond the area boundary. This happened less often in SoFo, and very seldom in Hökarängen. Again, this may be due to the defined area being relatively small, but even compared to SoFo, the rate of walking trips going outside the boundary was significantly higher and therefore the distance of the trips on average was estimated to be longer, especially when comparing utilitarian walking trips. During the tracking of walking trips, the tracking often continued beyond the area boundary, even up to Götgatan or Mariatorget in some cases. Sometimes the tracking had to stop for practical reasons, so as to not spend too much time on one single observation.

**SoFo**

Among the three areas observed, SoFo was estimated to be the area with the highest amount of walking trips. This includes not only walking trips conducted by residents of the area, but also pedestrians visiting the area, mostly visiting the shops, restaurants, and cafés, which make the area one of the most popular places to visit in Stockholm, not just for tourists, but also for locals from surrounding areas. As well as the walking trips of the residents, these visitors to the area largely contributed to the significant difference in pedestrian density between SoFo and the other two areas. These walking trips
of non-residents especially contributed to the pedestrian density and the liveliness of the area during the hours between the commuting hours and also during weekends, when the pedestrian density decreased in the other two areas. In contrast to the other areas, where the hours between commuting hours were mostly empty of pedestrians, in SoFo there were visiting pedestrians during these hours making up for the significantly fewer walking trips among the residents.

![Figure 3.11 Map of SoFo](image)

As in the other areas, the morning commuting hours during weekdays was the time when the density of walking trips conducted by residents was the highest. These walking trips were the most concentrated between 8 am and 9 am, which included many walking trips with small children, taking them to the daycare center or to the elementary school within or near the area. The trips that was interpreted as going to work or school originated at different home address points within the area, with a large number of them going towards Folkungagatan or Götgatan, (many of the trips observed were going to the subway station Medborgarplatsen on Folkungagatan). So, on streets such as Östgötagatan, there was a strong pattern among the pedestrians of moving northwards. With the large number of walking trips, mostly by residents during this morning peak hour, many involved small children, which created
an atmosphere of a lively, residential neighborhood. It was due not only to the presence of many pedestrians on the street, but also to the sounds of the conversation with the children and also the greetings between the residents.

While the commuting trips were concentrated to approximately one hour, there was a significant drop in the number of pedestrians within the area after 9 am until around 10 am. After 10 am, the number of pedestrians started to increase again, mostly due to visitors to the area from the outside. During the morning hours, there were in particular quite a number of people walking with strollers with babies, taking a walk, visiting the stores, and going to the cafés and restaurants for a drink or for lunch, and also often socializing (meeting up with friends). During weekdays, walking trips conducted by residents started to increase again after 4 pm. At around 5 pm, there was an equal or greater amount of walking conducted by residents than by visitors, mostly coming back from work and/or picking up children. During the early summer season, with pleasant weather conditions and long sunlight hours when most of the observation was conducted, there were many walking trips made both by residents and by visitors also during the evening hours of weekdays, and many pedestrians who appeared to be tourists were also observed. In the more detailed observations by tracking, residents were prioritized over non-residents, but when the number of walking trips by residents was limited, visitors were also tracked. The residents of the area could mostly be distinguished from the visitors by the origin or destination of their trip being entrances to the residential buildings in the area, by the items being carried e.g. grocery bags, gym bags, etc., and also to some extent by the attitude and the speed of walking. An experience from the observations is that residents, being more familiar to the area, tend to walk in a more purposeful and accustomed manner, and, since utilitarian trips are the most common among walking trips conducted by residents, the speed of walking of residents is usually faster than that of visitors.

The buildings within the area are mostly for residential use, but a high ratio of them has other uses on the ground level, creating a highly mixed use environment. While the ground level of the buildings are directly facing and connected to the sidewalk in the manner of traditional urban blocks in the area, there is a wide range of retail outlets, many cafés and restaurants, and also offices in these streets. Since the design of the buildings in relation to the

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4 For these trips, it was documented that the pedestrian seemed to not reside in the area, and the observation of these trips allowed the comparison between the walking trips of the residents and the visitors.
sidewalk allows close interaction between the activity at ground level of the buildings and the pedestrians on the sidewalk, this supports a certain degree of liveliness, with activities inside and outside the buildings. Compared to the sector with buildings that are solely for residential use, the buildings with offices at ground level was estimated to create a more lively and safe walking environment, by creating natural surveillance of the sidewalk during daytime when the residential buildings are mostly empty. Stores, cafés and restaurants seem to function even more effectively in this respect, since they generate activities that allow more direct and indirect interaction with pedestrians. They not only provide destinations for walking trips for both residents and visitors, but, the window displays of the stores, the products being displayed on parts of the sidewalk, and the tables of the cafés and restaurants on the sidewalk, also contribute to enhancing the attraction of walking, by creating a varied and lively walking environment.

![Figure 3.12 Photographs of the sidewalks in SoFo](image)

The largest difference between SoFo and the other areas was found during the weekends. While less walking trips were observed during the weekend in the other areas, in SoFo, it was during the weekend that the observed pedestrian density in the area was at its highest. During the weekends in May and June, the observation of walking trips, especially the tracking of trips in SoFo on weekends, was mostly conducted in May and June. Based on follow-up observations carried out during the autumn and winter months, the pedestrian density in May and June is likely to have been the highest during the year. Still, even during other months, it was observed that the amount of walking trips in SoFo at weekends was similar to or higher than the amount during weekdays, and also higher in comparison to that of the other areas at weekends.
and June, there was a high amount of pedestrian movement and activity in the area, especially around noon on Saturdays. There was generally a higher rate of walking with company in SoFo than in the other areas, but the rate was especially high at weekends, with only approximately one out of four trips being walking conducted alone. The high pedestrian density was estimated to a large extent to have been due to visitors. Also, on weekends, apart from utilitarian walking trips, such as going to the grocery store, the walking trips conducted by residents were more difficult to distinguish from those conducted by visitors. This may be due to the fact that there was a great number of visiting pedestrians, and also due to the fact that the residents walking for pleasure or going to the cafés and restaurants could not easily be distinguished from non-residents, especially when the start of the trip was not observed. Still, walking trips for pleasure conducted by residents could be observed to a considerable extent, which was a significant difference compared to the other areas.

The walking trips of residents at weekends, especially walking trips for pleasure (or non-utilitarian walking trips), took place in the more crowded streets, with pedestrians observing and interacting with other pedestrians, activities in the streets and objects, people, and activities in the stores, cafés, and restaurants. The small park in Nytorget and the many cafés and restaurants nearby, popular for brunch, were full of visitors and created liveliness on the streets with tables for serving also on the sidewalks. There was variety among the pedestrians in terms of age and gender (but relatively less in ethnicity), and also in the mix among the pedestrians between visitors, residents, and tourists. There was not only a large number of people walking, but also many people stopping in between walking, staying, sitting, and socializing on the sidewalk. The speed of the walking in general was significantly slower than on weekdays and compared to the other areas. There was more eye-contact between pedestrians passing by each other, compared to both other days or times of day and the other areas, and, since the most crowded streets had a pedestrian density that seemed to exceed the capacity of the sidewalk, the pedestrians were constantly caring for others passing by, through tilting the body to make space or even climbing off the sidewalk. However, from the attitude or the facial expressions of the pedestrians, discomfort or complaint was seldom detected. Finally, route choices for the walking trips, both utilitarian and for pleasure, were concentrated to the most crowded streets, which were usually the streets with highest amount of mixed-use at ground level of the buildings, e.g. stores, cafés and restaurants.
Not only during the weekend, but also during weekdays, the streets where the stores, cafés, and restaurants are more concentrated had a relatively higher pedestrian density than other streets, and the tracking of the walking trips of the residents also passed along these streets more often than other streets. The route choice may carry more meaning in SoFo than in the other areas, since while there are less alternative route choices offered by the street structure in other areas, the grid-structure street network in SoFo usually provides alternative routes. During walking trips, even during the utilitarian walking trips conducted by residents, pedestrians usually showed a more open attitude, generally speaking, watching and interacting with the activities at ground level of the buildings and also with other pedestrians. There seemed in general to be more eye contact with other pedestrians during walking in SoFo than in the other areas. Also, in addition to the often-observed scenes of visitors of the area, who seemed to have planned to meet at the area, greeting each other in the streets, there were several observed occasions when pedestrians, who were interpreted to be residents of the area, greeted each other or stopped for a conversation when meeting each other on the sidewalk by coincidence.

With the pedestrian density occasionally being higher than the capacity of the sidewalk on the most crowded streets in SoFo, the condition of the sidewalk was one factor which was generally in better condition in the other areas (especially in Södra Station). The width of the sidewalk differed within the area, and in some parts it was too narrow and caused difficulty in passing other pedestrians, especially beyond certain thresholds of pedestrian density. Also, the displays of products from the stores or restaurant and café tables and chairs placed on the sidewalk often took up the sidewalk space partially or sometimes almost entirely. However, as described, despite such conditions of the sidewalk, the streets with a greater degree of mixed-use were the ones with a greater pedestrian density, and were also more often included in the route choices of the residents. One result that seemed to be related to the condition of the sidewalk was that walking trips conducted with baby strollers seemed to prefer Åsögatan ahead of the parallel streets. This applied especially to the section of Åsögatan between Södermannagatan and Götgatan, where the sidewalk width is relatively wider than in other streets and also had a pedestrian density which was not too high, making it easier to pass with a

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6 The relative amount of eye contact between pedestrians during walking was documented based on actual observation of pedestrians and their eye contact with others and also by the amount of eye contact that the author received from the pedestrians in different areas and at different times.
stroller. Many of the walking trips conducted by residents were with a baby stroller, and it seemed that this specific group, for which the condition of the sidewalk may be more significant, showed a preference for specific segments, mostly with adequate sidewalk capacity for the stroller, which was slightly different from the preferred route of the general group.

Among the three studied areas, SoFo was where most variety in the purpose or destination of walking was observed and documented. This is interpreted as most likely due to the higher degree of mixed use, and especially to the fact that there is more variety in the kind of retail outlets and services within the area. This affected the variety of destinations for the utilitarian walking trips of the residents most directly. There was not only more variety in the purposes of walking, but the distribution of different walking purposes was less concentrated on a certain kind than the other areas. In terms of the ratio of each walking purpose within the entire amount of walking trips (by residents), the only kind that showed a lower percentage than the other areas was walking the dog, and the kind that showed a significantly higher percentage than in other areas was walking for pleasure.
3.3 Analysis of the Observation Results I

– Comparison with the Spatial Analysis of the Areas

As introduced and presented in Section 3.2, the results of the observation study have formed a large part of the detailed description of walking activities. While examples and summaries of the data on walking was presented in Section 3.2 in order to describe the contents of the observation data, from this section the results of the empirical study will be presented through the analysis of the observation data. First, in this section, the results of the observation study are presented and discussed in relation to the spatial analysis of the areas done through GIS. The analysis of the observation data done here is carried out, in large part, through the comparison between the study areas. This is, to some extent, similar to the neighborhood comparison method of the correlation studies on walkability. However, the difference lies in that it not only compares the neighborhoods in terms of the rather simple measurement of amount of walking but also investigates how the areas differ in terms of the detail of the walking behavior of the residents.

7 The GIS analysis of the areas presented here was carried out by Sara Sardari Sayyar at the School of Architecture, Royal Institute of Technology in Stockholm. The contents of Section 2.3 are from the co-authored paper, Urban Diversity and Pedestrian Behavior - Refining the concept of land-use mix for walkability, presented at the 8th International Space Syntax Symposium (Choi & Sardari Sayyar, 2012).
Quantitative analysis of the areas

<table>
<thead>
<tr>
<th>Neighbourhood</th>
<th>Residents</th>
<th>Working population</th>
<th>Total population</th>
<th>Total Population density</th>
</tr>
</thead>
<tbody>
<tr>
<td>SoFo</td>
<td>7540</td>
<td>2650</td>
<td>10190</td>
<td>806</td>
</tr>
<tr>
<td>Södra station</td>
<td>5082</td>
<td>3499</td>
<td>8581</td>
<td>874</td>
</tr>
<tr>
<td>Hökarängen</td>
<td>7989</td>
<td>997</td>
<td>8986</td>
<td>150</td>
</tr>
</tbody>
</table>

*Table 3.1: Residents, working population, total population and population density values (person per hectare) for each neighborhood.*

The axial map\(^8\) which was used for the configuration analysis is comprised of 66,000 lines covering Stockholm and some other municipalities in the vicinity. Data used for the accessibility analysis includes census data for all of the residential and working population from early 2000. Data regarding various activities include all registered economical activities from 2006, sorted according to their branch codes (SNI code). Both data sets offer highly detailed resolution at address level, yet at certain steps in the study the data was aggregated in order to compare neighborhoods based mainly on the measured mean values. Figure 3.13 represents total population density values at plot level.

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\(^8\) The axial map is merged from several different axial maps made by researchers in the research group Spatial Analysis and Design at the School of Architecture at the Royal Institute of Technology in Stockholm, and by the consultancy firm Spacescape.
Integration analyses at global level (radius 30) and district level (radius 9) show that SoFo and Södra Station are highly integrated with the whole city as a system on an urban scale, as well as highly connected at district level with their surroundings, whereas Hökarängen has the lowest integration at both levels (Figure 3.14). At local level (radius 3), comparing first two areas as illustrated in Figure 3.15, Södra Station appears to be slightly less integrated than SoFo in some parts of the area, while Hökarängen on the other hand has a fragmented structure with few integrated routes.

![Spatial integration analysis: global level (radius 30) (left), and district level (radius 9) (right)](image)

![Local integration analysis (radius 3) with most integrated lines highlighted](image)
Analysis of the access to population within walking distances, measured by combination of both metric distances and axial steps, illustrates that, within short walking distances (500m/3 axial lines), SoFo has higher access to both residents (Mean 11,885) and total population (Mean 18,931) compared to Södra Station (7,621 and 12,575 persons respectively), whereas within 1,500m and 9 axial steps, both areas have a similar degree of access to both groups (on average 60,000 residents and more than 100,000 persons in total)(Table 3.2).

<table>
<thead>
<tr>
<th></th>
<th>Residents</th>
<th>Total Population</th>
<th>Residents</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>500m within 3 axial lines</strong></td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Min</td>
</tr>
<tr>
<td>SoFo</td>
<td>4372</td>
<td>14312</td>
<td>7621</td>
<td>6315</td>
</tr>
<tr>
<td>Södra Station</td>
<td>28</td>
<td>2254</td>
<td>890</td>
<td>32</td>
</tr>
<tr>
<td>Hökarängen</td>
<td>28</td>
<td>2254</td>
<td>890</td>
<td>32</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>1500m within 9 axial lines</strong></th>
<th>Residents</th>
<th>Total Population</th>
<th>Residents</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>SoFo</td>
<td>14312</td>
<td>53043</td>
<td>8227</td>
<td>1720</td>
</tr>
</tbody>
</table>

Table 3.2 Accessible residential and total population in each area

The empirical results show that, although SoFo and Södra Station have similar population densities, the accessible population rate differs at local level, which is the effect of their built environment. It appears that SoFo is highly accessible at both levels by large numbers of non-residents, while Södra Station is accessible on average by fewer non-residents at local level. Hökarängen is accessed by the least numbers at both levels, which is around 10-13% of accessible population in other areas at both levels, containing mainly the residents. The minimum number of residents accessible from the home address points in this area (28 persons) at local level shows how empty some parts of the area could be. As it is represented in Figure 3.16and Figure 3.17, Hökarängen, just as other neighborhoods located in the southern part of Stockholm, have access to a significantly smaller number of non-residents at both levels.

Figure 3.16 Access to residents (left), and total population (right) at home address point level, within 1500 m and 9 axial lines (longer walking distance)
Access to some activities that are recognized as belonging to common destinations of the walking trips during the walking behavior observation study is also tested. The data includes various registered activities such as: retail outlets, restaurants/bars, leisure and recreational activities (e.g. cinemas, museums, sports facilities), other services (e.g. hairdressing, beauty salons and dry cleaning), and educational services (such as day care centers, schools), as shown in Table 3.3.

<table>
<thead>
<tr>
<th>SoFo</th>
<th>Retail</th>
<th>Restaurants</th>
<th>Leisure &amp; recreation</th>
<th>Other services</th>
<th>Educational</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>21</td>
<td>3</td>
<td>22</td>
<td>26</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>14</td>
<td>19</td>
<td>18</td>
<td>16</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.3 Number of registered activities in each area (in five selected categories)

Comparison between the areas in the analysis on access to activities from address points shows that within short walking distances (500 m/3 axial lines), SoFo has the highest access to various activities (e.g. 161 retail shops and 118
restaurants) on average, followed by Södra Station with access to less than one-third of the numbers of activities in SoFo (45 shops and 35 restaurants)(Table 3.4). Hökarängen has the lowest access to various activities at this level (e.g. on average 5 retail shops and 2 restaurants). Although there are 100 registered activities in total belonging to the chosen categories in Hökarängen, only 14% of them are accessible to the home address points at local level on average. Within longer distances (1500 m/9 axial lines) SoFo and Södra Station have access to a similar number of activities (Mean: 650 shops, 400 restaurants), while Hökarängen has the lowest access (both shops and restaurants on average 49 stores) (Table 3.5). In Hökarängen, although there are a greater number of activities accessible at longer distances than within short walking distances, the numbers are still significantly lower.

Table 3.4 Accessible activities and their numbers on address point level within short walking distances

<table>
<thead>
<tr>
<th></th>
<th>Retail</th>
<th>Restaurants</th>
<th>Leisure &amp; recreation</th>
<th>Other services</th>
<th>Educational</th>
</tr>
</thead>
<tbody>
<tr>
<td>SoFo</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td>105</td>
<td>210</td>
<td>161</td>
<td>118</td>
<td>73</td>
</tr>
<tr>
<td>Södra Station</td>
<td>20</td>
<td>95</td>
<td>45</td>
<td>20</td>
<td>75</td>
</tr>
<tr>
<td>Hökarängen</td>
<td>0</td>
<td>20</td>
<td>5</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 3.5 Accessible activities and their numbers on address point level within longer walking distances

<table>
<thead>
<tr>
<th></th>
<th>Retail</th>
<th>Restaurants</th>
<th>Leisure &amp; recreation</th>
<th>Other services</th>
<th>Educational</th>
</tr>
</thead>
<tbody>
<tr>
<td>SoFo</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td>63</td>
<td>66</td>
<td>66</td>
<td>74</td>
<td>20</td>
</tr>
<tr>
<td>Södra Station</td>
<td>248</td>
<td>349</td>
<td>349</td>
<td>245</td>
<td>209</td>
</tr>
<tr>
<td>Hökarängen</td>
<td>5</td>
<td>45</td>
<td>45</td>
<td>4</td>
<td>19</td>
</tr>
</tbody>
</table>

In all areas, retail shops comprise the major activities, while in Hökarängen there are too few accessible shops consisting mostly of convenience shops, catering for the local neighborhood (this comparison is according to type of the shops regardless of their offered good). On the other hand, in Södra Station and particularly in SoFo, there is access to more shops with greater variety (Figure 3.18). In these areas, as well as convenience shopping (possible to access at shortest time), there is access to shops offering comparative shopping (possible to compare the quality and price) in addition to a number of specialist facilities and exclusive shops.
Comparison of the Spatial Analysis with Observation Data

Comparison of the amount of walking in the three areas

Although the observation study from this project did not measure the objective amount of walking and this study does not aim to prove any (statistical) correlation between the amount of walking and built environment attributes, the perceived relative amount of pedestrian density during the observation in the three areas was documented. In terms of the average or overall pedestrian density of the streets in the study areas, SoFo has the highest, followed by Södra Station, and Hökarängen has a significantly lower density than the other areas. When comparing also the perceived relative rate of walking trips made by the residents of the neighborhood assumed from the subjective measurement of walking trips, and considering the population of the areas, this order remains the same, although one difference with the pedestrian density would be that the difference between SoFo and Södra Station seems to be smaller for the amount of walking trips made by the residents of the areas. These differences in the relative amount of walking in the three areas form the basis for the discussions made here, but the main purpose of the discussion is to investigate in greater depth the type of pedestrians and walking activities that make up this amount of walking, as well as how and why, which may also explain why these differences occur in relation to the conditions in each area.
Composition of the pedestrians

In this section, the areas will be discussed with the focus on how the defined study areas are used as the setting for walking. One difference between the pedestrian populated streets of SoFo and the often-empty streets of Hökarängen is in the composition of pedestrians in the areas. SoFo, compared to the other two areas, has a large number of pedestrians originating outside the area, whereas in Hökarängen there are very few or almost none. In Södra Station, although the number is higher than in Hökarängen, it is still significantly smaller compared to SoFo. As well as the difference in the amount of walking done by the residents of the areas, the difference in the number of pedestrians in the areas who are non-residents seems to be a strong reason for the difference in pedestrian density between the three areas. The lower rate of residents walking and the absence of pedestrians from outside the area in Hökarängen explain the significantly lower pedestrian density compared to the other two areas. Also, the fact that the difference in the pedestrian density between SoFo and Södra Station is greater than the difference in the rate of residents walking is due to the large difference in the number of pedestrians coming from outside the area.

These differences in the relative amount of walking trips and pedestrian density between the areas could be discussed in relation to the result of the analyses on integration and on access to different populations and various activities. Hökarängen is far less integrated at the global and district level, while SoFo and Södra Station are well integrated within the rest of the city. Hökarängen also has the least access to different populations and various activities at all levels of the analysis, and has few accessible shops, which mostly consist of convenience stores. On the other hand, while SoFo and Södra Station are both highly integrated at the global and district level and well integrated with their adjacent areas, the reason why SoFo has a greater number of pedestrians from outside the area by far than Södra Station may be explained, not just by the difference in the degree of integration, but also perhaps more strongly by the analysis of access to various activities. In the results for short walking distances, explaining more or less the condition within the area itself, SoFo has the greatest access (e.g. 108-210 retail shops, and 73-141 restaurants), while Södra Station has access to less than half the amount compared to SoFo (20-95 shops and 20-75 restaurants). It corresponds with the observation that the walking trips made by non-residents in SoFo consisted mostly of visiting the shops, cafés, and restaurants.
Difference in pedestrian density over different times of the day and days of the week

The differences between the areas in the composition of pedestrians or the rate of pedestrians coming from outside of the area affect not only the overall pedestrian density of the areas, but also the pattern in the distribution of pedestrian density in the areas over different times of the day and also the days of the week. In Hökarängen, with few pedestrians in most parts of the area during most hours, there is only a slight increase in pedestrian density twice a day, during commuting hours (in the morning and in the evening), consisting mostly of trips to public transport (the subway station). During the rest of the daytime hours, the streets of the area have very few pedestrians. In Södra Station, the pedestrian density is also at its highest during the commuting hours, but the density itself and also the degree of increase compared to the rest of the daytime hours is much higher than in Hökarängen. However, although Södra Station has higher pedestrian density than Hökarängen during most of the hours, when compared to SoFo, it has lower overall pedestrian density, which is due to lower pedestrian density during the daytime (on weekdays). While SoFo also shows a concentration or peaks of pedestrian density, consisting of the residents, during commuting hours in the morning and the evening of the degree similar to that of Södra Station, the area also has a relatively high number of pedestrians during daytime between these two peaks, which consists of not only residents, but to a large degree non-residents who visit the shops, cafés, and restaurants in the area.

The difference in the number of pedestrians coming from outside the area not only seems to affect the pattern of pedestrian density over different hours of the day, but also over the days of the week, between the weekdays and the weekends. In Hökarängen and Södra Station, with a lower number of pedestrians who are non-residents, the pedestrian density decreases at weekends compared to weekdays, probably due to the absence of commuting trips which make up the highest percentage among the walking trips taking place there. However, in SoFo, although the commuting trips of the residents are absent at weekends, the overall pedestrian density at weekends seems to be similar or even higher than during weekdays, which may be related to the increase in the amount of visitors to the shops, cafés, and restaurants from outside the area, which was especially high during the spring and early summer season with better weather conditions (when most of this observation study was conducted).
Pedestrian density as a walkability factor

As discussed so far, the density of pedestrians in an area seems to be the result of the conditions of the built environment related to the walkability. Although pedestrian density captures a slightly different aspect of the walkability of the environment from the amount of time spent on walking by individuals in the sense that it is more focused on how the built environment itself is used as a setting for walking, it is also often used as an outcome or the dependent variable for measuring the walkability of the built environment, especially in the studies from the urban design field. However, although it could be measured as the outcome of the condition of other walkability factors, it may also itself be related to the walkability of the given area as a factor, which is an important reason why the distribution of pedestrian densities and their pattern is presented and discussed here. The pedestrian density in the areas, especially the distribution and patterns of the number of pedestrians over different hours and days are closely linked to the liveliness of the area and may enhance the experiential quality of the walking activities by providing increased chances of (both direct and indirect) interaction with other people and activities during walking. The presence of other pedestrians contributes not only to the feeling of safety, but may become an attraction factor, especially for certain types of walking activities (e.g. walking for pleasure) which will be discussed in the later part. Therefore, pedestrian density, when rising above a certain level, may itself become a factor promoting walkability by increasing the quality of the walking activity and also possibly increasing the quantity of walking by providing the destination or reason for walking.

Distribution of walking purposes/types in the three areas

An important description of the walking behavior of the areas is on the presence and proportion of different purposes or types of walking activities. Examining the trips made by the residents of the areas, the variety and the distribution of walking activities varied among the areas. In Hökarängen, more than approximately 80% of all the walking trips of the residents observed were walking to the public transport. Other kinds of walking activities with much lower frequency included walking the dog, going to school, going to the convenience store, and walking for exercise or pleasure. In SoFo, there was far more variety in the types of walking activities compared to Hökarängen. The walking trips there consisted of different activities, such as walking to the
public transport, walking to school/day care center, walking to different kinds of shopping (from grocery to specialized retail), walking for pleasure, walking the dog, walking to the park, walking to recreational facilities, walking to the cafés/restaurants, etc. More importantly, the area not only had more variety in terms of activities, but the proportions among the different walking activities making up the total number of walking trips were more evenly distributed. Södra Station, both in its variety and distribution of different walking activities, showed a result that fell between the other two areas. The description of the detailed walking behavior of the areas in terms of walking purposes/types will be continued in the discussion in Section 3.6.

**Diversity and walkability**

This discussion about the presence of different types of walking activities in relation to the analysis of the urban form may suggest that the diversity in the built environment may contribute to the diversity in the walking activities as well. SoFo, which shows the highest levels in the results from the quantitative analysis in terms of density, connectivity, and land-use diversity, also shows a greater degree of diversity in walking behavior by variety in both the composition of pedestrians and the type of walking activities. This may be related to the built environment’s influence on the quantity of walking aspect, as land-use diversity seems to contribute to the destination- (or purpose-) providing effect of walkability. Moreover, although briefly described above, this diversity in both the urban form and the walking activities is an important factor in enhancing the quality of walking, which will be discussed in detail in the following sections.

**How the factors work closely together (in determining the walkability)**

The description of how the major factors of walkability, density, connectivity, and land-use diversity influence the given built environment in terms of the degree and nature of the walking activities/behaviors taking place there demonstrates the close relationship between the factors. The way in which the main factors work together in determining the walkability of an area shows the importance of the co-presence of factors and how they affect each other. The degree of density, connectivity and land-use diversity through their combination determine the character of the area in terms of the types of walking activities it supports, and to what degree. The explanation for the difference in pedestrian density, the composition of pedestrians and the
diversity in the walking purposes among the areas is provided when the
degree of the factors are observed together. For example, in SoFo, the high level
of integration at the global level illustrating the connectedness to the rest of the
city, together with the high diversity in land-use, especially in the detailed
types of commercial use and services, determine the diversity of the walking
purposes and the composition of pedestrians. Whether the high degree of land-
use diversity could take effect because of the context of high integration/
connectivity or the high (global) connectivity resulted in the high degree of
land-use diversity, (and likewise with regard to density and the other factors),
these factors seem to be closely related and linked together, because the
condition of the other factors affect and determine how the given factor will
appear.
3.4 Analysis of the Observation Results II

– The Major Factors Identified in Correlation Studies on Walkability

Density, Connectivity, Land-use Diversity

These terms are the factors most often discussed in walkability. Since these factors have been most consistently proven to be strongly associated with the amount of walking, this section will focus on these factors in presenting and analyzing the results of the observation study of this project. Although the attributes of the built environment in terms of these factors are frequently discussed by using the same terminology, these qualities can be investigated and measured on different levels and scales which may capture different aspects of influencing walking behavior. For example, although often placed under the same label, ‘connectivity’, different qualities of connectivity can be investigated and measured on different levels. According to the different aspect or scale of connectivity, they differ in the influence they have on walking. Also, a given area may show different degrees of connectivity according to the level at which they were measured. The same applies to the other two factors, density and land-use diversity. Here, recognizing these differences, how these factors on different scales/levels seemed to affect walking behavior were analyzed.⁹

⁹ While the discussion is focusing on the two factors, connectivity and land-use diversity, the factor of density is not directly discussed alone, but the condition of the density is rather a factor that supports and boosts the effect of the two other factors.
The “context” or connectivity at the global scale

Hökarängen

The walking trips in Hökarängen differed from the walking behavior in SoFo or Södra Station in that the trips almost never went outside the set neighborhood boundary. One reason for this may be the fact that in Hökarängen, the area boundary was set to cover a much larger surface area, and also that it is a somewhat pre-defined, existing boundary which defines the neighborhood as a suburb. However, another possible explanation may be in its connectivity to the rest of the city, shown by the low degree shown in the analysis on global integration (Hillier, 1996), due to the urban context it has as a suburb, opposed to the other two areas, which are in the center of the city. This might be a reason why almost none of the trips involved going to other areas of the city by walking. It could be argued that this limits the opportunities for certain types of walking from occurring, and this may also affect the frequency of the walking trip occurring. In SoFo and in Södra Station, many of the trips went beyond the set neighborhood boundary, entailing accessing the rest of the city by foot, implying that many trips of different kinds and purpose can be done by walking, due to the close accessibility/distance to the destinations offered by good connectivity to the rest of the city.

Södra Station & SoFo

With its large number of walking trips directed towards outside the area, compared to both Hökarängen and SoFo, Södra Station is a good example where global connectivity or the context of the area plays a significant role in determining walkability. This is especially the case when considering the walkability level for the residents living in the area. When observing the conditions within the area in terms of factors such as land-use mix or pedestrian density, the value is lower than in SoFo. Therefore, the destination and also the motivation-providing power of the area itself is weaker than in SoFo. However, what differentiates Södra Station from Hökarängen is the opportunity for walking trips directed outside the area to occur through the area being highly connected to adjacent areas and to the rest of the city. The central location and good connectivity to other areas greatly increase the number of possible walking destinations and support the walking activities of the residents. This is also shown in the quantitative analysis of the areas. In the
analysis of access to various activities and their average numbers in each area, Hökarängen has low values at both short walking distance and long walking distance levels. However, in the case of Södra Station, while the analysis for short walking distances (500 m/3 axial lines) shows large differences in the results with Södra Station having access to less than half the amount of destinations and activities compared to SoFo (See Figure 3.18 in Section 3.3), the two areas have similar values in the results in the analysis of longer walking distances (1500 m/9 axial lines).

These comparisons between the areas show that connectivity at the global level, together with the condition of other main factors, affect the pattern and the nature of the walking behavior of the residents. Although it is difficult to prove objectively the amount or frequency of walking in the different areas from this observation study, the difference in the rate or frequency of walking between SoFo and Södra Station is partly related to the fact that walking trips in Södra Station more often went outside the area than in SoFo. This is also related to the distribution of different types of walking activities as well. While residents in Södra Station showed a similar amount of walking trips compared to SoFo for walking trips such as going to the public transit for commuting, going to school or day care center, and going to the grocery stores, the difference lay more in the presence and frequency of other walking activities than these basic necessary activities. And these walking activities were the trips that were most frequently directed towards outside the area. Although the frequency of these walking trips may be slightly lower in Södra Station than SoFo, the observation study results and also the quantitative analysis showed that for Södra Station, access to destinations significantly increased for longer walking distances (than for shorter walking distances). This may also suggest that these trips in Södra Station may be of longer distances on average than in SoFo.

**Connectivity and distance – walking distance to destinations**

As described above, connectivity is one of the main factors that determine the distance to the walking destinations, together with land-use diversity and density. Distance itself can be considered, as in some studies on walkability (Lee & Moudon, 2006b), as the main factor of walkability, or the determinant factor in the decision to walk. However, although the distance to a possible destinations or the number of destinations within a given distance can be measured, the complexity of understanding distance as a factor is that the distance willingness to walk, as in the maximum distance that a person would
consider walkable or desirable when making the decision the walk, is difficult
to define. A ‘walkable distance’ would vary from individual to individual, and
might also vary according to the type of walking activity. Although further
investigation needs to be done in order to understand this complex issue, what
could be suggested from the observation study experience is that the ‘walkable
distance’ is the perceived distance, which the metric distance or route distance
alone cannot fully capture, and involves different factors, such as walking
purpose and the condition and the context of the walking route. While it could
be argued that the longer the distance is, the less likely or frequent it is that the
walking trip would occur, and, considering the subjective measurement of rate
of walking in the study areas, it seems that the walkable distance (as in
distance willing to walk for individuals) is longer in the inner city than in the
suburban area. However, the reason for this may not only be the context or the
connectivity at the global level, but also, as importantly, the difference in
condition in the density and the land-use diversity in the environment
surrounding the walking route that exists between the inner-city area and the
suburbs.

Another issue related to the walking distance is the different perspectives
put on distance. As discussed, the increase in the walking distance would
reduce the willingness or the possibility of walking. Therefore, in dealing with
walkability, distance is often dealt with using this perspective of seeing
increase as an impediment, which corresponds to how walking activities are
dealt with in transportation research. However, while most walkability studies
are interdisciplinary, in research done within the field of preventive medicine
with the aim of promoting walking, in order to increase the benefit of walking
as a physical activity, longer distances would be desired. Therefore, combining
these rather contradictory perspectives, the aim of walkability studies where
the main interest is in health benefits would be to find the balance between
these. If the destinations are given within a distance that is not too far as to
impede walking, longer walking trips would be more desirable. Although
measuring or evaluating the walkability of the study areas is not the purpose of
this observation study, from this perspective of the walkability research, Södra
Station would be a more ideal living environment in terms of walkability, if the
frequency of walking trips meets the recommended level for health benefits,
with its walking trips that often go outside the area and last for longer
distances than in SoFo.
Connectivity at the local level – the condition of the street network

Connectivity at the local level or the condition of the street network in the area is also identified as a factor often associated with the amount of walking. For the study areas, Hökarängen has a street network that is more difficult to read, with irregular patterns and cul-de-sacs. Also, in Hökarängen, the subway station and subway tracks that run through the middle of the area divide the area into two large parts, which also seems to lower the connectivity within the area. The other two areas in the inner city have grid street networks. The condition of the street network contributes to providing convenient routes to destinations within walkable distance and providing a choice of possible routes. SoFo, with its traditional city blocks, is in an ideal situation in this aspect. With the grid system with block sizes that are not too large, the walking trips occurring in this area often include different possible routes, with the same or similar route distances, whereas in Hökarängen, there are often only one given route choice from home address points to the walking destinations, such as the subway station, retail outlets, or schools. Having multiple route choices may have a positive influence on walking behavior, especially for routine walking activities around the residences, since it may increase the perceived level of safety and increase the possibility of meeting various needs for different qualities.

Land-use diversity at the local level

The result of the observation study, especially the comparison between the study areas, demonstrates how land-use mix influences walking behavior. It confirms how the presence of different land-uses other than residential use supports walking in residential areas by providing destinations for walking, shown in the (subjectively measured) frequency of walking and in the presence and distribution of purposes/destinations of walking trips. In terms of destination providing aspect, retail and service uses were the significant factor, both in the amount and variety. The comparison of the walking behavior and the analysis on the amount of access to different activities (Figure 3.18 in Section 3.3) illustrates this, and as described in the discussion on connectivity at the global level, depending on the context of the area, the amount of the non-residential land-use within the area itself could be compensated for or supplemented by a high degree of connectedness to surrounding areas, as in the case of Södra Station. However, what is determined by land-use diversity
within the area is how well the given area serves as a walking environment, which is strongly related to influencing the quality of walking.

**Land-use diversity at the street level**

*Vertical land-use mix*

Land-use diversity is a key factor in terms of not only the quantity of walking through direct provision of destinations, but also the quality of walking. This is done through determining how well the given built environment serves as the route environment for walking. It is especially influential in enhancing the experiential quality of walking by providing the potential for direct and indirect interaction with the space, the buildings, and the people and activities in them. How land-use diversity contributes to the shaping of a given built environment as a setting for walking is related not only to the amount of different land-use there is in a given area, but also more strongly to the distribution of land-use mix and the implementation and design of land-use diversity at the street and building level. Therefore, it should be measured and dealt with at a finer scale than how it should be measured for capturing the destination-providing effect of land-use mix. Since the design and use of the ground level of the buildings are important factors in determining the quality of a walking environment, vertical land-use mix seems to be an efficient and effective method for maximizing the effect of land-use diversity on the quality of walking.

The presence of other land-uses, especially different types of retail outlets and services at ground floor level of residential buildings, may contribute to creating a walking environment that is interesting, lively, and safe. The stores, restaurants, and cafés at ground level create an interface where there are contacts /communications between the building and the pedestrians by providing the pedestrians with things to look at and the possibility of being looked at. This may increase the experiential quality during walking and also enhance the feeling of security, through providing surveillance, the eyes-on-street (Jacobs, 1961; Gehl, 2010). In SoFo, with its grid street network, the route choices were concentrated to the streets with the highest degree of land-use diversity, to the streets which provide the greatest amount of interaction between the ground level land-use (mostly retail and service use) and the sidewalk. Land-use diversity affects how a given segment of the built environment serves as a lively and interesting walking environment not only by providing the interaction with the buildings and the activity inside them,
but also by contributing to pedestrian density. This can be especially effective if the different land-use can attract (or become the walking destination for) pedestrians from outside the area as well as the residents of the area. The presence of other people, both stationary and walking, seems to be an attractive factor which enhances the experiential quality of walking from the observation of the walking behavior.

The difference between SoFo and Södra Station in how the defined areas function as a walking environment may be related to the degree and distribution of land-use diversity. SoFo has a high amount of retail and service use (as a residential area) and a high degree of vertical land-use mix that is well spread throughout the area, which contributes to forming a lively and interactive walking environment. However, in Södra Station, vertical land-use mix in the residential buildings is present to a much lower degree, and the existing retail and service use is mostly concentrated to the few segments of the area which are the set boundaries of the neighborhood. The inner part of the residential area is dominantly single use (residential), with very few other uses which are mostly day care centers and elementary schools. Therefore, the streets within the area are very low in pedestrian density during most of the daytime hours and create a calm and less interactive/interesting walking environment. Although the integration analysis at the global scale shows that the streets in both of these areas show a high degree of connectedness to the rest of the city, the large difference in the pedestrian density and the condition as a walking environment may to a large extent be due to the difference in the degree of land-use diversity.

Office use

While there is a need for better investigation of how detailed land-use diversity should be identified and measured for studying walkability, the influence of office use has been relatively less discussed and investigated in the existing studies. Here, the discussion will focus on this use, trying to provide information on how it seems to influence walking activities in detail, also partly because this use is a good example that shows the importance of measuring it at the detailed level.

Office use may not influence walking by directly providing destinations for the residents of an area as does retail and service use, but may still influence walking by affecting the condition of the walking environment related to the quality of walking. The observation from the three areas show that the presence of office use in the area may have a positive effect on the
condition of the area as a walking environment, through increasing pedestrian density, providing surveillance and potential for interaction between the building and the pedestrians. Office use may increase pedestrian density through the working population and also visitors to the offices. It could also support the liveliness of the area through providing eyes-on-street and activities going on in the building, and such contributions may be valuable, especially in residential areas, since they enhance the liveliness and the feeling of security in the area during the hours in the day-time when activities in the residential buildings and by the residents are scarce. Therefore, the difference in the amount of office use in the areas, with almost none existing in Hökarängen and relatively more in the other two areas, seems to be one of the factors that resulted in the difference between the areas in supporting the quality of walking.

As well as in the case of retail and service use, for office use, how it is implemented and distributed in the area and also in the building seems to be important in terms of the degree to which it influences walking as described above. This is shown from comparing the influence of office use in Södra Station and SoFo, both of which areas have a fair mix of office use for residential neighborhoods. If the size of the working population and also its ratio to the residential population are compared, Södra Station has a higher size and ratio than SoFo. However, the degree to which the office use seems to have a positive influence on the quality of walking may be higher in SoFo, which is related to how the mix of office use is distributed and implemented within the areas. In Södra Station, the office spaces, just like the retail use, is concentrated within certain segments, and none in the inner part of the area. It is also often separated into different buildings from the residential use. However, in SoFo, most of the office space is situated at ground level of the residential buildings, and more evenly distributed over the area, taking up a larger floor area. Therefore it can more effectively contribute to the liveliness, attractiveness, and safety of the area by providing eyes-on-streets, visitors during day-time, and interaction with the pedestrians on the sidewalk. This again points to the importance of the design issue of vertical land-use mix.
3.5 Analysis of the Observation Results III

– Other Design Factors Discussed in Urban Design Literature

Other design factors

The description and discussion of the observation results given so far in terms of the major factors – density, connectivity, and land-use diversity – confirm that they are significant factors in the walkability of the area through different aspects. While the earlier discussions have been directly about these factors, describing the condition of the built environment and urban design that shows the degree of these factors at different levels and aspects, what will be described here are other design qualities or practices that seem to affect walking activities. The reason for analyzing and discussing these factors is that, although they have been less investigated and established as significant factors in correlation studies on walkability, they are the factors rather often discussed in urban planning and design literature in relation to pedestrian-friendly design of the environment. The discussion here will also include how some of them are related to how the major factors are implemented and some are not, but, as will be described, they all seem to function both directly and indirectly with the other factors, especially the major factors, in influencing walking behavior.
Design of the ground level

As discussed regarding the importance of vertical land-use mix, the use of the ground level is an important factor influencing walking. The design and the use of the ground-level seem closely related to how effective land-use diversity is in positively influencing walking. The influence here may not be significant in affecting the quantity of walking through providing destinations, but it is more related to the quality of walking aspect, how the different uses present in the buildings may enhance the quality of walking through creating a good walking environment. Design at the detailed street and building level that allows direct interaction between the sidewalk and building, especially active use of the ground level, such as shops, restaurants, or cafés, creates a walking environment that is safe, vibrant, and interesting. Design that allows the pedestrian on the sidewalk to see the displays of the shops and have both direct and indirect contact and interaction with people and activities in the retail and service use in the building would maximize these effects of having mixed-use. Such an interaction between building and the sidewalk is better supported where there is less or no distance between the sidewalk and the building, and in these conditions the shops, cafés, and restaurants on the ground level may often appropriate space, even reaching out onto parts of the sidewalk, by having product display or tables with people sitting, providing pedestrians more closely and directly with things and people to see and hear. SoFo is a good example where this is allowed and is present to a high degree. The observation of the walking trips shows that this mixed-use at ground level not only provides destinations for walking, but the segments with these uses, with the highest and closest interaction between the sidewalks, are where the route choices are concentrated.

The buildings as interfaces

Although it may not provide an effect as strong as retail or service use, for residential use, design that allows close contact with the sidewalk also seems to affect the quality of walking. It is important that the residential buildings are designed so as to offer the possibility of accommodating other use, especially at ground level. However, while it is difficult in practice to have a high degree of land-use mix in residential areas, design that maximizes the influence on the sidewalk would also be relevant for residential buildings, even for single-use
residential buildings. Entrances, windows, and balconies facing and close to the sidewalk contribute to surveillance over the street, which supports the feeling of safety (Jacobs, 1961; Gehl, 2010). Although they may be limited in activating the street in terms of creating liveliness and a feeling of safety, especially if the density is low and during the hours when the buildings are mostly empty, e.g., during daytime on weekdays, if the contact with sidewalk is at very close distance or direct, then even single-use residential buildings may have a positive influence on the quality of walking.

Hökarängen, where there is a low degree of land-use diversity compared to the other areas and there are different building types which are mostly single-use residential, demonstrates the difference in this effect of residential buildings on the quality of walking according to building types. For instance, the buildings directly facing the sidewalk (e.g., row houses), standing parallel and close to the street with entrances, balconies, and windows, had the highest potential of creating a feeling of liveliness and safety, whereas other types, such as tall point-house buildings, create a rather different walking environment. These taller buildings often stand at a distance from the street, with green space between the pedestrian sidewalk and the buildings, and with poor visibility of the location of the entrances allow less surveillance or the feeling of having eyes-on-street. Also, such a design of the building and its relation to the sidewalk creates an environment of a larger scale, which may affect the perceived walking distance to be longer, by creating a simple and uninteresting walking environment.

This influence of the residential buildings on pedestrians are discussed by means of different building types here, but this is because the design often differs according to building type, so this division by building type is not a suggestion for understanding these differences. Rather, it is how the façade facing the street is designed that is important, especially the part that is in closer and more direct contact with the sidewalk. For instance, although the buildings in SoFo are all similar in their height and distance to the sidewalk (which is in direct contact with the sidewalk), the difference in the design and the condition/use of the ground level results in different walking environments. The condition that the buildings stand directly on the sidewalk, with no space in between, supports maximizing the influence of having non-residential use at ground level, which is present in many segments of the area. However, the same condition, since it increases the influence of the ground level use of buildings on sidewalks, which is often the space to which the visual influence/allowance of the pedestrian on the sidewalk is limited, may create a very monotonous environment where there are no or few entrances to the
building and the windows lie higher than the eye level of the pedestrians, leaving a bland and empty wall facing the sidewalk. Segments with this condition also exists in part of SoFo and these were the segments with lower pedestrian density, which seemed to be less frequently selected in the route choices of both residents and non-residents.

**Legibility / Visibility**

While Södra Station is relatively highly integrated at both the global and district level, as the quantitative analysis also shows, the segments within the area have a rather low degree of pedestrian density considering their connectedness at the district level, for instance compared to the streets of SoFo. As discussed, an important factor causing this condition is how these parts lack provision of destinations for walking through a low degree of land-use diversity. Another factor that may explain the rather empty streets within the area, which creates a feeling of separation between this residential area and the surrounding parts of the city, is the design of the neighborhood, which hinders the legibility and visibility of the area. The arrangement and design of the buildings and streets at the entry points to the area, which disallow visibility and create a difficulty in orientation, as shown in the images, may also partly explain the low pedestrian density. This would especially disallow pedestrians who do not reside in the area to use the streets. These factors would have relatively less influence on the walking behavior of the residents than on first-time users of these streets or area, since residents would be better aware of the street system. However, these factors may indirectly influence the walking activities of the residents by creating a walking environment with low pedestrian density, which could have a negative effect on the quality of walking.

**Condition of the sidewalk**

The observation result seems to point in different directions in terms of the condition of the sidewalk. Since the sidewalk may be considered a requisite for walking, it may strongly influence walking, especially when it comes to whether the sidewalk exists or not. This is partly shown in the results for Hökarängen, where pedestrian sidewalks were often absent or only partly
existent in the detached house area (e.g., on only one side of the street or in partial segments of a street, being disconnected), the existence and the condition of the sidewalk may be one of the significant factors in the low amount of walking activities. However, given that there is an existing sidewalk along all parts of the streets, the comparison between the areas and also between the segments within the area show that the condition of the sidewalk, such as its width or aesthetics, had a limited influence in both attracting pedestrians or being selected in the route choices of the residents. The commercial streets in Hökarängen centrum and the wide pedestrian streets in Södra Station with low degree of use demonstrates the limited power of the condition (not the existence of a sidewalk) on positively influencing the quantity of walking. In SoFo, while the streets with highest amount of different uses, such as shops and restaurants, often had sidewalks of less convenient condition, with widths lacking the capacity to hold all pedestrians considering the high pedestrian density of these segments, they were still the most frequently selected route choices in the walking trips observed.

Car-free design

One of the most frequently discussed design practices relating to pedestrian-friendly urban environments is the design of car-free or car-light streets. The pedestrianization of streets has often been described as a successful scheme for making the urban environment walkable (Moudon, 1987; Gehl, 2010). It has, in fact, been particularly successful in cases where the restoration of an adequate, safe and pleasant physical space for pedestrians in conditions that often favor the automobiles over pedestrians was one of the key solutions in enhancing the walkability. These are often inner-city areas that satisfy other conditions/factors for walkability, such as having a central location with good connectedness to the rest of the city, having a high degree of pedestrian density or the potential for facilitating it through attractions with a high degree of land-use diversity. Since these areas in the inner part of cities, especially in Europe, are limited in its space, car-free design was an effective solution for creating a safe and comfortable environment for pedestrians.
Hökarängen

There are pedestrian-only streets of different types existing in the three study areas. Hökarängen has one in its shopping center, which is often referred to as the first pedestrian street in Sweden (Andersson, 1998). This street was designed to serve as the main commercial street of the neighborhood. While many of the most successful pedestrian-only streets are commercial streets, and often the main shopping streets of cities, the use of this car-free shopping street in Hökarängen demonstrates how the co-existence of other factors supporting the walkability is crucial for the functioning of such a street. Although this street has a spacious and pleasant physical infrastructure for pedestrians, with its car-free design and the ground level of the buildings fully reserved for commercial use, designed for good interaction with the street, the street has very low pedestrian density. Due to the low residential density, low degree of connectedness to the rest of the city, and the range of existing retail outlets that lack the capacity to attract either the local or non-local customers/visitors, this pedestrian-friendly street does not seem to fully function as the active, lively main street of the area it may have planned to serve as.

Other than this street with the pedestrian-only design resembling inner-city shopping streets, there are also many other segments of streets that are car-free in Hökarängen. These are the pedestrian paths spread over the area, usually in the green areas between the residential buildings. While the car streets are limited in connectedness within the area, often ending up in cul-de-sacs and forming a network that is difficult to read, these pedestrian paths connect different parts of the area to each other. While most parts of the car streets run in a north-south direction, the streets that run through the area in a west-east direction are mostly these pedestrian paths. While the car-streets alone would have created a condition often present in suburban neighborhoods with low walkability, with poor level of connectivity both to the rest of city as well as within the area, the pedestrian paths contribute to increasing the connectivity within the area. However, although the car-free streets also mostly have sidewalks for pedestrians, since these pedestrian-only paths are crucial in connecting different parts of the areas, this design of the streets has resulted in a situation where separation occurs between car traffic and pedestrian movements. This separation is in partly due to the planning and the design of the infrastructure, but also realized and intensified by the walking behavior of the residents of the area.
While the streets with cars have very few pedestrians during most of the daytime hours, the tracking of walking trips on site during the field study showed that the pedestrian paths, somewhat hidden in the green areas in between houses, are where most walking trips occur. The reason for this could be that these pathways are the ones that allow connection in an east-west direction in the western part of the area and, in most parts, the paths that connect the residential buildings/areas to the subway station. Since going to the subway station makes up the largest proportion of all walking trips taking place in the area, these pedestrian paths are rather inevitably included in the route choices. The walking trips that occur on these pedestrian paths, which are almost all of the walking trips occurring in the area, are mostly activities such as going to the subway station, going to the bus stop, going to school or day care center, and going to the convenience stores. They are the type of activities that could be classified as necessary activities.
Since the walking trips taking place on the pedestrian paths are mostly necessary activities and, given the fact that for most of these walking trips there is no other route choice (as in providing similar route distance), the pedestrian streets are chosen in route choices for the walking trips since they are either the only or the shortest route to the destinations. Even though these paths are chosen mostly for reasons of distance convenience, the design of the streets could also to some degree affect the quality of the walking trips, although there may be limitations to discussing this based only on observation data. These pedestrian paths are rather distinctive in that they are designed to cut through the green areas. There are few buildings surrounding or facing the streets in most cases, and other than those that lead across open green areas, many sectors of these paths lead through green areas often with tall woods, creating a very calm and natural walking environment. However, the fact that they are surrounded almost only by greenery, and seldom by buildings, creates a rather monotonous environment on the other hand. The observation of the walking trips during tracking showed that walking trips in Hökarängen were made at a higher average speed than those in other areas. The facial expression and the attitude of the pedestrians during walking on these pedestrian paths also seemed to be more unenthusiastic comparing to the same type of activities in the other two areas.

Although these pedestrian paths are designed and built as pavement on green areas, there are also many trails made from traces of attempts to cross green spaces by a shorter route. They are found on most corners of these streets, as well as on lawns and even on hills leading directly to residential buildings. As there are no possibilities for interaction with experiential quality to occur caused by buildings and activities around and within them along these paths, the quality that people seem to most desire during these walking trips seem to
be in providing the quickest route possible. One benefit of car-free streets is that it reduces the risk from car traffic and enhances road safety. However, in terms of other kinds of safety, such as crime prevention, the way the car-free street design is implemented may influence the walkability in a negative way, as in the case of these pedestrian paths in Hökarängen. The design of these streets that are separated from the buildings and also the car traffic, together with the overall low pedestrian density, means that these streets significantly lack, not only the possibility of creating experiential quality through interaction with other, but also surveillance, or the *eyes-on-street*, which are crucial for creating a feeling of safety. Although most parts of these pedestrian paths are supported by lighting, the fact that there can be long dark hours depending on the season in Sweden, means that such a condition may reduce the quality of walking, especially for certain group of pedestrians more sensitive to this issue.

Although these pedestrian paths are where the largest proportion of walking trips occur within the area, since the overall amount or density of pedestrian is very low, even these streets are often empty during most of the daylight hours except during commuting hours, when there is a concentration of walking trips to the subway station and to schools within the area. The absence of other pedestrians, as well as car traffic and different, or any, land-use in the surrounding buildings creates a monotonous environment in which it is difficult to create liveliness. These streets have many seating places, such as benches along the pathways, but during the entire field study, only one incident of use of these seating places along these pedestrian paths was observed. The route choices for the walking trips, other than the necessary walking activities that have no other route choice except these pedestrian paths, show that they rarely include these pedestrian paths. Although the area itself has a very low frequency of more optional or social activity types of walking trips, even those that do occur are concentrated to the streets with car traffic.

**Södra Station**

Södra Station also serves as an example of the implementation of car-free design in a residential neighborhood. In this area, the two main roads running in an east-west direction within the area are designed to be car-light. First, there is a street (or combination of two streets) which includes a car-free segment in the middle of the area connected to Fatburs Kvarnsgatan and Fatburs Brunnsgatan at each end. The car-free segment of the street is also connected to the corner of Timmermansgatan and Fatbursgatan, and this sector,
which is the entering point to the residential area from the northern part therefore well demonstrates the car-light character of this area. Together with the street running parallel also through the middle of the area which is pedestrian-only along its entire length, these car-light streets within the area allows no car traffic to penetrate through the area from any direction. This resulted in making this redeveloped residential area somewhat segregated or isolated from the surrounding area and creates a rather quiet and calm environment.

![Figure 3.21 Map illustrating the car-free sectors in Södra Station](image)

The other car-free street in the Södra Station area, Södermalmsallén, is an interesting case of the use of a pedestrian-only street. This wide street, which lies in the middle of the area, has a pedestrian path, a bicycle lane and a strip of greenery running in parallel. It is connected to a park situated in the middle of the area and has seating places (benches) set near the lawns and trees on the street. On this streets, with residential buildings on each side, there are

![Figure 3.22 Car-free sector on Fatburs Kvarnsgatan (left) / Södermalmsallén (right)](image)
entrances to the apartments, inner yards of the apartment buildings with fences, and also entrances to a day care center and elementary schools. However, the design of the car-free street created a difference in level between this street and the surrounding streets, both running in parallel and crossing. At each end of the area, the surrounding streets cross over Södermalmsallén with staircases on the sides leading up to the bridge over the street. It is connected to the streets running in parallel also mostly by staircases, with connection via rampways at two points.

![Figure 3.23 Staircases connecting Södermalmsallén](image)

Despite its large capacity, Södermalmsallén has a low level of pedestrian density during most of the daytime hours, even when compared to the surrounding streets. Except for the commuting hours in the morning and in the evening, when there are many trips taking and picking up children from the day care center and the school on this street, there are few pedestrians walking in this large-scale pedestrian street. As well as the parallel car-light street, this street has very low degree of land-use diversity, with mostly residential use and few other uses, such as education and recreational facilities. Therefore, the few users of these streets with wide, comfortable, car-free sidewalk conditions are limited mostly to the residents of the area. During a few days in late May and early June with good weather conditions and especially while the trees on Södermalmsallén were flowering, there were a couple of occasions observed when the street attracted pedestrians taking a walk to the street in order to use the seating places and enjoy the weather and the greenery, but considering the climate condition in Sweden, this attractor is valid only for a very short period of time during the entire year.
As discussed in the case of Hökarängen, an advantage of car-free design is that it solves the road safety problem. This is important for certain group of pedestrians, especially children. Since there are schools and a day care center for small children surrounding the street, the car-free situation creates a safe walking environment for children, and during daytime, together with the connected park area, the wide street is occasionally used as space for their play and recreation as well. However, in general, with the low pedestrian density, wide street width, and limited land-use diversity alongside, the street creates a calm but monotonous walking environment.

The tracking of the walking trips showed that Södermalmsallén was avoided in the route choices for many walking activities. Walking for pleasure trips almost never included Södermalmsallén in the route, but were instead directed to other surrounding streets with higher pedestrian density and more activities supported by land-use mix. In the walking trips for necessary activities, other than the walking trips made by the residents of the area where the destination or residence was located on Södermalmsallén, there were few commuting trips that passed through or crossed the street. While the difference in levels and car-light design has created difficulty in the orientation of these streets from surrounding streets, these commuting trips were made by individuals who seemed to be well aware of the area and able to orientate through the complicated staircases and ramps, since these provided the shortest route to their destination. An interesting result from the observation was that in some walking trips, Södermalmsallén was avoided even at the cost of a detour. Although these were necessary activities, such as going to the public transit or the grocery store, the car-free street was avoided, probably due to the inconvenience of having to use the staircases. The observation
showed that the number of persons who avoided using the stairways was higher than the author expected.

SoFo

While car-free design has been rather strongly implemented in the other two areas, SoFo is different in this respect. When evaluating the effect of the car-free program in the other areas, the walking environment created by the pedestrian-only streets seem to partially decrease the quality of walking, mostly due to the way it has been designed and implemented. Due to the context and the design method, the effect of car-free design is rather different in these areas compared to the effect it has had in other cases that are considered to be successful, such as in Venice, Italy or major shopping streets in cities. For SoFo, in terms of an argument for better walking facilities, e.g. regarding sidewalk width and traffic safety, the necessity may be rather high, considering the high number of pedestrians during the crowded hours that seem to overload the sidewalk capacity. However, most streets in the area allow car traffic, and there is only a small sector where vehicles are restricted.

Figure 3.25 Map and photograph of the car-free sector of Södermannagatan

Part of Södermannagatan between Bondegatan and Skånegatan is designated a car-free sector (“gågata”). This sector is where the street width is narrower than in other parts of the area, but has higher number of pedestrians. The restriction of car traffic and the change of the street into a pedestrian street was implemented recently (in 2006), initiated by requests from the residents and shopkeepers of the area. While the designed sidewalk is very narrow, now that the sector is only for pedestrian use, it provides a comfortable and safe walking environment. The shops and cafés situated there are using the space
for tables and for displaying products. During the hours when the area has many visitors, the street is actively used by passers-by, café and shop visitors, and other people sitting and staying. It is a good example of a context where the implementation of car-free design may be effective in supporting walking and the use of streets.

**Götgatan**

Götgatan is an example of a street with car-free design that provides an interesting contrast to Södermalmsallén. The streets are situated close to each other on Södermalm, both centrally located within the entire city. Götgatan is one of the main commercial streets in the inner city of Stockholm, with a great concentration of retail outlets and services at ground level. It has a large number of pedestrians visiting the street on average. Therefore, the car-free environment creates a safe and comfortable walking environment for the high pedestrian density, consisting of different walking speeds and activities. The strong contrast in the intensity of use of the two streets during the same hours at weekends illustrates the effect of land-use diversity in the context of similar high connectivity at the city level.

![Figure 3.26 Photographs of Götgatan and Södermalmsallén on the same day (weekend afternoon)](image)

Götgatan is a good example where a car-free program is an effective way of supporting pedestrian comfort in settings such as major shopping streets, where there is high pedestrian density and lack of facilities for walking on sidewalks only. In Södermalmsallén, however, in the context of the street which is a quiet residential neighborhood, the car-free design rather reinforces the quiet, sparsely peopled and park-like atmosphere, creating a very different
environment from Götgatan. This illustrates that, although both implementations may be referred to with the same label of ‘car-free street’, the disallowing of vehicles may have different effects for the pedestrian environment depending on the context and the specific design.

**Car traffic vs. pedestrians**

As discussed so far, one benefit of designing car-free streets in residential areas is the improvement in traffic safety. Hökarängen is an example of an environment where the separation of car traffic and pedestrian movement is implemented through the planning and layout of car streets and pedestrian paths. However, although the risks from car traffic are solved in the car-free segments, in places where pedestrians intersect with car traffic, which still exists extensively and inevitably, conditions for pedestrians are not as “pedestrian-friendly”, when compared to the other study areas. Compared to the other two areas, SoFo allows car traffic almost entirely throughout the area. The amount of car traffic is similar to that of Hökarängen. However, with the higher pedestrian density in SoFo during most of the daytime hours, the dynamics between car traffic and pedestrians differs between the two areas. SoFo has a somewhat pedestrian-dominated environment, where vehicles move at slow speed with care for the pedestrians. In Hökarängen, vehicles move higher speed, and the observation showed that at intersections, pedestrians often waited for the car to pass and then crossed the street, while in SoFo the opposite was nearly always the case.

While a car-free design could be a key solution for activating inner-city streets with high (levels or potential for) pedestrian density, connectivity, and land-use diversity, it is difficult to achieve this effect in residential areas through car-free design alone. The various cases of car-free streets in the study areas show that, despite the advantages the implementation of a car-free concept can bring, such as improvements to traffic safety, there is also a risk of impeding walkability, such as creating inconveniences in walking conditions through differences in level, and limiting the possibility for land-use diversity, which is an important factor in enhancing walkability through both quality and the quantity aspects of walking.
3.6 Different Walking Activities and their Route Choices

During the field observation, especially in the detailed observation of individual walking trips during tracking of pedestrians, the destination or the estimated purpose of the walking was documented. What will be discussed here are the different walking trips and their route choices through describing specific examples or patterns in an area. The route choices and the presence and distribution of different walking activities in each area may allow discussion on the difference between various purposes of walking in how they interact with the built environment.

Utilitarian walking trips

In this thesis, walking trips that involve the daily activities of residents, such as going to work, school, grocery shopping, and other ‘necessary’ purposes, including going to the public transit in order to take a trip for these purposes, will be called ‘utilitarian’ walking trips. Although there are many different specific purposes among this kind of walking trip, the reason they are discussed together here is because of the similarity in the behavior of these activities, such as the attitude of the pedestrian and the quality of the factor that influences the route choices. And the most important factor in the route choice these walking trips have in common seems to be the issue of walking
the *shortest distance*. Since the origin and the destination of these utilitarian trips are more fixed points compared to other types of walking, such as walking for pleasure or walking the dog, in most cases they took one of the shortest, or the only shortest route possible. Although efficiency of movement may be the strongest factor or quality sought by the pedestrian for utilitarian walking trips, (which was a common factor for all three areas), other factors involved in how pedestrians interact with the built environment during walking will also be discussed here, on the basis of specific route choices and some differences in the patterns between areas.

**Hökarängen**

Hökarängen is the area where the ratio of utilitarian walking (within entire walking trips) was the highest. Due to its street network, including the pedestrian paths, the area does not allow different route choices (of the same or similar distance) for most of the walking trips. Therefore, the utilitarian walking trips usually took the only shortest route, which in most cases included the pedestrian paths through the green areas. In this area, especially for utilitarian walking activities, the dominant and often the only factor in the route choice seemed to be the efficiency of movement. What seems to illustrate this strongly is the fact that, while the paved pedestrian paths and sidewalks usually provide the reasonably shortest route distance between the start and the destination, the pedestrians in this area were very often creating spontaneous trails which made an even shorter distance. As described earlier, these are trails that usually pass across or through the green areas and sometimes even pass through very narrow, dark spaces between buildings, creating a less comfortable and safe walking environment than the paved pedestrian paths (see individual walking trip case #1 in Section 3.2).

**SoFo**

Contrary to Hökarängen, SoFo is where the pedestrians are usually given alternative route choices due to the grid street network. Therefore, although the route choices of the utilitarian trips were mostly based on selecting the shortest route distance with the least number of turns, there were cases where different routes with similar conditions in this sense were possible. In the tracking of these cases, the results show that there are streets or sectors that the residents seem to choose or include in their routes more often. These were the sectors which had relatively higher number of pedestrians, both residents and
visitors, and which were often also the sectors with higher level of non-residential use at ground level. The close observation during the tracking of trips suggests that these sectors seem to offer the pedestrian greater opportunities for direct and indirect interaction with other people and the activities both inside and outside the buildings, which may enhance the experiential quality of the walking activity (see individual walking trip case #2 in Section 3.2).

In the observation of the utilitarian trips in SoFo, there were a large number of cases when the pedestrian was actively interacting with the buildings, such as looking closely into the displays of the shops or the people and the activities in the cafés and restaurants. The offices at ground level of the buildings also seemed to contribute to the quality of walking, by creating a feeling of liveliness and surveillance. The design of the ground level of the buildings providing good visibility between the pedestrians on the sidewalk and the activities inside the building seems to contribute greatly to this effect. The presence of office spaces, compared to residential-use only buildings, seems to be especially effective during the daytime in influencing the atmosphere of the walking environment, when residential buildings are mostly empty and quiet. There were many cases of both the observer and other pedestrians observed having eye contact during walking with persons sitting in the offices close to the windows of the buildings. These observations may be related to possible reason why sectors with higher ratio of other uses and pedestrian density seemed to be chosen more often in the route choices for utilitarian trips (compare: Demerath & Levinger, 2003; Du Toit et al., 2007).

This preference for streets with more pedestrians or shops, restaurants, cafés, etc. in the route choices was consistently observed during various times and days. It was a strong pattern, observed during commuting hours as well as during daytime, and also throughout the week including weekends. The utilitarian trips with such preferences included various purposes, such as walking to and from work, to the public transit, to the grocery store, and many others. Even from the morning time commuting trips, there were several observed cases when the pedestrian was looking closely into the window displays of the shops not yet open. One difference between morning commuting time and daytime was that the sector with mostly office space at ground level seemed to be chosen less often in the morning, since it had the opposite effect from the daytime with no activity in these spaces during this time. However, such a difference did not seem to apply as much to the sectors with more retail use, since the shops, although closed, still often provided
window displays of the products that the pedestrians could see and interact with.

*Figure 3.27 Photographs of sidewalks in SoFo*

In the weekends during the observation study in SoFo, there was significantly high pedestrian density, largely due to the high number of visitors to the area. Since the visitors or non-residents seemed to make up more than half of all pedestrians, the trips of these pedestrians were predominantly concentrated to the streets with uses such as retail, cafés and restaurants. On the other hand, the segments with residential-use only buildings had significantly smaller number of pedestrians, often less than five at a time. The difference in the pedestrian density between the streets was so large that the segments with higher pedestrian density were in a condition where the number of pedestrians seemed to overload the capacity of the sidewalk. An interesting result from the observation was that, even in these situations, the residents making utilitarian trips still chose to pass through the busy and lively part of the streets more often than the less crowded parts. Since there were many pedestrians visiting the area for non-utilitarian purpose walking, the overall speed was relatively slow and the crowdedness often made it difficult to pass ahead of other pedestrians. There was very little space between the pedestrians in both directions, and there were frequently situations when pedestrians had to tilt the body or step down into the street in order to make space for pedestrians coming from the opposite direction. Therefore, the speed of utilitarian trips of residents, such as going to the grocery store or other shopping, was slower than the average speed during weekdays. Despite this condition of the walking environment, in the majority of the cases observed, residents making utilitarian trips nevertheless kept their preference for route
choices including these segments with higher numbers of pedestrians and other uses in the buildings (compare: Ewing, 1999; Moudon, 1987; Gehl, 2010).

Although this was a dominant pattern, there were still a few cases that showed a different behavior. While the majority of the residents did not seem to mind choosing the segments with high pedestrian density which might cause uncomfortable walking conditions, there were a few occasions observed during the busiest hours of the weekend where residents seemed to partially avoid the busy segments. One example is a walking trip of a resident on a Saturday around noon. The pedestrian was a man pushing a small boy in a stroller and also carrying a bag of groceries, (although the actual scene of emerging from the grocery store was not observed). This walking trip was partially tracked and observed, beginning from when the pedestrian was found walking southwards on Östgötagatan. The reason this trip was chosen for observation was the fact that the pedestrian was walking at a significantly faster speed than the other pedestrians. Pushing the stroller with a grocery bag, the man walked in a hurried manner, overtaking many of the pedestrians who were mostly walking at a slow speed during this time. An interesting fact was that although the man seemed to be walking at a fast speed and in a very purposeful manner, he did look into the displays of the stores a few times during the walk, as most other pedestrians at this time were also doing. The route this pedestrian took was the segments with higher pedestrian density (Östgötagatan and Skånegatan), but while walking on Skånegatan, he took a detour, choosing to walk through the less crowded streets (see the map in Figure 3.28). The reason for this may be that the high number of pedestrians as well as the space in the sidewalk occupied by the tables and chairs from the cafes and restaurants in this part made it difficult for him to walk with the comfort and at the speed he wanted, especially since he was also pushing a stroller.

![Figure 3.28 Route map of the given example from SoFo and photographs of the avoided path](image-url)
As is the example of the walking trip described above, there were pedestrians who seemed to be more affected in their route choice by certain factors, such as the condition of the sidewalk, than other pedestrians were. From the observation, these pedestrians were often people pushing baby carriages and elderly persons. These pedestrians were more often observed making a detour in order to avoid segments with less comfortable (e.g. narrow, crowded, or with staircase) conditions on the sidewalk. Nevertheless, in SoFo, the unusual cases in route choice were significantly fewer in number than the dominant pattern, and in the majority of cases, the high density of pedestrians and other uses in the building had a more positive effect of attracting walking and enhancing its experiential quality than the negative effect of creating a walking environment with less convenient or comfortable infrastructure (sidewalk condition).

Another result from the observation that supports the dominant pattern in the route choice in SoFo is the difference between normal weather and rainy conditions. In order to check whether there was any difference in the walking behavior between different weather conditions, observations during rainy condition were conducted during the field study. Although the amount of time spent on observation during rainy conditions was far less than during normal weather conditions, some differences were documented. Since SoFo was the area where such differences seemed to exist more obviously than in the other areas, more observation during rainy conditions were conducted here (seven occasions, each consisting of several hours). What seemed to be different during rainy conditions was that walking trips or their route choices seemed to be more evenly distributed among different streets and segments compared to comfortable weather conditions, when they were more concentrated on certain segments as described in the previous paragraphs. This was found in both the observation of the overall distribution of pedestrians in the area and also in the individual tracking of walking trips. It may be that during rainy conditions, pedestrians are more influenced in their route choice by efficiency of movement and comfort of the walking environment.

*Södra Station*

The tracking of utilitarian trips in Södra Station also showed that the route choices were mostly based on the shortest distance. However, one interesting result found in Södra Station was the avoidance of the Södermalmsallén. Due to the difference in level between Södermalmsallén and the surrounding streets,
this street is connected to the other streets mostly by staircases. During commuting hours, there were many walking trips on this street due to the fact that many daycare centers and elementary schools were located here. However, at other times, a strong tendency to avoid Södermalmsallén was found in the route choices for utilitarian trips, such as going to the grocery store or going to public transit. Even for walking trips that had to pass Södermalmsallén in order to find the shortest route distance, a large number of them avoided including the street at the cost of a longer distance. The fact that there were several observed cases where the ramp way connecting Södermalmsallén was chosen instead of the staircases despite a detour, and that such a detour was almost always present in the walking trips with baby carriages, may suggest that the presence of the staircases and people’s avoidance of them is the main reason for these route choices.

Figure 3.29 Route choice map of the case avoiding Södermalmsallén

Walking for pleasure

Walking for pleasure or recreational reasons was an activity that showed an observably different behavior from the more necessary walking activities. Excluding walking for exercise, these walking trips were generally conducted with a much less purposeful attitude and at a slower speed, with more flexibility between moving and sojourning. The route choices for these activities also proved to be distinctly different from the route choices for utilitarian trips. The destinations of these walks were less fixed and the movement between different locations was also not always directed by the shortest distance route, as in the case of utilitarian trips. In the observation of these walking trips, the quality that the pedestrian pursues may be
investigated through the destinations and moreover the route choices during the walk.

SoFo was the area in which the greatest amount of walking for pleasure was observed out of the three areas. It was also the area where the ratio of walking for pleasure as a proportion of the entire number of walking trips was the highest. Also, a large number of these trips were conducted within the area (as opposed to the result in Södra Station). The observation of these trips showed that they were in most cases directed towards and through the sectors with higher amounts of other pedestrians and activities. During the weekdays and the hours with relatively fewer pedestrians in the area, the strolls of the residents were directed more towards specific sectors with retail stores or Nytorget. In the weekends, with significantly higher pedestrian density, the residents took their strolls in the streets with greater numbers of other pedestrians, which were often the sectors with non-residential use at ground level of the buildings. During the walk, the pedestrians observed other pedestrians as well as people sitting or staying in and outside the buildings in stores, cafes, and restaurants, and also looked at the displays of the shops, often stopping as well. Since there seemed to be a strong preference for these specific sectors during these walking activities, the routes were often circular in shape, or moving back and forth on the same street.

While the sectors with a higher number of pedestrians and non-residential use were the routes most often chosen for recreational walking, another street with a slightly different characteristic was often observed to accommodate this type of walking activities as well. This was Katarina Bangata, which has a tree-lined pedestrian path running down the middle of the street, as well as sidewalks connected to the buildings. While pedestrians making utilitarian trips and some of the recreational walking trips seemed to prefer the sidewalks near the buildings, where it is possible to see the displays of the stores and the activities within the building, walking trips by the elderly and pedestrians with baby carriages, especially those making recreational walking trips, seemed to prefer the pedestrian path in the center, which provided a wider width, benches, and a more comfortable walking environment.

In Södra Station, as for the other types of walking, walking for pleasure was also mostly directed towards places outside the set boundaries of the area. There were very few strolls that were going to or passing Södermalmsallén. These few cases were either observed on the day with exceptionally pleasant (sunny) weather conditions, when the trees on Södermalmsallén blossomed and attracted visitors staying on the street, or were observed on accompanied strolls. In walking for pleasure alone or pedestrians with baby carriages, there
was, reversely, a tendency to avoid Södermalmsallén. Medborgarplatsen, a crowded square close to the Södra Station area, was a popular destination for the strolls(pleasure/social walking) of the residents of Södra Station (e.g. individual walking trip case #3 in Section 3.2). While the streets within the area are rather quiet, walking for pleasure seemed to be directed towards places with more activities and people.

One example illustrating this is the walking trip tracked and observed on an afternoon during the weekday (May 11, 2010, Tuesday, around 2 pm). The pedestrian tracked was a middle-aged man, coming out from an apartment on Fatburs Kvarngatan. He walked towards the east on Fatburs Kvarngatan at a rather slow speed. On this street while walking, he was observing other pedestrians and also carefully reading the flyers attached to the walls and the lamp posts. Instead of walking straight forward to Swedenborgsgatan, he took a detour by turning left and walked down Fatbursgatan, which is a street with cars and also more pedestrians. On Swedenborgsgatan, he slowed down in front of the entrance to the commuter train stations where many people were both moving about and staying, observing the activities and people there. He stopped to look at some teenagers performing with their skateboards for a few minutes, and continued to walk along the pedestrian path leading to Fatburs parken and onto Medborgarplatsen.

![Figure 3.30 Route choice map of given example for walking for pleasure in Södra Station](image)

Hökarängen was the area where the least number of persons walking for pleasure was observed. Very few could be found in the first place, and moreover, the tracking of these trips was difficult, since the walking speed tended to be slower and the pedestrian in most cases became conscious of the
observer and the tracking had to be stopped. Therefore, there was difficulty finding a pattern in the route choices of these walking activities. However, compared to the utilitarian walking trips which were concentrated in the pedestrian paths, the recreational walking trips were mostly observed in the car streets, and also often directed towards or passing through the centrum.

Walking the dog

Walking the dog was another type of walking that showed a significantly different behavior from both utilitarian trips and walking for pleasure. This was the only type/purpose of walking that was significantly less present in SoFo than in the other two areas, whereas walking for most other purposes was more frequently observed in SoFo. In Hökarängen and in Södra Station, walking the dog was the type of trip that made up a significant part of all walking trips, especially during daytime, when there were relatively fewer pedestrians. However, this seems to be due not to the fact that these trips were more likely to take place during these hours, but more to the fact that the number of other trips was significantly lower than during other hours. In that sense, the number of instances of walking the dog observed in SoFo may be low also because of the higher frequency of other purposes of walking, but the absolute number of instances of walking the dog seemed still to be relatively lower than in the other areas.

Walking the dog, especially when excluding walking “with” a dog for other (utilitarian) purposes, was an activity that showed a different pattern from other walking activities. Since it involved frequent stopping and staying during the walking activity and was often conducted in a slow speed, tracking these walking trips was very difficult. Therefore, these trips were documented mainly by the location in which they were observed and only partial observation was possible. Södra Station was the area where relatively more instances of walking the dog was observed. Comparing the amount of walking activities found within the defined areas in Södra station with SoFo, there were fewer instances of walking for pleasure but far more instances of walking the dog. One reason for this may be that Södermalmsallén seemed to attract this specific walking activity, probably due to its design which resembles a linear park. Walking the dog was consistently observed in this street over the entire hours observed. Although tracking of these trips was limited, it seemed that these walking trips were not only made by the residents living within the defined area, but to a large degree by residents from the surrounding areas.
The fact that Södermalmsallén has a greater area of lawn compared to the other streets in the surrounding area in the inner city seems to be a key factor in attracting this specific walking activity.

In Hökarängen as well, walking the dog was an activity that was observed over various hours. As in Södra Station, the route choices for walking the dog showed a slightly different pattern from route choices for utilitarian walking activities. However, a difference was that whereas pedestrians walking the dog seemed to be attracted to the street with more green space in Södra Station, this was not the case in Hökarängen when analyzing where these walking trips were observed. On the contrary, walking the dog was more often observed in the car-streets than the utilitarian walking trips which were concentrated more to the pedestrian paths that run across the green areas and thus have the largest amount of green space along the route. The reason for this difference between Södra Station and Hökarängen may be that, compared to Södra Station, Hökarängen has a significantly greater amount of green space in the area and most of the streets have patches of lawn along the sidewalk, which seemed to be an important factor for walking the dog. Also another reason for such a pattern of route choices may be that people seemed to avoid streets with higher pedestrian density when walking the dog.
4 Discussion

Through the empirical study, not only the analysis of the obtained data, but also the different lessons and reflections on walkability obtained throughout the course of conducting the observation study allowed speculations about how to view and approach walking in relation to the built environment. The discussion presented here is based on ideas and insights gained from such reflections, the results of the observation study, and also reflections from literature reviews. The discussion first considers the various attributes of the built environment that seem to affect walking behavior, not only whether or not they are valid as walkability factors, but more why and how they seem to affect walking. The differing relevance of various factors, how they function together with or over other factors, and how different factors function and could be positioned in relation to the different aspects of the built environment’s influence on walking are also discussed. As well as on how to view the built environment factors, the discussion will continue about how to deal with walking in understanding and investigating walkability, especially how to understand the different aspects of walking activities. This includes discussion of the importance of acknowledging the different types of walking activities in dealing with how they are influenced by the built environment. Also, the importance of recognizing and understanding the aspect of walking as a social activity will be discussed.
On different factors of the built environment

Density, connectivity, land-use diversity – significance of the major factors

Factors identified as major in correlation studies of walkability, such as density, connectivity, and land-use mix affect walking behavior especially by directly providing destinations within walkable distances, which may be the reason why they have been identified most frequently as significant in studies dealing with the quantity of walking. If walkability of the built environment is considered distinguishing the aspect of directly influencing the quantity of walking by providing destinations within walkable distances and rather indirectly influencing the quantity by affecting more the quality of the walking experience, what has been mostly identified in terms of major walkability factors is the former aspect. This is due to the method and data used for the studies that have identified these factors, as well as the context of these studies, which are mostly urban environments with highly problematic settings that prohibit walking. The results of the empirical study of this project, from analyzing the difference in perceived amounts and rates of walking between the neighborhoods studied in relation to the spatial analysis of the areas, seem to also confirm the significance of the major factors in the destination-providing aspect.

However, a more interesting implication of the results of this observation study is that, in investigating in detail how these factors seem to influence walking behavior, these major factors are also of significance to the aspect of influencing the quality of the walking experience. The way built environment influences the quality of the walking experience seems to function by creating qualities related to making a comfortable and interesting environment for walking. As the results and the analysis of the observation study show, the qualities created by the conditions of the different factors, often together by means of combinations or co-presence, that strongly influence the walking activity are liveliness, safety, attractiveness, sociability, or the possibility to interact with buildings, activities, and other people (both stationary and moving). Although some qualities, such as legibility and orientation, are determined more strongly by the design and planning of the streets and buildings at the detailed level, the key factors, such as liveliness, safety, or sociability, are created and determined more strongly by the main factors defined as influencing the quantity of the walking as well (i.e. density, connectivity and land-use mix).
The understanding of the different aspects of the major factors influencing walking (i.e. providing destinations and routes / influencing the quality of the activity) also points to the importance of investigating the factors at different scales, especially in terms of the scales at which urban design operates. Urban design influences the walkability of the urban environment on different scales and in different aspects. In terms of these main factors already defined, if the destination and route-providing aspect of these factors is first considered, they are realized or determined more by large-scale planning and design practices. The aspect of determining the quality of the walking experience is instead more related to urban design more on a micro-scale, such as at street-level and building-level. This urban design at micro-scale is concerned with how the factors are implemented at more detailed level in practice. This is important in the sense that they may determine how the condition or degree of the factors provided at the larger-scale planning and design practices may fully function in influencing walking behavior. They would determine how effective the given condition of the factors are, so given the same degree is provided when measured in the larger scale, this condition of urban design at micro-level would determine the degree to which they would be influential. And this condition of urban design at street- and building-level not only determines how the factors would be influential in the quantity-influencing aspect, but they are especially important in determining the quality of walking aspect. It could be considered that, in terms of the main factors defined for walkability, urban design related to these factors at a larger scale is more related to the quantity-influencing aspect, while urban design at detailed scale in how the factors are implemented is more related to the quality of walking aspect.

The description on how the main factors, density, connectivity, and land-use diversity influence the degree and nature of the walking activities/behaviors in the areas studied during the observation demonstrates the close relationship between these factors in influencing walking (as presented in Section 3.3). The way in which the main factors work together in determining the walkability of an area shows the importance of the co-presence of factors and how they affect each other. The degree of density, connectivity and land-use diversity through their combination determine the character of the area in terms of the kinds of walking activities it supports, and to what degree. The explanation for the differences in pedestrian density, the composition of pedestrians and the diversity in walking purposes between the areas may be more properly provided when the degrees of the factors are observed together rather than by considering single factors separately. For example, in SoFo, the high degree of integration at the global level, illustrating the connectedness to
the rest of the city, together with the high diversity in the land-use, especially in the detailed types of commercial use and services, determine the diversity of the walking purposes and the composition of the pedestrians. Moreover, as the main factors function in close relation to each other, other design factors related to walkability also seem to function while being influenced in their effect by the condition of other factors, especially the main factors discussed here.

*Other urban design factors related to the walkable environment*

Other than the main factors identified in correlation studies, which are related to the measurement at a larger neighborhood scale, there are other factors at the more detailed urban design level. In these factors, there are qualities or practices that can be discussed as related more directly to how the main factors (density, connectivity, land-use mix) are realized, and there are also those that are not as directly related to these main factors, but are classified or identified more as “pedestrian-friendly” design. These are urban design programs, schemes, or practices that are often considered to be related to the pedestrians’ quality needs in terms of convenience, safety, pleasure, etc. They often deal with the very direct setting of the walking, the sidewalks, how they should be designed in detail, and also include some programs or schemes such as car-free design. These are more related to the convenience and aesthetics of the physical setting for walking. Other design factors related to walkability would be design conditions that determine the legibility or visibility of the urban environment. As can be also assumed from the fact that the correlation studies dealing with the quantity of walking have been failing to prove consistently the significance of these other factors, they may seem to be more related to the built environment’s aspect of influencing the quality of the walking experience. Also, as described e.g. in the discussion on the use and influence of car-free design in the study areas, how effective they are in positively influencing walking in real situations seems to be dependent on the context of the given environment, which is closely related to the condition of the main factors.

The discussion here does not intend to underestimate the importance of these factors. For example, other than the main factors, the factor related to the securing and designing of the sidewalk is one of the most often discussed factors (especially in urban design-related literature). It is true that this is an essential factor in walkability, both in providing the possibility to walk and not hinder walking, and also in terms of the quality of walking by making it more
pleasant, convenient and safe. Also, it may sometimes become the key solution to improving walkability in certain contexts. However, what should not be misinterpreted is that this does not imply that it will always be the case, and that in many other situations, considering and managing this factor alone may not be sufficient, such as in the case of dealing with residential neighborhoods, especially the problematic suburbs with which the health-oriented walkability studies are mainly concerned. In these situations, in solving the problem of the built environment disallowing walking, the existence or the aesthetics of the sidewalk did not show as much significance as other factors did, such as density, connectivity, and land-use mix. Of course, this may partly be due to the limitation and weaknesses of the existing walkability studies in dealing with the proper identification and measurement of built environment attributes and walking activity. Still, it seems that this factor is often rather minor in the hierarchy of walkability factors in many of the most serious situations of low walkability. But, as claimed above, this does not imply that the sidewalk as a factor is not significant, especially regarding the existence or provision of a space for pedestrians (as partially opposed to the “design” of the sidewalks). It could be rather argued that the existence of a proper sidewalk is the very basic precondition for walking. Their influence may be difficult to measure and prove in relation to the amount of walking, because they are actually too essential.

The fact that the projects, discourses, and theories from the urban design field that deal with walking have concentrated on central areas in the inner city is also the reason why they have disagreeing perspectives in terms of the design related to the condition of the sidewalk. While providing a pleasant and convenient infrastructure for walking (often the sidewalk), by means of design, with careful consideration for pedestrians is often emphasized in urban design practice and research, the public health-oriented walkability studies have often failed to prove the correlation between the amount of walking and factors related to the condition and the aesthetics of the sidewalk. The reason that the provision and improvement in the design of streets, especially sidewalks, have been discussed often is that this has actually been a key solution to improving the walkability of the urban environment in projects in city centers. But if the background to this is carefully observed, it occurred in a situation where the proper provision of infrastructure/space for pedestrians had been neglected in the planning and designing of the urban environment with the development of a car-dependent society, resulting in an urban environment that hinders walking activities. When the pedestrian-friendly environment started to regain its proper place in urban planning and design, the solution to increasing the
walkability of areas in the city center was to rebuild and redesign the space for pedestrians. This reconstruction and renovation of the sidewalks was the key solution, since it took place in an environment where other key factors in attracting and assisting pedestrians, such as land-use mix, density, and connectivity were already existent to some degree, or at a rather high level in these inner-city areas, and the infrastructure was the missing part.

As it appears, understanding or improving walkability and knowing what factors to measure and manage seem to depend largely on the context and the type of walking. This issue is important for understanding the various ways in which the built environment influences walking, and also for understanding how the different factors as discussed above seem to work together or over each other. Therefore, in order to gain a better understanding of walkability, a key issue is knowing what these different ‘kinds’ and ‘aspects’ of walking are in particular and understanding how they relate to and interact with the built environment.

**On different aspects of walking**

*Walking in the city vs. everyday walking*

As mentioned above, many of the theories and discourses on walking from the fields of urban planning, design and architecture have focused rather on specific types of walking, such as walking in the city center or walking in the park. On the other hand, the walkability research that has been developing in cooperation with the fields of preventive medicine or transportation research have conducted their studies more often in a residential context, such as suburbs. Although both are dealing with ‘walking’, they are in fact dealing with very different aspects of walking activity. The statistical studies on walkability which deal with the quantity of walking in the built environment-walking relationship approach walkability with the focus more on the walking done by individuals in their everyday life around their residence in residential areas. Based on the findings from their correlation analysis, they are often more interested in utilitarian walking in residential neighborhoods, while the theories and discourses from the field of urban design are often discussing walking in the city center, which is a very different type of activity. This difference between everyday utilitarian walking and walking in the city (as in the central areas) is one of the reasons why the two bodies of research are often discussing different aspects of urban planning and design as being of main
interest when discussing walking in relation to the condition of the urban environment.

For instance, although design qualities related to legibility or ease of orientation are often discussed as important factors when discussing walking in the city, since this walking often includes first-time or less-frequent users of the area under consideration, these qualities may have significantly less influence on the everyday embodied walking of an individual taking place in the area around the individual’s residence, where the individual would be well aware of the condition and layout. The fact that qualities that may be valid in influencing one type of walking may not be as valid for another type of walking may explain why the different theories and studies on walking seem to make contradictory statements. This may explain why Jan Gehl’s classification of activities in the city (Gehl, 2010) argues that necessary activities, in which the utilitarian walking would be included, would occur regardless of the condition of the built environment. This is explaining the aspect that it is not as influenced by the qualities or factors that influence the type of walking that takes place in city centers. However, the statistical walkability studies focusing more on the quantity of walking aspect, have been arguing that the analysis of the correlation between amount of time spent walking and different measures of built environment factors shows that utilitarian walking is the type of walking perhaps most influenced by the condition of urban form. These contradictory statements are made because the two bodies of research are dealing with different types of walking and also different aspects and factors of the built environment-walking relationship.

The difference between walking activities

The reason why different kinds of walking are associated with the built environment in different ways and to different degrees is that people desire slightly different qualities in the environment depending on the different types of walking. The qualities desired here relate to determining the quality of the walking during the actual course of the activity, but also relate to determining whether to walk or not. The reason why utilitarian walking has been most often proven as being most significantly influenced by built environment in the statistical studies on walkability is because it is most affected by the destination-providing aspect of the environment, the aspect that has been most explicitly measured and was the main problem in the condition of the US suburbs, where the walkability research was initiated. And the reason why
walking for pleasure has not so often been proven to be as much influenced by built environment as utilitarian walking is that it was analyzed with the same kind of data as was measured for the built environment’s aspect in hindering walking by not providing destinations and possible environment to walk, when walking for pleasure in particular is more sensitive to other aspects of influencing the quality of walking. As described, this aspect is related to the qualities that are made by built environment factors other than just the provision of destinations and possible, convenient routes to and from them. From the observation, walking for pleasure was more sensitive to these qualities, as shown by the difference in the route choices made by pedestrians engaged in this walking activity, and perhaps the type most influenced in terms of its quality by the built environment.

The issues discussed so far, such as the influence on quantity / quality of walking and the different types of walking activities, may also be related to the issue of making to choose walking over other modes vs. generating walking activities (i.e. more as an activity that can only be done by walking). If we think about Jan Gehl’s division of different activities in mind (Gehl, 2010), there are on the one hand necessary activities, which have to take place whatever the conditions are. For these activities, such as going to the grocery store, going for errands, going to work/school, the influence of the built environment on them would be to determine whether they can (as in “possible”) be done as a walking trip. This is related to the quantity influencing aspect, providing destinations within walking distance and also a possible, convenient, and safe route. However, as discussed before, this influential power is more about whether it is allowed or not, in other words, whether conditions will hinder it or not. It does not mean that the presence of these conditions will automatically generate walking trips. When the built environment conditions are above the level that does not prohibit walking from happening, then the role of the built environment for these necessary activities would expand into making people choose walking over other modes of transport, if we assume that we take the standpoint of walkability research initiated from the preventive medicine field and have the aim of promoting and encouraging increased amounts of walking.

As in the situations of trying to make individuals choose walking over other modes of transport which may seem more physically convenient, such as taking the automobile, when it comes to the point of actually promoting walking (not just disallowing it), there are so many other strong factors, both intra- and extra-personal, that are part of this equation that the influence of the built environment inevitably decreases when compared to its potential power of hindering walking from happening at all. And, just as for the quality-
influencing aspect, this forcing a choice in preference to other modes of transport for necessary activities has to do with providing the built environment conditions that contribute to increased quality of the walking activity over its duration. Although this issue requires further investigation, it may concern providing the qualities that people desire in a walk, with possible examples being liveliness, sociability, interaction, experiential quality, etc. Therefore, it seems that, for necessary activities, the quantity-influencing aspect has to do with the ability to generate them and the quality-influencing aspect with making to choose walking over other modes of transport when they occur.

However, when it comes to optional and social activities, the mechanism seems slightly different. The types of walking that may belong to these kinds of activities are activities such as walking for pleasure or for recreation. These activities are slightly different from the activities discussed above, in that they naturally involve walking, which means that they can almost only be done by walking and seldom compete with other modes of transport. Because of this, they are different in that they are involved mainly with the generating walking trips aspect, but this aspect does not involve so much of the quantity influencing aspect of the built environment as in the case of the necessary activities. This is because they often do not involve a fixed destination point, but take place according to the condition of the built environment, which has more to do with the quality-influencing aspect of the environment. The reason for or the desire to generate these walking activities, as in deciding to do them or not, is often same as the qualities that are desired during walking which determine the quality of the activity, and these qualities are the ones discussed above.

Walking together vs. walking alone: on walking with company

In dealing with the different kinds of walking, one aspect that could be considered is the presence of company during the walking activity. In comparing walking alone and walking with someone else, it is difficult to say what the difference may be in terms of the frequency or the quantity of walking. Since walking with someone else is more dependent on the situation in terms of possibility, it is difficult to discuss the influence it may have in generating walking activities. In the observation study of this project, there were significantly fewer pedestrians who were accompanied by one or more
than pedestrians walking alone.\textsuperscript{10} Accompanied walking trips were more frequently observed during the weekends than on weekdays. Also, among the study areas, SoFo had a significantly higher amount of accompanied walking trips than the other two areas. Although it is difficult to discuss the influence of having a company on the frequency and quantity of walking, the difference between walking together and walking alone in the quality of walking may be considered. From the detailed observation of the walking trips, how the pedestrians’ interaction with the environment seems to differ when walking alone compared to when walking with someone else may be discussed.

In many of the walking trips consisting of two persons walking together, the pedestrians often seemed to interact less with the surrounding environment during walking than pedestrians who were walking alone. These cases were most often observed in SoFo. The pedestrians in SoFo were very often observed interacting actively with the environment, looking at the activities and people, both inside the building and on the street. However, for pedestrians who were walking together, especially in cases where the two people were actively interacting and having a conversation during walking, they seemed to be less aware, interested, or influenced by the condition of the environment, especially in the activities and ground level uses of the buildings next to the sidewalk. The interaction in these cases was concentrated more between the pedestrians walking together than with the surrounding environment. Again, the interaction and influence in terms of the built environment discussed here is what takes place during the actual walking activity, and not about how the built environment affects the occurrence, frequency, or duration of these walking trips. On the other hand, there were accompanied walking trips where the walkers still seemed to observe the environment actively. These were walking trips where the pair of pedestrians seemed to be close family members or friends where the pedestrians were consciously observing the built environment. These cases were observed in SoFo and in Södra Station. In SoFo, there were a few observed cases where the pedestrians were walking slowly together, often without conversation, and both actively looking into the ground levels of the buildings or even looking up

\textsuperscript{10} In the perceived relative amount of pedestrians documented in the study areas, the amount of pedestrians walking alone is significantly higher than pedestrians with company. There is an even greater difference in the number of “observed” trips between walking alone and walking together, since walking trips with company may have been chosen less often than for individual trips. The total amount of walking trips with company that has been tracked and observed during the field study is less than 50, if excluding walking with children.
to observe the building architecture. Also, in Södra Station, there was a case observed where a middle-aged couple was taking a walk where they were actively observing and discussing the environment and the facades of the buildings. Still, these cases were less frequent than the accompanied walking trips, where the pedestrians seemed to observe and interact with the built environment less during walking.

Also, in relation to the walking trips involving more than two people, a slight difference in the route choices was observed. These cases were collected in Södra Station mainly, and were related to the use of Södermalmsallén. For example, there was a walking trip of a couple (May 29, 2010 Saturday 2 pm) walking from Magnus Ladulåsgatan to Swedenborgsgatan. At the cost of making additional turns and also using of the staircases going down and up from Södermalmsallén, the couple passed through Södermalmsallén. Considering the situation that they were walking hand-in-hand and that the sidewalk on Magnus Ladulåsgatan was not wide enough for two pedestrians to walk side by side if another pedestrian walking in the opposite direction passed them by, the choice of Södermalmsallén for their route may have been partly due to the fact that the street offers a spacious walking environment, and also possibly a pleasant landscape design to pass through on a weekend afternoon.

![Figure 4.1 Route choice map of the given example (June 1, 2010, group of five passing Södermalmsallén)](image)

Another similar case with the same route choice passing Södermalmsallén was on a weekday (June 1, 2010 Tuesday noon) lunchtime, when a group of five people came out from an office building on Magnus Ladulåsgatan. Also,
going down and going up the stairs from Södermalmsallén, they chose to walk on Södermalmsallén instead of Magnus Ladulåsgatan, which may be partly due to the width of the sidewalk on Magnus Ladulåsgatan, and also the fact that on this day, the trees on Södermalmsallén were in flower and the weather was sunny, attracting many visitors to the street to enjoy the park-like environment and the pleasant weather. These cases are different from more frequent cases in Södra Station, where the use of Södermalmsallén, especially the use of the staircases was avoided in route choices, even at the cost of detours. It may suggest that when walking together with others, the factors determining the condition of the sidewalk, such as the width of the sidewalk, may function more strongly in certain situations.

**On partitioning walking**

Although the difference between the various aspects or types of walking should be acknowledged in order to better understand the relationship between walking and the built environment, there is not yet any systematic knowledge about how to best categorize walking activities. In the observation study data of this project, the walking trips were documented by their specific purposes, assumed from the destination or the origin of the trips (either where they actually began or the point where the observation by tracking had started), or sometimes by means of the route, attitude and conduct of the pedestrian involved in the walking trip being made. The specific walking purposes include e.g. going to the grocery store, going to the public transit, going to daycare/school, walking the dog, walking for pleasure, going to the restaurant/café, going to the park, going to other specialized retail outlets, etc. The analysis of the differences between various walking activities have been presented and discussed in Section 3.6. While the data from the observations documented the individual activities separately by their specific purpose, the analysis of these various walking activities suggested some standards that may be used in the classification of different walking activities. It seems that in order to best understand their relationship to the built environment, the categorization of the walking activities could be carried out in view of their differences in terms of the effort, goal, efficiency, frequency, continuity, intensity, duration, etc. It also seemed that by partitioning the walking trips by means of the specific purposes could be helpful to some extent in classifying walking by categorization based on the degree of these standards (i.e. effort, goal, frequency, intensity, etc.). However, we should also be aware that although some walking activities might belong to the same category if subdivided by the
purpose as classified above (e.g. going to the grocery store, walking the dog, etc.), they may differ in the degree of the standards (e.g. effort, goal, intensity).

It is crucial to note this, because according to these standards, the qualities of the walking environment desired or prioritized by the pedestrians may differ, and this would affect the degree and the reason/factor that might more or most strongly influence the walking activity. Also, one weakness of the classification of walking activities by their specific purpose is that people may often combine different purposes simultaneously, and here again, what would determine the nature of the walking activity is not only its purposes or destinations, but also the attitude or the desire of the walker, which is determined by its effort, goal, intensity, etc. Although the documentation of the walking trips in this study were done by means of their specific purposes, what the observation of this project tried to investigate is this difference on how the different natures of walking activities, based on the standards discussed above, are influenced in different ways by the built environment, not just by their type in a simplified categorization, which lacks precision and deeper understanding of the complexity of walking behavior.

As well as the specific purposes of walking, the different aspects of walking activity, such as being a travel activity, physical activity, social activity, etc., should be carefully investigated. These different aspects of walking are related to how research and investigation on walking is done from the perspectives of different fields, for different reasons and with different interests and aims. The most dominant fields, such as the transportation field and the preventive medicine field, with their respective focus on different aspects (travel activity vs. physical activity), are a good example of how walking is investigated from very different perspectives. While they tend to focus each on a specific aspect of walking, whether it is as a travel behavior or as a physical activity, at the current stage of research, both fields in their studies are addressing difficulties caused by the fact that the relationship of how the built environment influences walking is extremely complex. The difficulties the different studies on walking are experiencing may be due to the very fact that they are often considering or focusing only on a single aspect of walking. This indicates that understanding walking by incorporating all of these aspects and obtaining a full, broad, and extensive overview of the complexity of walking is difficult but crucial. The fact that there exists such different aspects and types of walking and that they do matter in fully understanding the relationship between walking and the built environment was one of the main issues that this project tried to explore, and what the observation study managed to investigate.
Walking as a social activity

To explore the issues of walking together, the interaction with other pedestrians during walking, and how private a walking activity is, a simple experiment was carried out by the author on the streets of Stockholm (April, 2011). The purpose of the experiment was to test if it is possible to walk with an unknown pedestrian. The goal set for success was to walk side by side with an unknown pedestrian for at least 10 seconds. The experiment was first carried out on Södermalmsallén on a Saturday afternoon. However, after several attempts during an hour, it was impossible to walk even at a close distance of the pedestrians passing. It was especially due to the fact the street is very wide, and the number of the pedestrians passing by was few, and the fact that the pedestrians could see and notice each other even from long distances. The unknown pedestrian would consciously change speed or direction slightly, showing avoidance of being within a certain distance of other pedestrians walking. The same experiment was continued (on the same day) on Götgatan, one of the highly populated shopping streets located short distance away from Södermalmsallén. As it was on a Saturday afternoon, the street had a high pedestrian density, with the street being car-free as well. Still, the width of the street is narrower than Södermalmsallén and number of pedestrians was significantly higher, so the distances between pedestrians were much closer. However, the experiment did not succeed in Götgatan either. When the author approached and tried to accompany them walking side by side, the pedestrians altered their position or direction or changed the speed of walking in order to avoid walking together with a stranger. Such a tendency of pedestrians keeping certain distances to other pedestrians was observed throughout the observation study as well. Pedestrians tend to keep their own rhythm while walking with other pedestrians, managing and making the rhythm so that it falls within the entire movement rhythm of a given environment, but still remains individual, unique, and private.

The experiment of walking together with a stranger demonstrates how people walk alone even when walking amongst others, and also how one person walks amongst others even when walking alone. Although the attempt of walking together with a stranger failed, it showed that people are conscious of and interact with other pedestrians in conducting the activity of walking (alone). The interaction with other pedestrians and the effect of other people in walking is closely related to understanding the aspect of walking as a social activity. This is related to how the presence of others and the potential possibility of interacting with others seem to have a positive effect on walking.
There are various works of literature that argue the significance of these interactions. For example, Goffman (1971) observed nonverbal interactions between passing pedestrians and found that pedestrians communicate and express significant cultural meanings in subtle acts. It is frequently argued that the greater the activity on the street, the greater the potential for interaction (Demerath & Levinger, 2003). Jan Gehl also emphasizes the design of the city as a meeting place and argues that the city’s greatest attraction is people and “man is man’s greatest joy”. He describes that people gather where things are happening and spontaneously seek the presence of other people and that people prefer to walk on more lively streets with life and activity and feel the walk to be more interesting and safer (Gehl, 2010).

The empirical study from this project has provided different examples regarding this aspect. In Södra Station, many cases of walking for pleasure were directed towards Medborgarplatsen, a public square and surrounding streets that were more crowded, with a large number of other people present. In SoFo, the walking trips of different purposes showed a tendency to make their route choices and destinations on the streets with a greater number of other pedestrians. The liveliness created by the presence of other people seemed to be closely linked to enhancing the experiential quality of walking. This illustrates how people are attracted to other people. However, this study suggests that while this is true, what attracts pedestrians is primarily being among other people, especially if these are strangers. People seek to walk among but still not with other people. Considering how the presence of other people was one of the significant aspects of how the built environment, especially the major factors such as density, connectivity, and land-use diversity, positively affected walking, understanding how to encourage walking as a social activity may be a very important issue in dealing with the walkability of the environment.
5 Conclusion

The planning and design of walkable environments is receiving more and more attention for its various benefits related to public health, sustainability, economy, or social life. Therefore, there is a growing need for knowledge about the walkability of the built environment. Studies on how the built environment affects walking - whether it is about designing a pedestrian-friendly environment or preventing an unwalkable environment - are conducted from different perspectives using different methods with the aim of producing such knowledge. An active body of research, the field often referred to as walkability research, has been conducting correlation studies between various attributes of the built environment with the amount of walking. Initiated and encouraged by the public health interests, it is currently providing most concrete evidence through statistical analysis that walking behavior is related to the condition of the built environment. Through comparison with the quantity of walking, some attributes of the built environment have been identified as major factors related to the walkability of the environment. While these major factors include density, connectivity, and land-use diversity, other factors also often discussed in literature and studies dealing with pedestrian-friendly design from the urban design field have not been very successfully proven statistically in their significance regarding their effect on walking. These are often the factors
related to the facility for walking such as the sidewalk and aesthetics or convenience of the environment at the detailed scale.

In order to fully understand the value of the statistical studies on walkability, and also understand why there are differences in the results of these studies and the factors that are discussed as important in some of the urban design literature, we need to consider the context of the different studies and what aspect they are capturing within the complex mechanism of walkability. Most of the correlation studies on walkability have been conducted in highly car-dependent, problematic (from the perspective of walkability) contexts (e.g. residential neighborhoods in USA, Canada, or Australia). These studies often deal with situations where the condition of the built environment disallows or hinders walking. They are capturing the effect, or rather the absence, of the destination and route providing aspect of walking. Although the aim of the walkability research is often described as to encourage walking, these studies are dealing with the situation where the environment prohibits walking.

The influence the built environment has on walking is not only the positive effect of encouraging it, but also the power to negatively affect walking by prohibiting it. The impeding aspect of the environment is an important issue to be aware of, since if the condition of an environment is in such a state, the negative influence will inevitably affect the walking behavior in the given environment. Considering the setting of the majority of the existing walkability studies, the correlation studies on walkability have mostly captured this aspect, and the main contribution they are providing is the knowledge about how certain minimum conditions in terms of the major factors in the built environment must be secured in order for the environment to serve as a setting for walking (and not prohibit the activity). The reason that the correlation studies have been successful in identifying the major factors (density, connectivity, and land-use diversity), but not as successful with the other, more detailed design factors concerning aesthetics or convenience often discussed as important in urban design literature may be that the major factors have higher leverage among the different factors within walkability, and that other factors may not have such significant influence unless the major factors are first secured in order to allow walking.  

As discussed earlier in Chapter 2, another possible reason why some of the factors discussed as important in urban design literature regarding pedestrian-friendliness have not been proven significant in walkability research may be that some of the urban design literature is not based on empirical or scientific evidence, but often rather more dependent on expert knowledge or speculations.
more detailed level may take effect more strongly in the higher level of the walkability, when the walkability mechanism is more concerned with actually encouraging walking. These differences in the leverage among factors, or the hierarchy among them, may also be related to the discussion about how some factors are more directly involved in providing destinations for walking, while others are more related to enhancing the quality of the experience during the actual walking activity (presented in detail in Section 2.3).

While most of the existing walkability studies have been examining rather severely problematic conditions for walking, this research project, based on an empirical study in Stockholm, was able to examine walkability in a slightly different context from the majority of existing studies. For example, comparing to the studies which examine the suburban neighborhoods in North America, the residential neighborhoods in Stockholm studied in this project allow investigation of walkability at a higher level, which does not only deal with the impeding aspect of walking, but also why and how certain condition of the environment seems to encourage or enhance walking activities. This condition allows us to investigate the effect of the major factors regarding both the quantity and quality of walking, and also to better examine the effect of other urban design factors. With the major built environment attributes and other cultural and public transport related factors at a more desirable level, it becomes more feasible, in a context such as Stockholm, to better examine the influence of the factors at the urban design level which have relatively lower leverage than the major factors.

![Figure 5.1](image.png)

*Figure 5.1 Different level of walkability captured by walkability studies*

As well as exploring the different factors in terms of the various effects they have on walking at various scales, another main purpose of this project was to explore the different aspects of walking activity. The reason for the
inconsistency and limitations in the results of the existing correlation studies may be, first, the limitation underlying the context or setting of those studies, as discussed above. Another possible reason could be the limitation in variability and scales of the factors being identified and investigated, and an important addition to these may be the lack of consideration for the complexity of walking activities. The same applies to the urban design literature dealing with pedestrian-friendliness in terms of the reason why some of the factors they are arguing to be essential do not prove to be as significant in other studies on walkability. These works of literature often focus on a certain context and therefore tend to deal with a specific kind of walking (e.g. a promenade in the city center). However, they seldom discuss the specificity of the walking activity or the urban context they are dealing with, which is highly related to the scope and the limitation of their discussion.

Walking activities differ in how they are influenced by various factors of the built environment as the results from the empirical study show. Since different kinds of walking activities vary in their goal, effort, frequency, duration, etc., they also vary in how strongly and in what aspect they are influenced by the condition of urban form and also in the qualities the pedestrian searches for and desires from the built environment (as discussed in Section 3.6). Partitioning walking activities in investigating their relationship to the built environment may be one of the key issues in dealing with the limitations of the existing studies regarding the difficulty of obtaining reliable and consistent results in statistical analyses. As well as for the development of the correlation studies on walkability, in order to produce knowledge about the planning and design of walkable environments for researchers and practitioners in the field of urban planning, design, and architecture, acknowledging the different types of walking activity may also be crucial. For these tasks, there is a need for more detailed understanding (than what the current correlational studies can provide) of how and why the factors of the built environment affects walking, and in dealing with this, partitioning walking may be inevitable in order to produce more accurate knowledge about walkability.

The observation study from this project confirms the finding from the existing studies on walkability in terms of the significance of the major factors – density, connectivity, and land-use diversity – although it also suggests that these factors should be identified, measured, and investigated on different scales to fully discuss how and why they affect walking. The results of the empirical study (through neighborhood comparison) suggest that the major factors seem to positively influence the rate or quantity of walking, and
moreover, show that an environment with better conditions in terms of these factors also increases the diversity of walking activities. The results also confirmed the hypothesis that other urban design factors related more to aesthetics or convenience of the walking environment at the street and building levels (which are often discussed in urban design literature) seem to be more related to determining the quality of the walking experience than directly influencing the quantity of walking. However, what is more interesting from the observation study is that, the major factors are not only significant in determining the amount and the variety of the walking activities the given environment accommodates, but also as significant in determining the quality of walking. The degree of these factors, as well as the attributes related to how they are implemented at the detailed street and building level which assists them to function more effectively, seem to be crucial in creating some of the major qualities of the environment that have a positive effect on the walking experience. These qualities include liveliness, surveillance and sense of security as well as sociability, which are related to how the built environment provides the pedestrian with other people, objects, and activities to see, hear, and interact with.

The differing conditions for these aspects among the study areas seem to be important in understanding why the frequency, diversity and other details of the walking activities taking place in these areas differ. Through detailed observation of walking activities, the observation study explored how the various kinds of walking activities are different in their relation to the built environment. By observing the details of the walking behavior, such as route choices, the study investigated how they are differently affected by the built environment, which is related to what qualities or condition the pedestrian mainly desires or requires from the environment for a given kind of walking. If a preliminary classification of the walking activities according to these criteria is tried out, the walking activities – in a rather general and simple categorization - may be divided up into utilitarian walking, walking the dog, and pleasure/social walking(promenade). This is only a rough division of how they may be classified, and walking activities may also often include different purposes at the same time.

Also, if we also consider the experiential quality of the walking activities that are provided by the condition of the built environment, the nature of the walking activities seem to be very different according to the given environment, although they may be for the same purpose of walking. For example, walking the dog in Södra Station and walking the dog in Hökarängen may be a rather different activity in terms of the experiential qualities the urban form can
provide the pedestrian with during the walking (as illustrated in Figure 5.2). Similarly, utilitarian walking in Hökarängen and utilitarian walking in SoFo may be different in that that the latter has more possibilities for the interaction with the environment that people seem to desire, especially during a promenade. These details illustrate how urban form influences and interacts with walking activities and the pedestrians.

![Figure 5.2 Different walking activities](image)

The walkable environment is argued for from many perspectives. There are various benefits from walking – physical health benefits, psychological benefits, social benefits, etc. In promoting walking, much of the focus, especially in the studies initiated from the field of preventive medicine, has been on its nature as a physical activity and its potential health benefits. However, a suggestion that could be made from the results of the empirical study of this project is that if the aim is to actually encourage walking through the condition of the built environment, the focus may have to be put more on the aspect of walking as a social activity. This concerns more the enhancement of walkability at the higher level, where the condition of the built environment is equipped with a possible setting for walking and does not impede walking. From there, one of the key issues in encouraging walking through urban design seems to be related to how walking may be enriched as a social activity, especially through interacting with others. Planning and designing an urban environment which offers pedestrians greater opportunities for spontaneous
exchanges with other people, activities, objects, or buildings may be an important strategy for creating an environment which offers a greater amount of walking destinations and also improves the experiential quality of walking activities.

The continuing part of the research project

In the next phase of this PhD research project, the analysis and discussion of the various purposes and aspects of walking will continue, and may produce knowledge contributing to the development of taxonomy of walking. As well as investigating how walking could best be classified and measured in order to understand walkability, a critical investigation and discussion of how the built environment factors may better be identified and measured will continue. In the later part of the project, based on the findings and insights into walkability gained from the earlier part of the project, the way in which built environment attributes are identified and measured in the quantitative analyses relating to walkability will be examined. The aim of this project is to produce knowledge about the complexity underlying walking, in terms of both the built environment and walking. It aims at contributing to provide suggestions of how urban form and walking could better be analyzed and measured in walkability studies through various methods, including quantitative analysis, and also aims at producing knowledge that may assist practitioners in how the design of the environment may affect walking. In doing so, one of the important issues that this project will investigate is how the management and measurement of the condition of the built environment in terms of its influence on walking may be differentiated between factors and strategies.
References


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Lee, Chanam and Anne Vernez Moudon. 2006a. Correlates of walking for transportation or recreation purposes. *Journal of Physical Activity and Health* 3: S77-S98.


List of Figures

Except for the figures listed below, all of the figures including photographs, maps, and graphs are produced by and belongs to the author.

**Figure 1.1** from Urban Diversity and Pedestrian Behavior - Refining the concept of land-use mix for walkability. 2012. Choi, Eunyoung and Sara Sardari Sayyar. In *Proceedings of the 8th International Space Syntax Symposium*, Eds. Margarita Greene, José Reyes and Andrea Castro, 8073:1-8073:15. Santiago de Chile: PUC.

**Figure 2.1** from Measuring the Unmeasurable: Urban Design Qualities Related to Walkability. 2009. Ewing, Reid and Susan Handy. *Journal of Urban Design* 14(1): 65-84.
