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UNDERSTANDING WALKABILITY:
Dealing with the complexity behind pedestrian behavior

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Abstract

The issue of pedestrian-friendly urban environments has been of increasing importance lately in urban planning and design. In order to develop a better knowledge about the walkability of the built environment, it is important to understand the complexity behind walking behavior. 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 in the built environment that the pedestrian prioritize during the walking activity. With an empirical study in three residential areas in Stockholm, Sweden, this study investigated the different types and aspects of walking activities in how they are influenced by and interact with the built environment. The results of the observation study of walking behavior showed that the condition of the built environment related to the density, connectivity, and land-use diversity seem to influence the amount and diversity of walking activities that occur in the given environment and also affect how the walking activities are conducted. This is related to the degree of the potential of the urban form in providing the different qualities that the pedestrians may desire from the environment in their walking activities, which is not only related to providing walking destinations and possible routes, but also qualities that may enhance the experiential quality of walking. Investigating the different aspects of walking in how they occur and are conducted in the urban environment is important in understanding why and how different conditions of the urban form may discourage or encourage walking. This may not only be useful in providing insights for more accurate knowledge on walkability, but may also assist a better understanding and application of other urban design theories on pedestrian movement as well.

Keywords: *walkability, pedestrian behavior, pedestrian movement*

Theme: *Urban Space and Social, Economic and Cultural Phenomena*

Introduction

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. Urban planning, design, and transportation research have examined walking in the urban environment (Frank and Pivo 1994; Handy 1996; Kockelman 1997; Hillier 1996; Gehl 1987), and there is also a growing field often referred to as "walkability" research which is a multidisciplinary form of research initiated from the preventive medicine field with the health beneficial aspect of walking as the most significant motivation (Saelens et al. 2003a; Leslie et al. 2005; Heath et al. 2006). Walkability studies have provided evidence through statistical analysis between the amount of time spent on walking and the factors of the built environment that individuals' walking behavior is related to the condition of the urban form.

Earlier findings from transportation and urban planning research and the recent walkability studies have defined some major factors in the walkability of urban form, 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. 2003a), better connectivity (Boarnet and Crane 2001; Crane and Crepeau 1998; Kitamura et al. 1997), and higher density (Cervero 1996; Frank and Pivo 1994; Messenger and Ewing 1996). Studies that have examined neighborhood characteristics related to walking rates indicate that population density is among the most consistent positive correlates of walking trips (Frank and 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).

While 'walkability' studies often measure and analyze walking by the amount of time spent on walking by individuals, there are also urban design research dealing with pedestrian movement with an empirical-quantitative approach that often deal 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 (Stonor et al. 2002; Ewing and Handy 2009). 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 from such studies in terms of where people walk, it also has some limitations. For example, it fails to capture the meanings of the rates or flows of pedestrians, since it seldom captures many of the qualitative aspects of these flows, and it has little to say about individual routes or lengths of walks and walking routines. 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. Although there are indications and preliminary results that show some of these relationships, it is a question that deserves more investigation.

In order to deal with these limitations and challenges and to develop better knowledge on walkability, it is 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. 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. Walking can be seen as a physical activity behavior, as a travel behavior, as personal recreation, as a social activity, and so on. 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. 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. 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 (Lee and Moudon 2006; Forsyth et al. 2007; Forsyth et al. 2008). The walkability research has been relatively better at acknowledging and investigating these differences in walking. While simplified and limited both in categorization and refinement, it has provided evidence for the usefulness of subdividing walking activities (e.g. between utilitarian walking trips and walking for leisure). Separating walking types is important 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. Although partitioning walking behavior is crucial in walkability research, there are difficulties in systematically categorizing walking behavior, which also appear in existing categorizations.

This paper reports from an ongoing PhD research project on walkability that investigates the complexity behind the relationship between walking behavior and urban form. One of the research questions of this project is to explore the complexity of walking behavior regarding their relation to the built environment. Through an empirical study, the difference between walking activities were explored, both in terms of how they differ in their nature, and also in terms of how according to that difference, the way they are influence by and interact with the built environment may be different. This is done through detailed investigation of both the built environment and the walking behaviors with regard to their complexity. While many studies and theories on walking and the built environment often search for ways to simplify the built environment-walking relationship so that it can be easily measured, this project, with an observation study combining a qualitative method, tries, conversely, to subdivide the built environment-walking relationship. Although it may seem to go in the opposite direction, considering the lack of knowledge about the complexity underlying the built environment-walking relationship and how the current research is pointing to it as a likely reason for the limitation of existing theories and studies on walking, we may first need a better understanding of the complex relationship between built environment and walking before we can simplify them.

The Empirical Study

The empirical study investigated 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 project tried 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. 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 (See Figure 1). The two areas in the inner city are situated close to each other in the city center, where one is a traditional urban area and the other is a more recently redeveloped area. The area with the traditional urban blocks will be referred to as the SoFo area, and during the 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 shown to have a strong connection to the rest of the city in its configuration 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 the inner city which will be referred to as the South Station area (Södrastation in Swedish) in this paper, is a redeveloped area planned in the 1980s, where over 3000 flats were newly built after the renovation of the southern railway station of Stockholm. This area is a highly fragmented area, somewhat segregated from the rest of the island it is located in, and 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. In large parts of Hökarängen, the residential buildings have three to four stories, being widely spaced with green spaces and yards. While the population numbers are similar in the three selected areas, the population density in Hökarängen is significantly lower than in the areas of the inner city.

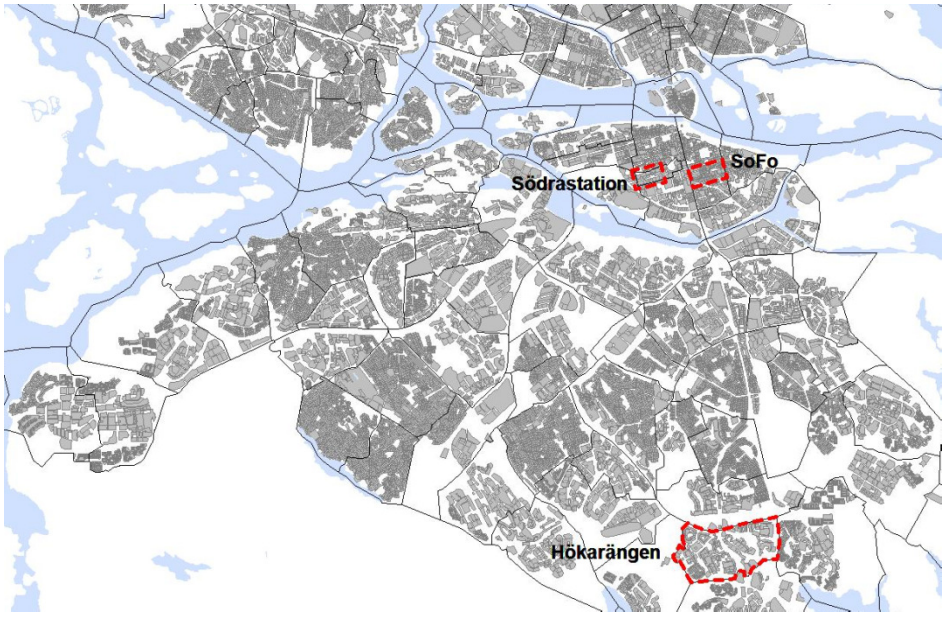

Figure 1 Map of the three studied neighborhoods in Stockholm

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 there by observing perceived subjective measurement of pedestrian density and its patterns, 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 that were tracked and observed, and how the condition of the built environment seems to have influenced them. By obtaining hard data on real behaviors of walking in different situations, it tried 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.

The site observation was conducted by the author and included both working days and weekends and holidays, and covered the hours between 7am and 8pm. The main part of the field study was the tracking of walking trips on site, which was rather unusual for a study of walkability. Since this project aimed to develop a better understanding of walking behavior, and especially to classify walking activities, an important part of the field study was in the detailed observation of individual walking trips. In terms of age group and gender, the choice of the walking trips was made randomly, but with concern for allowing variety. During the entire observation, approximately 2000 walking trips (including partial trips) were tracked and observed in the three areas. 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 allowed 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. 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 initially 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. 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. through 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 from the observation study.

Spatial Analysis of the Areas

Since the on-site observation was limited in investigating the condition of the urban form to very local observations, quantitative analysis of the more structural properties of the areas' urban form and other major built environment factors has been also used in analyzing the field study data.[1]

Table 1 Residents, working population, total population and population density values (person per hectare) for each neighborhood (Choi and Sardari Sayyar 2012).

Neighbourhood	Residents	Working population	Total population	Total Population density
SoFo	7540	2650	10190	806
Södrastation	5082	3499	8581	874
Hökarängen	7989	997	8986	150

Integration analyses (Hillier 1996) at global level (radius 30) and district level (radius 9) show that SoFo and the South Station area are highly integrated with the whole city on an urban scale, as well as being highly connected at district level with their surroundings, whereas Hökarängen has the lowest integration at both levels (Figure 2)[2] . At local level (radius 3), the South Station area 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 (Figure 3).

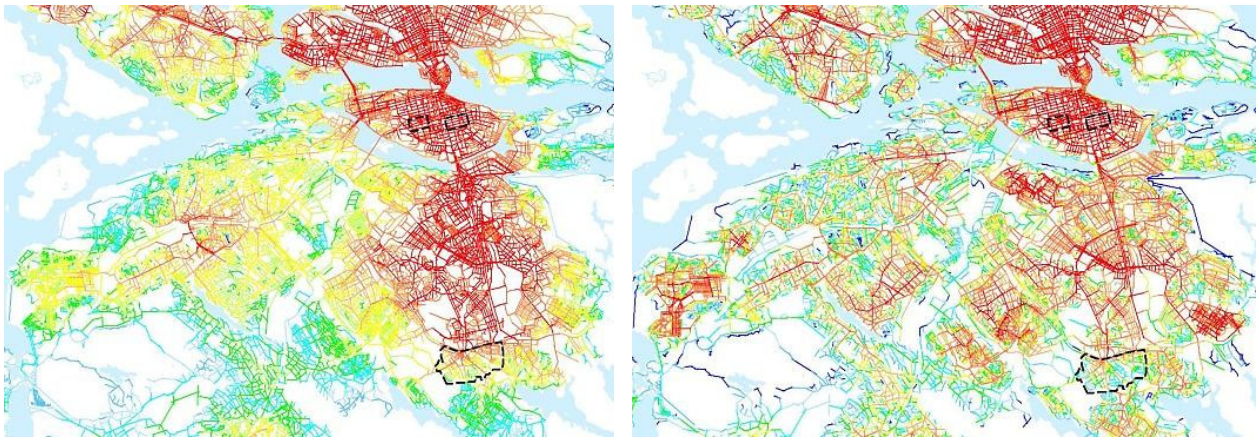

Figure 2 Spatial integration analysis: global level (radius 30) (left), and district level (radius 9) (right) (Choi and Sardari Sayyar 2012).

[1] 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 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 and Sardari Sayyar 2012).

[2] The axial map 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).

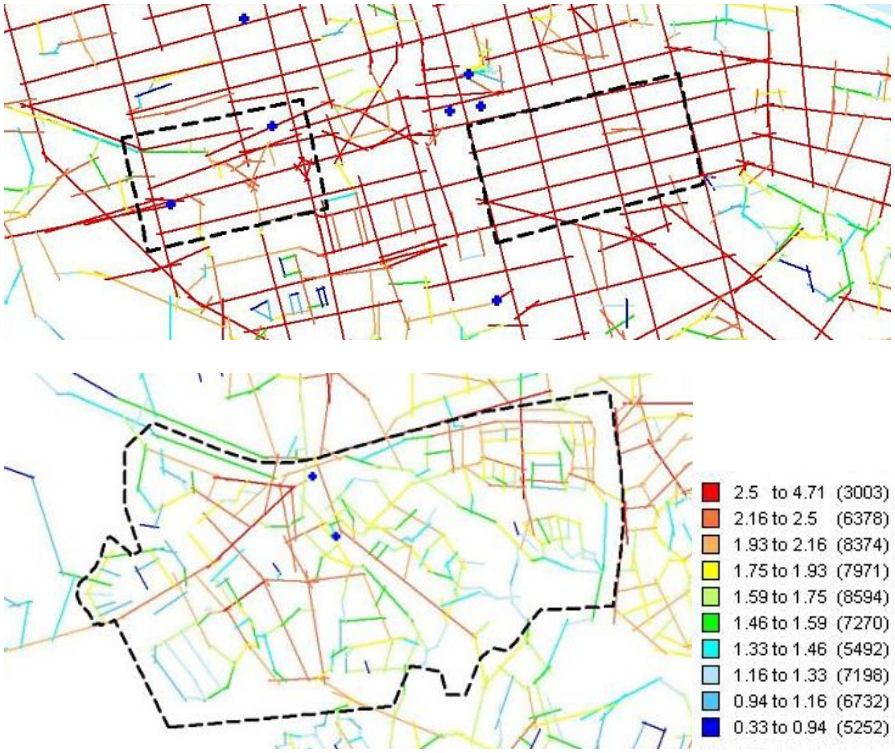

Figure 3 Local integration analysis (radius 3) with most integrated lines highlighted (Choi and Sardari Sayyar 2012).

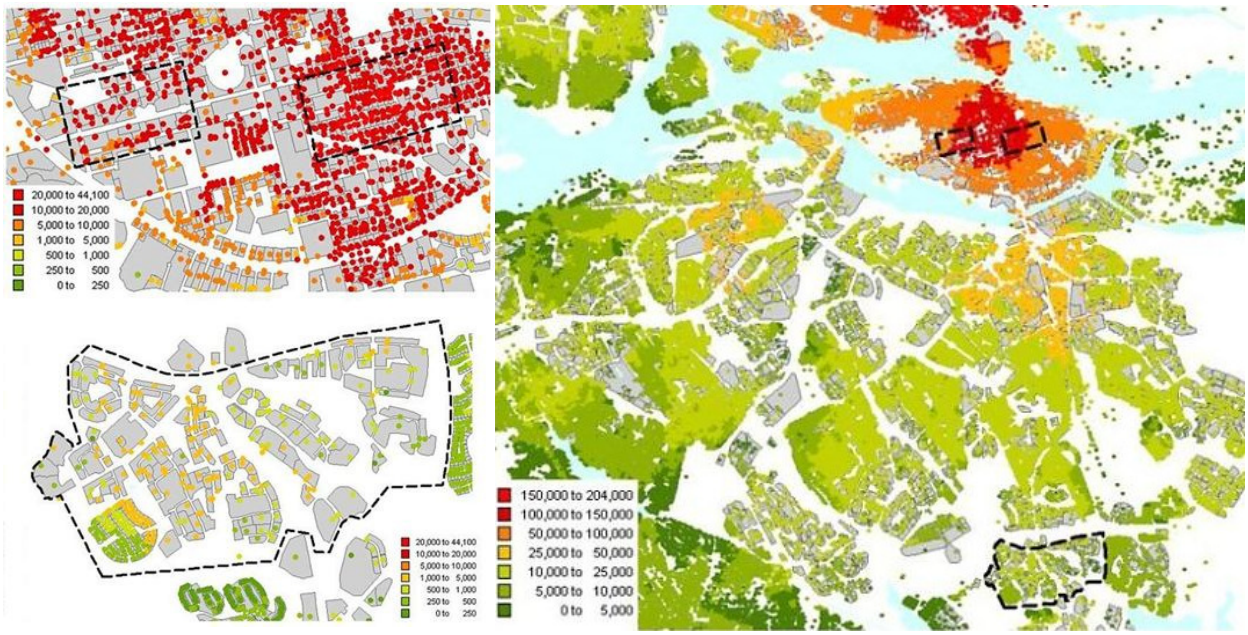

Figure 4 Access to total population at home address point level, within 500 m and 3 axial lines (shorter walking distance) (left), and within 1500 m and 9 axial lines (longer walking distance) (right) (Choi and Sardari Sayyar 2012).

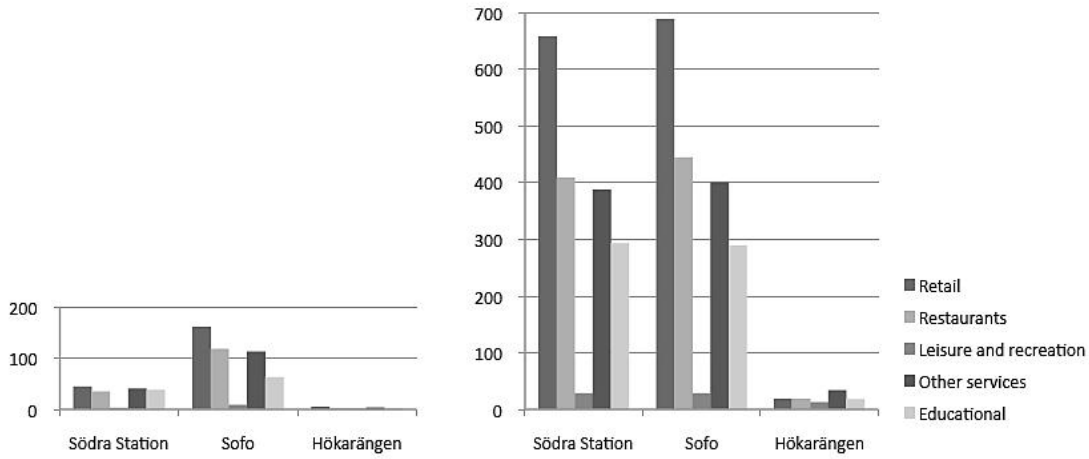

Figure 5 Access to various activities at address point level on average, within 500 m/3 axial lines (left) and within 1500 m/9 axial lines (right) (Choi and Sardari Sayyar 2012).

SoFo has the highest access to various activities and population (Ståhle et al. 2005), followed by the South Station area. The suburban area of Hökarängen has significantly lower degree of access to different land use and population compared to the other two areas.

Results of the Observation Study

Distribution of walking purposes/types in the three areas

In examining the walking trips made by the residents of the study areas, it showed that not only the relative amount but also, more importantly, the variety and the distribution of walking activities varied among the areas. In Hökarängen, approximately more than 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. The South Station area, both in its variety and distribution of different walking activities, showed a degree of result that fell between the other two areas.

Different walking activities and their route choices

During the field observation, especially in the detailed observation of individual walking trips through the tracking of pedestrians, the destination or the estimated purpose of the walking was documented. An important part from the observation data was the presence of different purposes or aspects of walking trips and the patterns and characteristics in their route choices. Such data may allow discussion on the difference between various purposes of walking in how they interact with the built environment. According to these details, some classification of the walking trips has been applied in order to show the differences among walking activities.

Utilitarian walking trips

In this study, walking trips that involve daily activities, 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, were grouped as 'utilitarian' walking trips. Although there are many different specific purposes within this kind of walking trip, the reason they are discussed together 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. 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), there were also some other factors involved in how pedestrians interact with the built environment during walking which also showed a significant difference among the areas.

Contrary to Hökarängen, SoFo is where the pedestrians were 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 provided. In the tracking of these cases, the results showed that there are streets or sectors that the residents seem to prefer in including in their routes. 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 walking 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. 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.

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 showed 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.

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. 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 the public park. In the weekends, with significantly higher pedestrian density, the residents took their strolls in the streets with greater numbers of other pedestrians. 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 from time to time 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.

Walking the dog

Walking the dog, especially when excluding walking "with" a dog for other (utilitarian) purposes, was an activity that also 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. Although tracking of these trips was limited, it seemed that these walking trips seemed to be attracted to the street with more green space and also in many cases seemed to avoid streets with higher pedestrian density.

Discussion and Conclusion

In most urban planning and design research that examine walking in the urban environment, walking activity has been dealt as a rather simplified concept, often put under a single label, "walking" or "pedestrian movement". It has been seldom acknowledged in existing research that walking activities vary in terms of their effort, goal, efficiency, frequency, continuity, intensity, duration, etc. Some of the recent walkability studies have pointed to the importance of acknowledging different types of walking in order to obtain more accurate knowledge on how the built environment may encourage walking (Rodriguez et al. 2006; Saelens et al. 2003a; Lee and Moudon 2006), but there is not yet any systematic knowledge about how to best categorize walking activities. It seems 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 standards such as effort, goal, frequency, intensity, etc., as was tried in this study as well. 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). Also, one weakness of the classification of walking activities by their specific purpose is that people may often combine different purposes simultaneously.

An important result from this study in this respect regarding the complexity behind walking is on the different characteristics of walking that is related to how the pedestrian conducts walking (e.g. as reflected in the route choice and attitude/conduct during walking) and also (both directly and indirectly) to the occurrence of walking. What would determine the nature of a walking activity is not only its purpose or destination, but also the desire of the walker, (which is, again, related to its effort, goal, intensity, etc.). According to these standards, the qualities from the walking environment desired or prioritized by the pedestrians may differ, and this would affect the degree and the factor that might more or most strongly influence the walking activity. 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 various characteristics of walking activities differently interact with the built environment, not just a division of walking activities by their type in a simplified categorization, which lacks precision and deeper understanding of the complexity of walking behavior.

Again, 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 (experiential) 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 (Rodriguez et al. 2006; Saelens et al. 2003b) 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 may be 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, especially for a "social" kind of pleasure, in particular is more sensitive to other aspects of the urban environment.

Compared to more "utilitarian" types of walking, these recreational walking activities are slightly different in the sense that they more naturally involve walking, which means that they can almost only be done by walking and seldom compete with other modes of transport. Also, 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, and also the factors influencing their route choice seem to include qualities related to liveliness and sociability, which are related to how the built environment provides the pedestrian with other people, objects, and activities to see, hear, and interact with. From the observation study results, among different types of walking, walking for "social" pleasure was more sensitive to these qualities, as shown in the route choices made by pedestrians engaged in this walking activity, and was also the type most influenced in terms of its quality by the built environment.

This difference in the nature of walking activities is also related to how the difference in the condition of the built environment among the study areas seemed to have influenced the frequency, diversity and other details (e.g. route choices and attitude) of the walking activities taking place in these areas. Through detailed observation of walking activities, the observation study explored how the presence and various kinds of walking activities are different among studied areas (with SoFo area having higher amount and diversity of walking activities). Also, another important result is that for the walking activities of the same purpose, there seemed to be difference in the character or nature in how they are conducted among the areas. That is, if we consider the degree of experiential quality of the walking activities that are provided by the condition of the built environment, the nature of the walking activities seemed to be shaped very differently according to this condition that vary among the areas although they may be for the same purpose of walking. For example, walking the dog in the South Station area with higher building and pedestrian density and walking the dog in Hökarängen in the streets mostly surrounded by green spaces are rather different activities in terms of the experiential qualities the urban form can provide the pedestrian with during the walking (as illustrated in Figure 6). Similarly, utilitarian walking in Hökarängen and utilitarian walking in SoFo is different in 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 the condition of urban form influences and interacts with walking activities or the pedestrians.

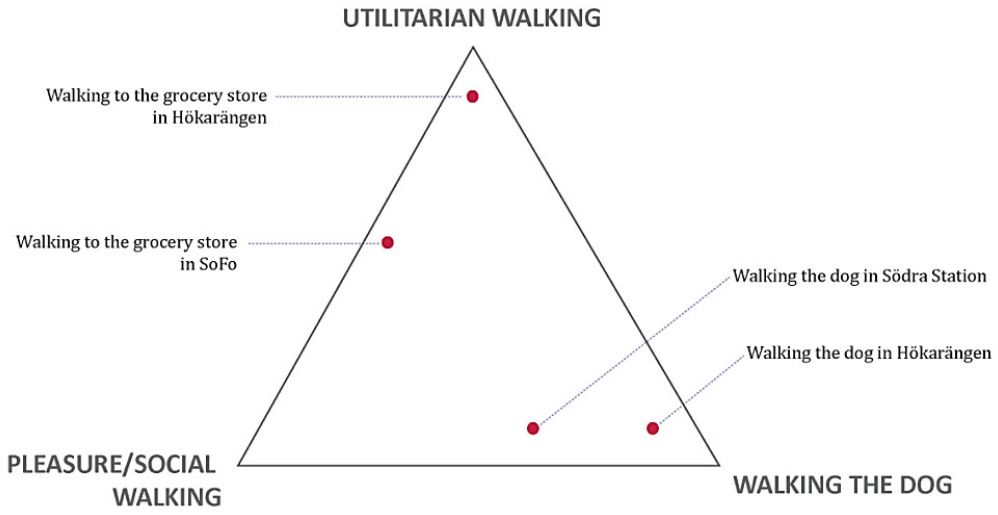

Figure 6 Different walking activities

What has been discussed so far indicates that the built environment influences how much and which purposes of walking may occur in the given environment, and also influence how the walking activities are conducted through the difference in the potential of providing different qualities that pedestrians may desire from the environment in conducting their walking activities. What qualities the pedestrian would prioritize in conducting their different walking activities may be to a large extent affected by the context or the built environment that it takes place in. Understanding these details may be important in understanding why different condition of the urban form may discourage or encourage walking. This is related to how the different walking behavior and their patterns in the study areas seem to be influenced by the condition of the built environment. The higher connectivity, land-use diversity and density of an area generates higher amount of utilitarian walking by providing more destinations and convenient routes to them. The generation of a considerable amount of walking trips or pedestrian density and a pattern in them within the given urban environment would then function as a generator of walking activity itself. This would be in generating activities of walking for "social" pleasure, and also affecting the frequency and route choice of utilitarian walking trips as well. Thus, the pattern of walking behavior and pedestrian density would be reinforced. Walking pattern itself becomes a generator of walking.

A more detailed understanding on walking behavior and its relation to the built environment may not only assist developing the knowledge for walkability research, but also be useful in the understanding and application of different theories and research on walking or pedestrian movement, such as the Natural Movement Theory in space syntax research (Hillier 1996). Concepts such as 'to' and 'through' movement (Hillier et al. 1993; Peponis et al. 1997; Penn et al. 1998) capture some important characteristics of how pedestrian movement occur, but they may be limited in fully understanding how walking in the urban environment are conducted, and would not be capable of providing enough explanation in answering certain types of questions regarding walkability. By understanding the mechanism behind how different walking activities are conducted in relation to the built environment, we may better understand how and why the principle such as 'natural movement theory' may more strongly or less evidently explain a given situation in the urban environment and also better understand how these ideas may be applied in the design of urban form for better walkability.[3]

[3] This will be the main focus in the coming part of this research project where more quantitative analysis of the data on walking trips from the observation study in relation to the spatial analysis of the urban form will be conducted.

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