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PREFACE

In recent years the walkable city has been strongly promoted to reduce car trips in urban areas and to support a healthy lifestyle among urban residents. Walking is a mode of transport in itself, but also the basis of intermodal transports, and a foundation for accessibility in the transport system. In this context the design of the built environment could be regarded as an action to increase the modal share of walking, and an urban setting that supports walking is an indispensable prerequisite for a sustainable city.

"Urban Walking" is a multidisciplinary research project drawing upon architecture, traffic planning and environmental psychology. The objective of the research is to identify physical features, transport system characteristics and urban design qualities that encourage or hinder walking as a whole trip or as a part of a trip chain in the Swedish context. A second objective is to develop new urban design strategies for promoting walking as a mode of transport in itself and as a prerequisite for travel with public transport and intermodality. This report presents a new approach, the pedestrian-oriented view of the built environment, and proposes the Vista Observation Analysis (VOA) of urban form as a method to understand the role of the built environment in urban residents' choice to walk.

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Lund, November 2012

Maria Johansson

Project leader

SUMMARY

This report presents and tests a theoretical framework for describing the influence of the built environment on transport walking in urban settings. Walking is an important mode of transportation due to its environmental friendly, health improving, psychological enhancing and socializing outcomes. Previous research on walking and built environment does not acknowledge the 3D aspects of spatiality or governing aspects within the urban planning process and their effect on walking conditions. The presented method, the Vista Observation Analysis (VOA), takes its theoretical framework from a combination of Foucault's theory of discipline and Gibson's spatial vista concept. VOA provides a contextual and situated perspective on physical features, through the determination of vistas as they appear in the walking process and in plans of the areas of study. It also shows ideological implications, here in an interpretation of the disciplining mechanisms of directing or dictating. "Directing" mechanisms afford a spatial possibility, while dictating mechanisms present a material obstacle of some kind. Both types appear along a walking route. Hence the situated and visually determined materiality of urban form is seen as influencing transport walking. The VOA of the outdoor built urban form was here conducted along three walking routes in Malmö, Sweden, and the data was qualitatively analysed. The VOA showed for instance the importance of detecting how different routes varied in the successive coupling of vistas, thus implying a measure of how well they support transport walking. The result of the VOA is discussed in relation to the outcome of the application of a quantitative environmental audit tool, the Irvine-Minnesota-Inventory (IMI), along the three walking routes. The IMI did not capture the basic differences in the traffic structures and is hence insufficient for the Swedish context. The result of VOA shows the need to integrate visibility aspects when studying pedestrian conditions. It also shows the need for a refinement of the directing/dictating scale in order to capture the diversity of the basic urban structure and the specific needs of various types of walking. Further development of VOA could include theories of environmental psychology and incorporate digitalized tools commonly used by urban planners to rationalize its application.

SAMMANFATTNING

Denna rapport presenterar och testar en teoretisk utgångspunkt för att beskriva den byggda miljöns inflytande på transportgående i stadsmiljöer. Gående är av flera skäl ett betydande transportmedel, som främjar miljö, hälsa, psykologisk utveckling och social samvaro. Tidigare forskning om gående och byggd miljö beaktar inte tillräckligt hur tredimensionella och materiella egenskaper hos arkitekturen samspelar med upplevelsen, och hur detta ingår i planeringen av stadsmiljöer. Den metod som presenteras här – VOA (Vista Observation Analysis) – tar sin teoretiska utgångspunkt i en kombination av Foucault's teori om rumslig disciplinering och Gibsons idé om rumsliga vyer (vistas). VOA ger ett kontextualiserat och platsspecifikt perspektiv på de fysiska rumsliga egenskaperna. VOA redovisar i plandokument vistas längs en gångsträcka så som de uppträder när en person går sträckan. Analysen visar också rummets ideologiska implikationer, här genom de disciplinerande mekanismerna "ledande" och "dikterande". Ledande mekanismer erbjuder rumsliga möjligheter, medan dikterande mekanismer visar på materiella hinder. Båda mekanismerna är verksamma längs en gångsträcka, och således förutsätts att transportgående påverkas av en situationsbestämd och visuellt betingad materialitet. VOA tillämpades i en empirisk studie längs tre gångsträckor i Malmö. Informationen redovisades kvalitativt och visar betydelsen av att notera hur olika sträckor varierar vad gäller hur vistas successivt kopplas till varandra, vilket ger information om hur väl en sträcka kan förväntas stödja transportgående. Beskrivningen av gångsträckorna baserad på VOA diskuteras i relation till resultatet från en kvantitativ expertchecklista, Irvine-Minnesota-Inventory (IMI), applicerad längs samma sträckor. IMI diskriminerade inte mellan de grundläggande skillnaderna i trafikstrukturer och var därför otillräcklig för en svensk kontext. Beskrivningen med VOA visar på betydelsen av att integrera visuella aspekter då man studerar stadsmiljöns förutsättningar för gående. Beskrivningen visar även att en förfining behövs av ledande/dikterande-skalan, för att den skall fånga skillnaderna i den fysiska miljön, samt särskilda behov för olika varianter och syften i gåendet. En vidareutveckling av VOA kan inkludera t ex miljöpsykologisk teori samt införliva stadsplaneringens och den arkitektoniska designens digitala instrument.

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1. INTRODUCTION

The design of the built environment, the urban form, is one aspect that sets the physical framework to walking, but how? A growing body of research shows a connection between physical activity, such as walking, and the design of the urban form and layout (Frank et al., 2005, Cerin et al., 2006, De Nazelle et al., 2011). Ecological models suggest that health behaviour is influenced by the physical environment, psychological and social factors, and policy decisions (Stokols, 1992, Sallis et al., Glanz et al., 2008) such as urban design strategies. A pedestrian-friendly built environment not only promotes a healthier and sustainable lifestyle, offering opportunities for psychological development (Mackett et al., 2007) and well-being (Foster and Giles-Corti, 2008, Middleton, 2011), but also assures a large group of people access to the city regardless of their socio-economic status (Southworth, 2005). Public space is a "part of our everyday social reality", where space and our spatial behaviour affect and define each other (Madanipour 2003), and so the ability to walk also influences the sense of belonging in an urban community. Middleton (2011) points out the lack of studies differentiating types of walking, e.g. walking as a means of transport, recreation or exercise, and the specific needs of the different types of walking. The focus in transportation research has been on motorised transport, and there is a lack of knowledge about how walking differs from other means of transport (Foltête and Piombini, 2010). Complex models are needed to understand the influence of combinations of design elements on walking (Alfonzo et al., 2008, Foltête and Piombini, 2010), as well as the "Hierarchy of Walking Needs within a Socio-Ecological Framework" (Alfonzo, 2005).

The aim of this study is to develop and test a theoretical framework and a methodology for analysing urban form in relation to transport walking: the Vista Observation Analysis. The method is applied along walking routes in order to capture spatial aspects and power aspects, and the way these influence access to urban public space in the built environment. The present research contributes to the existing body of assessment instruments in this field by adding theoretical concepts that capture the basic concepts of urban form specific to transport walking, while introducing a method applicable for architects and urban planners. The suggested method, VOA, is one of many ways to analyse the built environment. In this study, the Irvine-

Minnesota Inventory (IMI) instrument (Day et al., 2006) is applied in parallel to the VOA in order to provide an additional quantitative description of each route. Another aim is to test the IMI in a Nordic setting. IMI was selected from several assessment tools for walking because it captures an extensive range of aspects, can be applied to parts of routes, and is designed for use on-site by professionals.

1.1 Previous research on walking

In previous studies, walking has usually been considered in terms of a quantified outcome. The term 'walkability' has been applied as a measure for assessing how urban settings support and encourage walking. The walkability index is derived from a range of parameters, e.g. the extent to which the built form is "… providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network" (Southworth, 2005). Several methods, based on archive data (e.g. Geographic Information Systems, GIS), environmental audits (e.g. the Irvine Minnesota Inventory, IMI) or self-reported data (e.g. The Neighbourhood Environmental Walkability Scale, NEWS), have been applied to analyse measured and perceived characteristics of the built environment and their influence on physical activity (Brownson et al., 2009), and to derive walkability indices or scales. Examples of the more common methods developed and applied in previous walking studies within various academic fields are described below, in order to provide a general overview of studies of walking in urban areas.

1.1.1. Walking as a quantified outcome

Measured and observed assessments. GIS approaches utilise existing data and so may be relatively labour- and time- efficient (Brownson et al., 2009). Several studies have applied various GIS-based models to generate a walkability measure of the built form at neighbourhood level, analysing connectivity and proximity (Owen et al., 2007, Frank et al., 2005, Leslie et al., 2007), street connectivity, dwelling density and land-use mix (Leslie et al., 2005), route choices (Borst et al., 2009, Foltête and Piombini, 2010) and, in combination with other methods, measuring perceived walkability, NEWS/NEWS-A (Leslie et al., 2005, Cerin et al., 2007a, Arvidsson et al., 2011). Objectively measured physical activity or frequency of walking are positively associated with objectively measured walkability (Frank et al., 2005, Owen et al., 2007), and the application of GIS by using data on dwellings, land use, connectivity, and net retail area provides accurate information on walkability (Leslie et al., 2007). Studies applying GIS to analyse route choices – deviation analysis (Foltête and Piombini, 2010) and resistance factors (Borst et al., 2009) – use models based on the effort needed to reach a specific destination, as well as time and distance minimisation. These studies suggest further development of the categorisation of environmental features.

Environmental audit tools are applied to collect data on characteristics that are best assessed by direct observation (Brownson et al., 2009). The IMI developed in the USA is an extensive questionnaire designed to measure the link between the built environment and physical activity. IMI is designed for use by trained raters on a segment level, defined as the space between two buildings, and the IMI assesses 162 environmental items in four categories: accessibility, pleasurability, perceived safety from traffic and perceived safety from crime. The IMI can be combined with GIS (Day et al., 2006). Only those items that discriminate between segments are included in the final analyses, and inter-rater consistency was high and statistically reliable (Boarnet et al., 2006). Werner et al. (2010) reported inter-rater agreement for most items to be in the range 60-100%, but suggested further refinement of the categories. Various studies involving IMI have successfully distinguished between environments with different degrees of walkability (Gallimore et al., 2011, Werner et al., 2010, Brown et al., 2007).

Ewing and Handy (2009) proposed a method for use by designers, planners, and researchers that would enable them to objectively assess subjective qualities of the urban street environment. Urban design qualities – imageability, enclosure, human scale, transparency and complexity – are linked to specific physical features to articulate the complex relationship between walking behaviour and the urban environment. The authors stress the importance of understanding the relationship between environmental features, and the individual's perception of the environment is understood as a possible combination of physical features, urban design qualities and individual reactions. The expert panel's hypothesis on the relationship between different characteristics and perception was only partly confirmed (Ewing and Handy, 2009). A combination of GIS and Ewing and Handy's method showed high correlation between transparency and complexity and the equivalent GIS measures (Purciel et al., 2009).

Perceived assessments. Most evidence on the relationship between the built environment and walking is based on self-reported data, and the most widely used tool is the NEWS questionnaire (Brownson et al., 2009). The NEWS questionnaire is designed to evaluate the perceived influence of environmental aspects on walking within a neighbourhood. A walkability index is generated according to environmental variables – residential density, land use mix, street connectivity, infrastructure and safety for walking/cycling, aesthetics, traffic hazards and crime – and compared with reports on individual walking frequency and/or health status (Saelens et al., 2003). Cross-validations of NEWS/NEWS-A show a higher concordance on individual level than on block group level, and a difference on separate levels for the influence of perceived environmental factors on walking (Cerin et al., 2009, Cerin et al., 2006). Further NEWS/NEWS-A studies have been implemented in various settings outside the USA (Cerin et al., 2007ba, Leslie et al., 2005, Arvidsson et al., 2011, Cerin et al., 2009, Cerin et al., 2007ab, Cerin et al., 2006).

1.1.2. Walking as a qualitative experience, research method, act of resistance and enunciation

Middleton (2010, 2011) draws attention to the need for qualitative studies on walking, and an acknowledgement of the importance of habits and routines in individual walking decisions when developing and implementing policy strategies. Kelly et al. (2010) stress the importance of incorporating the actual activity of walking, and present a study comparing three methods aimed at capturing the pedestrian perspective on the environment. A stated preference survey, an on-street survey concerning attitudes to environmental attributes, and an on-the-move survey were used (Kelly et al., 2010). The result of the study showed that the three methods can complement each other to extend the concept of walkability to some extent (Kelly et al., 2010). The result of the study also showed a need for designing special 'pedestrian maps' that highlight important pedestrian attributes. These attributes often do not appear on conventional maps that are designed for motorised transport (Kelly et al., 2010). In this study, walking is both the outcome and part of the survey method. This could be compared with the dérive of the situationists and the psychogeographic map. Psychogeography is defined as

"The study of the specific effects of the geographical environment, consciously organized or not, on the emotions and behavior of individuals." (cited from http://library.nothingness.org/articles/SI/en/display/7 retrieved 12.12.11.)

In the Kelly et al. (2010) study, the researchers defined the specific route, questions, etc., whereas in a dérive (Knabb, 2006) the pedestrian is responsible for all decisions and observations. In the field of architecture, there are few specific methods for exploring the link between walking and the built form, and walking is mostly considered in terms of the flâneur, or an act of resistance, and not as an effective means of transport. The flâneur first appeared in the early 19th century, and Benjamin (1999) characterises the flâneur as an urban observer. In its original form it was considered to be a largely male activity, while the situationists presented a new type of flâneur with their method of dérive (Sadler, 1998) for exploring and experiencing the city.

"One of the basic situationist practices is the dérive, (1) a technique of rapid passage through varied ambiences. Dérives involve playful-constructive behavior and awareness of psychogeographical effects, and are thus quite different from the classic notions of journey or stroll." (Debord, 1957 cited from http://www.bopsecrets.org/SI/2.derive.htm retrieved 12.12.11.).[i]

Central to the dérive is the act of resistance to established urban design and the individual's experience of the city; the journey itself is part of the outcome. The dérive not only offered a new way of experiencing space, but also called for new ways to depict these experiences. The result of a dérive could be a psychogeographic map (see Debord and Jorn, *The Naked City,* 1957 in Sadler, 1998), where the experience of the walk is depicted using a collage technique. De Certeau (2002) outlines a modified version of the dérive, where walking is considered as a fundamental way to experience a city due to its possible enunciation functions.

1.2 Gaps in previous research on walking

Existing research on walking has great potential but the development and evaluation of measurement methods are still in their infancy (Brownson et al., 2009). In the literature on environmental audits (neighbourhood observations), data from observation methods, tools, and analysis are inconsistently reported, making comparisons difficult (Schaefer-McDaniel et al., 2010). The quantitative studies need to be complemented with descriptions of the built environment; this would provide information about how the relationships between urban form features influence pedestrians, the social implications of the built environment, and type of walking that takes place. Methods used in architecture need to be given more structure if they are to be made applicable for professionals outside and inside the field, and if they are to be applicable in this type of research setting (Kärrholm et al., 2012). The present article therefore specifically addresses three gaps in the existing literature on urban form and walking. These are described below.

The spatial configuration. Walking has to be studied in relation to the physical 3-D settings and their combinations of design elements. Ewing and Handy (2009) confirm the importance of considering the built environment as a compound of urban design qualities and physical features, and examining the individual's response.

The power perspective. Historical transformations and consequences of ideological, political or social intentions behind urban design are seldom or never examined in studies of walking. In contrast, research in urban morphology examines built form and variations in the urban landscape in the light of historical and social processes. Very simplified, urban morphology could be described as dealing with four main themes within geography: 1) analysis of street patterns; 2) a critical understanding of typology classification systems by mapping the transformation and formation of the urban landscape over time; 3) explanation of the changes and identification of initiators of change, as well as the extent of the changes; and 4) symbolism and meaning expressed in the urban landscape by its designers (Lilley, 2009).

The specific needs of transport walking. The built form must be considered from the perspective of the specific needs of an activity, so the definition of walking has to be divided into categories of different types of walking. In this study, walking as a means of transport is defined as a journey where the pedestrian has a specific destination, i.e. the walking is not for exercise or recreation, and the pedestrian wishes to minimise journey time and maximise efficiency (Middleton, 2011). Foltête and Piombini (2010) argue that the shortest route is a stronger influence on pedestrian route choice than environmental features. Middleton (2011, 2010) emphasises that studies of transport walking should consider individuals' habits and routines. In this study, participants reported the importance of maintaining momentum, perseverance, awareness of traffic, etc. but also "enjoyment". The preliminary work for this research project included a focus group discussion that considered factors important to transport walking – these included short cuts, avoidance of road traffic, the possibility to walk in the sun but sheltered from the wind, variety of building types on the journey, other pedestrian activity, and separate paths for cyclists and pedestrians.

In this article the conditions for detecting walking options within the built environment will be studied from a visual perspective – the visibility of urban form features, and the type of impact and consequences they might have on efficient navigation for a pedestrian.

2 . THEORETICAL FRAMEWORK

The theoretical framework is based on the theory of vista (Gibson, 1986) and serial vision/sequence of revelation (Cullen, 1976), but also on a spatial discourse on discipline (Foucault 1995). The first part considers visual perception and descriptions of spatial configurations, and then Foucault's notion of discipline will be applied as a way of capturing power aspects of built form.

2.1 The spatial configuration

Gibson uses vista to describe how the environment is perceived in relation to pedestrian locomotion.

"An alley in a maze, a room in a house, a street in a town, and a valley in a countryside each constitutes a place, and a place often constitutes a vista (Gibson, 1966b, p.206), a semienclosure, a set of unhidden surfaces. A vista is what is seen from here, with the proviso that "here" is not a point but an extended region. Vistas are serially connected since at the end of an alley the next alley opens up; at the edge of the doorway the next room opens up; at the corner of the street the next street opens up; at the brow of the hill the next valley opens up. To go from one place to another involves the opening up of the vista ahead and closing in of the vista behind. A maze or a cluttered environment provides a choice of vistas. And thus, to find the way to a hidden place, one needs to see which vista has to be opened up next, or which occluding edge hides the goal. One vista leads to another in a continuous set of reversible transitions." (Gibson, 1986, p. 198)

Pedestrian mobility is afforded by a series of vistas, which are linked to the occurrence of obstacles and barriers.

"A cliff face, a wall, a chasm, and a stream are barriers; they do not afford pedestrian locomotion unless there is a door, a gate or a bridge. A tree or a rock is an obstacle. Ordinarily, there are paths between obstacles, and these openings are visible. The progress of locomotion is guided by the perception of barriers and obstacles, that is, by the act of steering into the openings and away from the surfaces that afford injury." (Gibson, 1986, p. 132)

As a spatial concept, vista explains the process of the visual perception of the relationships between physical features when walking in any kind of environment, natural or artificial (Gibson, 1986). Vista can be compared with serial vision and a sequence of revelations that address the relationships between architectural design and walking (Cullen, 1976). Cullen's study presents a typology of urban situations that emphasise the effects of different plan layouts – design elements in relation to plan location (Cullen, 1976), and both theories provide a framework capturing the 3-D aspects of the spatial settings.

2.2 The power perspective

Foucault's discipline concept (1995) provides a theoretical model for how an immaterial property, power, can be translated into a material property, built form. The material becomes the mechanism to exercise power over the individual body and its movement (Foucault 1995), and it depicts how a society can implement its ideas on power and control in the architectural design of its institutions. Bentham's *Panopticon* is applied as an architectural reference to explain how discipline can be translated into a physical form, but it is not to be comprehended as a 'model' building for exercising power. Instead:

"…the diagram of a mechanism of power reduced to its ideal form; its functioning, abstracted from any obstacle, resistance or friction, must be represented as a pure architectural and optical system: it is in fact a figure of political technology that may and must be detached from any specific use." (Foucault 1995, p. 205)

According to Foucault (1995), the disciplinary society constitutes vertical partitions of time and space. This is a consequence of society's constant battle to overcome any kind of opposition, revolt or resistance, and the disciplinary techniques use different modalities of partition to destroy "anything that may establish horizontal conjunctions". The constant "procedures of partition and verticality" are manifested in separation of time, space and movement, and ensure that no horizontal relations can be established (Foucault 1995). The human body is manipulated in what Foucault (1995) calls "a machinery of power", which implements its techniques on the human body to reconstruct a new and more obedient body. Discipline is defined as "a type of power" that could be implemented in an institution or in the everyday routines of people's lives. The disciplinary schemes are not only applied in extreme or temporary situations, but can also be regarded as permanent institutions (Foucault 1995), represented by buildings manifesting the disciplinary scheme through their plans, sections, built form and materials. The built form becomes a mechanism to control bodily movement.

2.3 A Vista Observation Analysis, VOA, of urban form features related to transport walking

The focus here will be on how plan and material features might obstruct or facilitate visibility by providing different degrees of transparency. Visibility is considered a variable of the urban form important for facilitating efficient navigation, due to its ability to create connection between vistas. The discipline concept will be applied in order to analyse these connections in terms of their effect on the pedestrian's walking options.

Here, the pedestrian situation is regarded as the physical site, the activity and its needs. Walking is defined as a sequential event, where the pedestrian moves through vistas within the existing built environment. A vista is defined as the accessible walkable physical space, and it can be blocked by various permanent or temporary elements, e.g. buildings, fences, greenery, cars. The link between two vistas enables the acknowledgement of the "extended region" of a vista, which is not to be interpreted as a fixed space, and obstacles and barriers are regarded as strictly material objects (Gibson, 1986). A continuous series of vistas provides coherent information on pedestrian permeability, while disconnected vistas will fragmentise the information. Pedestrian permeability is any passage suitable for pedestrians, and the occurrence of viewed motion can serve as an indicator of permeability. Cullen (1976) refers to motion as a part of "the Existing" and "the Revealed" view of the environment while walking. Here, the visibility of the built form and its pedestrian permeability will be limited to the field of vision in the direction of walking and observed on-site, in contrast to technical plan analysis, i.e. isovist analysis, of the overall visibility and permeability (Hillier, 1993, Benedikt, 1979) that does not distinguish between degrees of visibility.

Foucault's concept of discipline (1995) provides an understanding of the governing and constraining aspects of urban form and, here, specifically on the mobility of pedestrians. The notion of discipline will be applied to analyse material aspects from a power perspective: how the material form affects the possibility of actions, in this study the activity of walking. Specific needs of transport walking (see 1.2) include being able to navigate efficiently and to some extent anticipate what will happen further along the route. All buildings exert some discipline through their verticality but the type of power exercised, and the degree of discipline, are described more precisely through the terms 'dictation' and 'direction'. Here, 'dictating' mechanisms imply restriction on movement while 'directing' mechanisms facilitate navigation and efficient pedestrian mobility. The crucial point is the link between vistas, and whether or not a continuous series of vistas are produced. Short overlaps between vistas, or completely disconnected islands of vistas, will dictate mobility, while well-connected vistas are supposed to direct the pedestrian. Dictating mechanisms not only impair, obstruct or limit the visual horizontal communication and hinder physical movement; they may also attract a homogeneous group of users by only allowing one type of mobility. Spatial situations facilitating interaction allow "horizontal conjunctions" between individuals and the environment (Foucault 1995), and in this study directing mechanisms are seen as important for transport walking because they provide information on walking options. A continuous series of vistas can act as a dictating mechanism if obstacles other than the built form obstruct the visibility of the pedestrian permeability, e.g. compact greenery, temporary objects. Compared to Space Syntax, the VOA captures social mechanisms of the physical and material environment, whereas the quantitative analysis in Space Syntax (Hillier and Hanson, 1984) focuses on structural hierarchies.

The model below attempts to address identified research gaps by extending the description of urban form to include spatial configurations and power perspectives. This will enable us to address the specific needs of an activity, in this case transport walking.

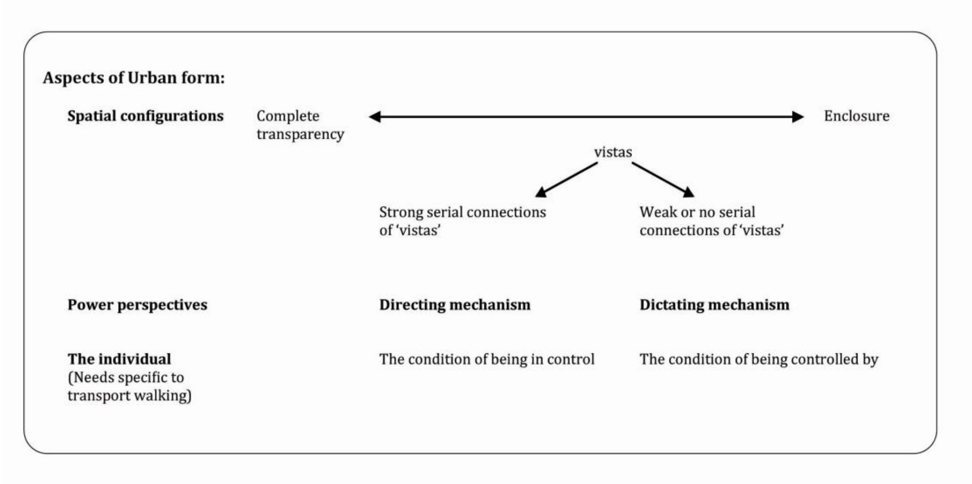

Figure 1. The model describes the proposed method, VOA, for analysing aspects of urban form relating to transport walking. The model corresponds to the identified gaps in previous research. (Authors' elaboration)

Example of spatial situations constituted by dictating and directing mechanisms

In an enclosed staircase with a lift, doors to each floor and no windows, the visibility of walking options will be obstructed by the opaque walls. For the person walking up or down the stairs, the vistas will be separated by doors, and information about how to move around will be scarce. The doors both obstruct the view of the user and are barriers to mobility. The built form can be described as containing dictating mechanisms, making it difficult to acknowledge information on mobility options. A more open staircase with a lift, windows and no doors to each floor will offer overlaps between vistas: links. Only vertical movement is possible, yet the user can gather information about the outdoor and indoor environment. The spatial situation of the open staircase contains directing mechanisms.

2.3 Research questions

The aim of the empirical study was to test the method, VOA, and to study the visibility of pedestrian permeability along three route segments that illustrate how different urban architectural settings may vary in terms of the walking options they offer. The IMI assessments were used as a quantitative reference. The specific research questions were:

RQ1: To what extent does the built form obstruct or facilitate the visibility of pedestrian permeability along each segment, i.e. how does it influence the degree of transparency?

RQ2: To what extent does each segment contain directing mechanisms (continuous sequence of vistas) or dictating mechanisms (disconnected vistas)?

3. METHOD

3.1 Case settings

Three segments of walking routes in Malmö, Sweden, were chosen for the study. The segments were located in the Lorensborg, Dammfri, and Rönneholm neighbourhoods. The neighbourhood are socio-demographically similar, but represent a variety of spatial situations offering different types of walking environment due to different traffic and urban planning strategies (Table 1). Lorensborg has a modernistic pattern of traffic separation. Part of the district comprises high-density buildings while another part has groups of more neighbourhood-oriented residential blocks. Dammfri only has groups of neighbourhood-oriented blocks, with some traffic separation. Rönneholm is a combination of grid blocks and more individual block structures. All three districts have pedestrian footpaths and are located within walking distance of Malmö city centre. The length of each segment was 300 m.

Table 1. Neighbourhood data. (Sources: www.malmo.se; Tykesson, 2001, 2002; site observations)

Neighbourhood	**Segment A: Lorensborg**	**Segment B: Dammfri**	**Segment C: Rönneholm**
Inhabitants	3,952	3,686	6,996
Area (ha)	37	31	48
Car ownership Cars per 100 inhabitants	27	29	28
Income SEK/inhabitant	132,165	148,209	154,840
Age and gender	Age % 0-18 13 19- 87 **Total** 100 Women 54	Age % 0-18 11 19- 89 **Total** 100 Women 57	Age % % 0-18 12 19- 88 **Total** 100 Women 55
Neighbourhood structure (Building year)	Modernistic/ Neighbourhood-oriented block structure (1956-69)	Neighbourhood-oriented block structure (1945-55)	Mix of grid block and individual block structures (1900-80)

Segment A: Lorensborg

Segment A comprises a pedestrian-only path with a south-north orientation. The residential buildings along the route are individual housing blocks in pairs, partly connected. The segment extends between a car park and the local square. The segment starts at the car park, crosses a pedestrian space located between a small shopping centre and a pair of residential blocks (9-16 storeys) with an outdoor passage at ground level, crosses a road before continuing along a pedestrian path situated between a courtyard (green space, playground, laundry facility) and a long second pair of residential blocks, (9-16 storeys), and ends at the square, which is surrounded by a commercial building (1 storey), and a mixed residential and commercial block (9 storeys).

Segment B: Dammfri

Segment B is a combined pedestrian/cycle path, traffic separated by a painted line, with a south-north orientation. The route crosses two roads via pedestrian crossings. The adjacent residential buildings are individual housing blocks. On the west side of the segment, the route passes two private courtyards, the end elevation of three residential blocks (3-4 storeys), the end elevation of a higher residential block (5 storeys), and along the front elevation of a residential block (6 storeys) with an adjacent fenced courtyard/green space. On the east side are the front elevations of four residential blocks (3 storeys), the end elevation of one residential building (5 storeys), and a fenced courtyard.

Segment C: Rönneholm

Segment C is a combined road and cycle path with an adjoining pavement and adjacent parking, with a west-east orientation. The segment starts on a pavement adjacent to a cycle path and a cul-de-sac for cars. The route crosses two roads and on the north side runs past a 4-storey residential block , the end elevation of another block (4 storeys), an open green space, followed by the front elevation of another residential block (4 storeys), fronted by a strip of grass. On the south side, the segment passes a park with an adjacent single row of car parking, an L-shaped block of residential and commercial properties (4 storeys) with parking in front of the building, and the end elevations of three residential and commercial blocks (4 storeys). For further information on plan layout see Figures 2-4.

3.2 Quantified descriptions of case settings

The segments were further characterised using the IMI (Boarnet et al., 2006), which allowed assessment of the walkability index of the selected segments. This environmental audit tool was chosen because it provides a comprehensive expert assessment based on on-site observation that can be used as a frame of reference for the VOA. After a training session, including a discussion of how the examples provided by Alfonzo et al. (2005) could be applied in a Swedish context, and on-site ratings along a test segment, five independent trained raters assessed the three segments on-site during daylight hours in November 2011. The greenery still had foliage and there was no precipitation. Firstly, the full distance was walked in the direction towards the city centre and back again to get an overall impression. This was followed by the actual assessment, in accordance with the instructions provided for the instrument, while walking along the segment. Each assessment took approximately 45 minutes per segment.

Table 2. Result of IMI audit

Dimension	Accessibility	Pleasurability	Safety	Traffic
Number of items in IMI	58	57	14	47
Number of items relevant for the context	33 (56%)	32 (56%)	7 (50%)	39 (83%)
Segment A, Lorensborg	64.5 %	61.2%	97%	15%
Segment B, Dammfri	47.5%	55.9%	80%	39%
Segment C, Rönneholm	70.5%	65%	100%	28%

Inter-rater agreement was 60% or more for all items except three. In accordance with Werner et al. (2010), it was decided to retain these few items in the analysis. The items were coded into the four overarching dimensions of accessibility, pleasurability, safety and traffic and, as suggested by Werner et al. (2010), only items relevant for the investigated context are included (a list of applied items can be obtained from the authors). Table 2 shows the total number of items in each dimension, the number of items relevant for the present context, and the percentage of the total possible score for each dimension and walking route. This approach gives comparable figures for how well the walking segments score on each dimension.

3.3 The VOA: Instrument, procedure of observation and analysis

Pedestrian permeability, visibility, and vistas were marked on plan drawings of each segment. A flexible design was applied to develop a structured observation method (Robson, 2002).

From the point of view of being trained as an architect and in order to capture the experience of a pedestrian the tool for obtaining information was a structured on-site observation of each segment in order to capture the experience of a pedestrian. One observer collected the data in January 2012, on foot and in daylight. The following variables were observed and marked on a map:

1. Pedestrian permeability: Pedestrian permeability was interpreted as a public space accessible 24 hours a day, and comprised paths and passages where pedestrians could walk along and that were connected to the segment. Before the observation, the pedestrian permeability according to the map was highlighted and was later compared and supplemented with the observed permeability. The visibility and vistas along each segment were continuously observed and mapped while walking towards the city centre. The studied area was limited in terms of the distance visible from the segment.

2. Visibility: a) The field of vision in the walking direction was recorded, as were the objects/material features, e.g. buildings, greenery, and parked cars that obstructed or facilitated the view of the pedestrian permeability. Occurrence of viewed motion was noted as an indicator of possible permeability. b) Potential sightlines along adjacent and connecting paths and streets.

3. Vistas: The beginning and end of the physically accessible spaces of vistas along the segment were recorded.

After the observation, brief notes were made about observed material and form features. Each segment was observed three times for 30-45 minutes. During each walk a few stops were made to mark the observations on a map. The result of the mapping was digitalized and analysed once, then each segment was observed a second time to double-check the variables. The original plan drawings were revised using additional information from photos, and Google and Eniro maps.

The visual data was qualitatively analysed using the VOA (see *2.3)* in order to describe the following: the extent to which the segment connects to the adjacent pedestrian permeability; the extent to which the visibility of the segment was linked to its pedestrian permeability and the adjacent pedestrian permeability; and the extent to which each segment provides a continuous sequence of vistas (directing mechanisms), or disconnected vistas (dictating mechanisms).

An experienced practicing architect was invited to carry out a structured review of the analysis's result, the interpretation of which corresponded to that of the observer.

4. RESULTS AND ANALYSIS

The mapping of permeability, visibility, and vistas and field notes from the on-site observations formed the basis for the analysis. The mapping is illustrated in Figure 2-4 .

4.1 Analysis

Segment A

There are only three points of connection (Figure 2: starting point, link a.1-3, and end point) to the adjacent pedestrian permeability, and the visibility of the path and its continuation is generally low. Visibility of the surroundings is only high when crossing the road, and adjacent walking options are hard to detect because of the openness with no guiding elements (Figure 2, end of vista a.1). Disconnected islands of vistas and short overlaps reduce visibility of the pedestrian permeability and of the surroundings. This is a consequence of the situation of the buildings in relation to each other. The great difference between semi-enclosure and openness could explain the weak links between vista a.1-4, although the a.3-4 have instances of and a longer coherent overlap than the former two, but nevertheless offered few possibilities to detect motion beyond the passage between corner 5 and 6. The dictating mechanisms of the urban form seem to be strong along the segment because of the short visual and physical overlaps, combined with the isolated paths of the courtyard. The dictating mechanisms are intensified in the semi-enclosures created by the solid walls blocking the view in the walking direction, and on some occasion by compact greenery. The visual view of the first vista, a.1, is blocked by an end elevation (building 3). Cullen (1976) refers to this kind of spatial situation as a “closed vista”. The long solid wall (3) of vista a.3 is a strong dictating mechanism due to the impossibility of passage through it at any point. The greenery affords different degrees of transparency within the vista a.3, and partly prevents the pedestrian from detecting corner 6, which could otherwise give a hint of vista a.4, (cf. Cullen (1976) “screened vista”).

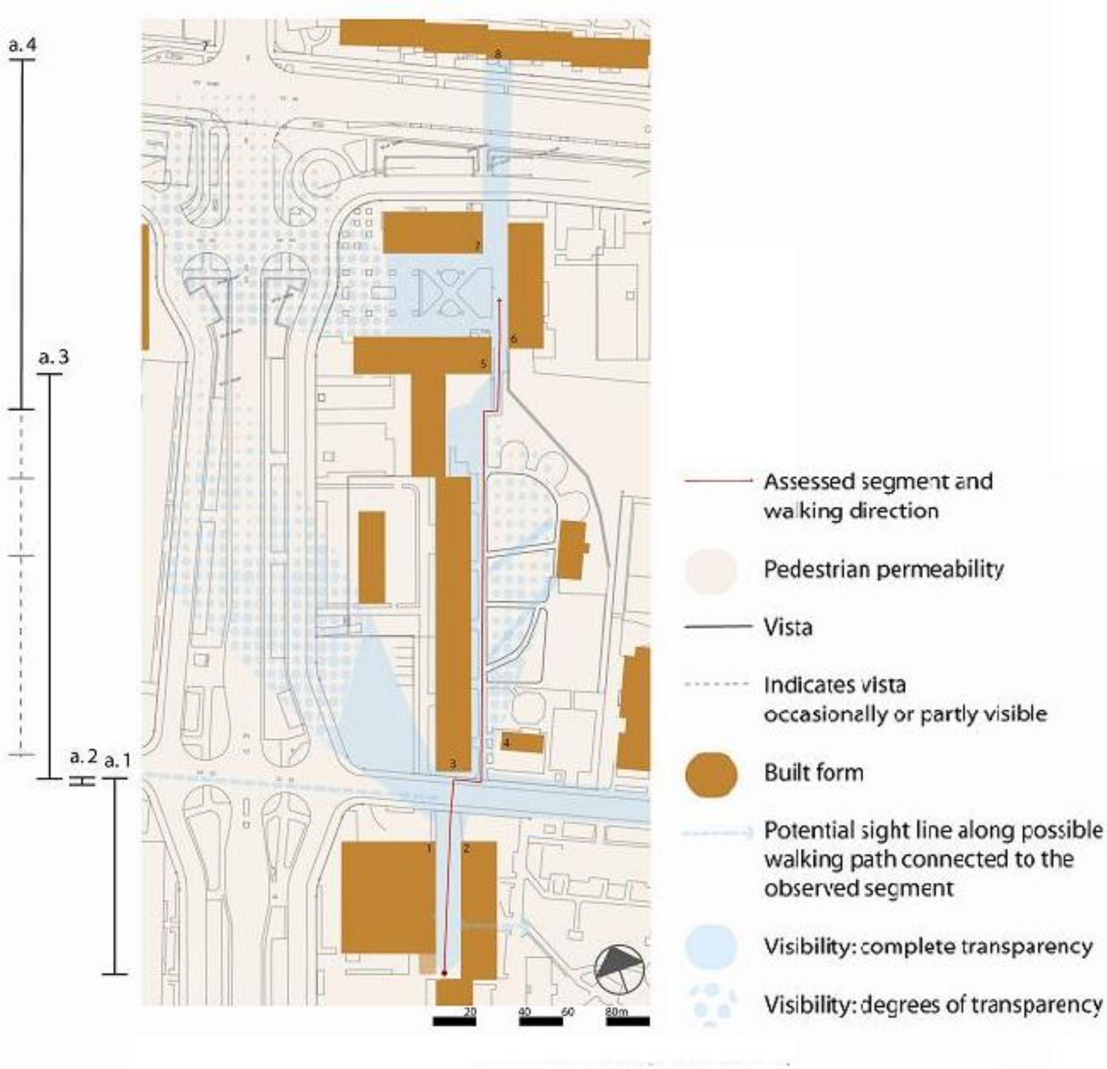

Figure 2. Segment A Lorensborg. Plan drawing of observed route showing the visibility of the surroundings while walking, and the stretch of each vista.

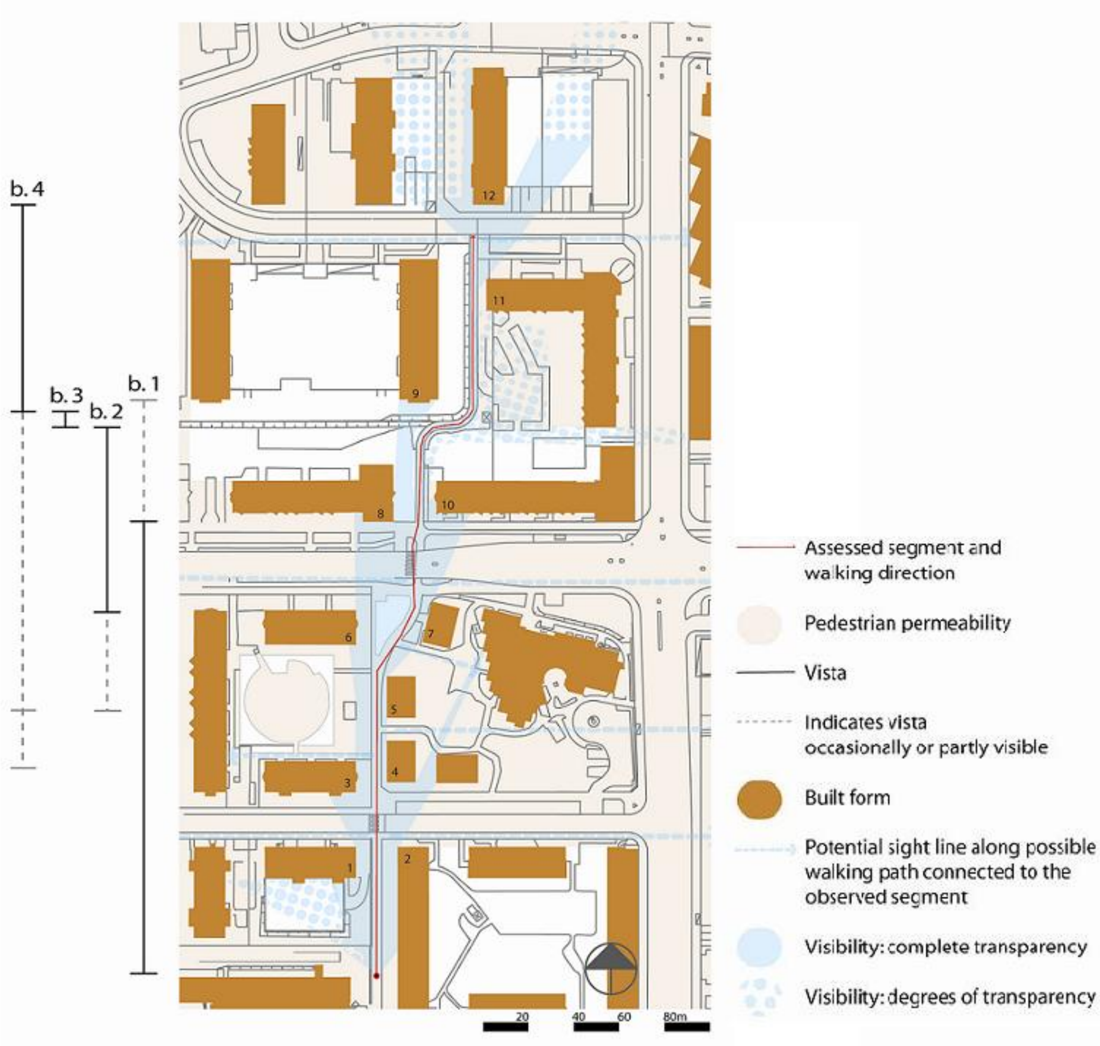

Figure 3. Segment B Dammfri. Plan drawing of observed route showing the visibility of the surroundings while walking, and the stretch of each vista.

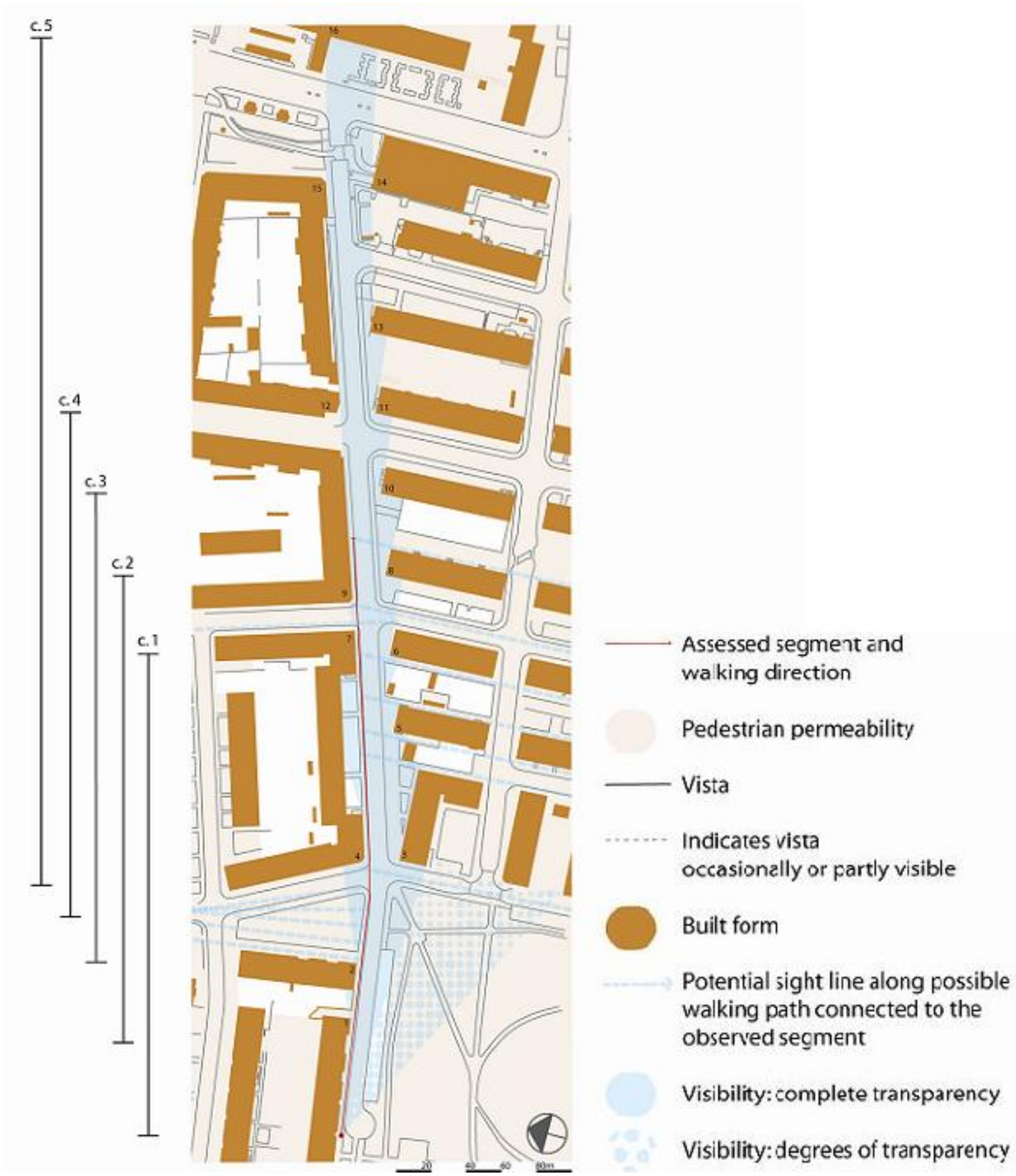

Figure 4. Segment C Rönneholm Plan drawing of observed route showing the visibility of the surroundings while walking, and the stretch of each vista.

Segment B

The segment is well connected to adjacent pedestrian permeability, but there are few opportunities to acknowledge it and the visibility is mostly restricted to the actual segment. The low visibility of adjacent pedestrian permeability is a dictating mechanism, while the intersecting streets (Figure 3, vista b.1) occasionally provide opportunities of directing elements for horizontal communication. Vista b.1 has a more obvious connection between built form and the path, while the other vistas are disconnected from the built form and blocked by fences and opaque greenery. The latter act as an obvious dictating mechanism for mobility and reduces the visibility of the continuation of the path. The b.1 and b.2 vistas have a spatial overlap, and b.1 and b.4 have points of visual overlap, but this dictates rather than directs the mobility due to the lack of continuity in the visibility. The appearance of low buildings and visually accessible courtyards might be deceptive when looking on the plan, because this might give an impression of high visibility of pedestrian permeability. Segment b has a mix of dictating and directing mechanisms, where the latter interrupt the former.

Segment C

The segment is well connected to the overall pedestrian permeability. At the starting point the visibility, direction south, is partly obscured by greenery, reducing somewhat the transparency of adjacent walking options. Vista c.1 is blocked by corner 3, but vista c.2 begins to be revealed immediately near the start of the walk and, further along the segment, several vistas simultaneously overlap (Figure 4). The continuous revealing of vistas is similar to "punctuation": a building concealing the next vista which offers a pause but does not interrupt the mobility (Cullen, 1976). The segment contains several directing mechanisms. Several occasions of high visibility of connecting pedestrian permeability occur through variations in size of the openings, the intersecting streets that are not perpendicular, and the mix of end elevations and front elevations facing the street connecting to the path. This enables a series of continuous vistas (Figure 4, c.1-c.5) with long overlaps. The built form affords visibility of pedestrian permeability on account of its layout, and at one point transparency through a shop window at a corner location. Location of parking along the pavement obstructs the view when walking right next to a parked car, but does not interfere with the field of vision in the distance, and the dictating mechanism of cars seems to vary according to the distance from the pedestrian's location. The smooth transitions between the vistas, coordinated with the direction of the segment, constitute directing mechanisms, which compensate for the dictating mechanism of the long solid wall running along the north side of the segment.

5. DISCUSSION

The VOA is developed as a structured method to observe urban form and transport walking. It allows analysis of walking according to a theoretical framework that includes spatial configurations, vistas, as well as a power perspective in terms of directing/dictating mechanisms. It thereby addresses some of the gaps in the existing literature on urban form and walkability.

The layouts of each neighbourhood are explicit or implicit consequences of different traffic and urban planning strategies, providing three different pedestrian permeability networks where the network is the fundamental basis for any type of walking. The observation of the visibility in relation to the permeability of each segment captures one urban form variable related to transport walking and the pedestrian's need for efficient navigation.

The three segments differ in visibility pattern. Segment C has several visual links to the adjacent pedestrian permeability on a neighbourhood level, a longer sightline in the walking direction, a continuous visibility pattern, and a part where more than two vistas simultaneously overlap. The layout of the urban form of segment C offers opportunities to 'see' around corners (Gibson, 1986), and is suggested to have the highest qualities for transport walking due to the range of visibility offered by the spatial configuration providing a variety of directing mechanisms. Segment B has one vista, b.1, offering a mix of directing and dictating mechanisms, followed by a disrupted series of vistas strongly dictating the mobility, where sudden twists of the path cut off the field of vision, as in segment A. Locomotion is still possible, but the visibility is reduced both within and into the vistas. This must be distinguished from situations where physical objects obstruct walking (Gibson 1977), as in the example of the long impermeable building in vista a.3. The dictating mechanism of the building is not only its vertical partition (Foucault 1995), but also its horizontal extent.

In terms of directing and dictating mechanisms, coupled with the vista concept, the VOA provides a power-related perspective in terms of the extent to which the pedestrian can be in control of their transport walking options. This study was limited to public space accessible 24/7, but nevertheless shows the importance of access to public space “at a time when the welfare state has come under threat of restructuring, and social fragmentation has intensified.” (Cuthbert, 2003).

The IMI analysis yielded a quantitative description of the suitability of the three segments for walking, and this can serve as a frame of reference for the VOA results. The IMI analysis rated segment C highest on accessibility, pleasurability and safety. Consequently both methods agreed on segment C as the most supportive of transport walking, but IMI was not able to accurately differentiate the traffic situations of the segments. This problem also illustrates the importance of analysing urban form at a fundamental level when defining walkability criteria, by adding categories regarding visibility (Southworth, 2005, Cullen, 1976) and directing/dictating mechanisms to existing quantitative instruments. The present IMI result confirms the findings of Werner et al. (2010) that the instrument must be improved to increase sensitivity. The underlying theoretical concept of the categories of the walkability scale has to be diversified into subcategories to produce more specific knowledge of the basic urban structure, and to allow its application in any type of urban context. The experience of applying the IMI also showed that the imbedded cultural dimensions (e.g. “strip malls”, pawn shops) in the items make it difficult to apply as a single analysis tool in a Nordic context.

Like isovist analysis, VOA is applicable in any context, natural or artificial, due to its focus on the fundamental spatial conditions of form. It differs from isovist analysis of the overall visibility (Benedikt, 1979), and GIS-based objective measures of built form through its direct dependence on a pedestrian and the walking direction. The visibility of space tends to be overestimated in 2-D analysis of plan compared to 3-D observation on-site. In the VOA the visibility is limited to the subjective field of vision of the observer, but extended to the on-site observer’s ability to acknowledge the three-dimensional aspects of urban form, temporal (e.g. cars) and seasonal elements (e.g. greenery). The subjectivity of the observations could be considered a weakness, but could also be recognised as a source of information linked to individual features, e.g. gender, ethnicity, class, height, which could be balanced by using more than one observer.

The connectivity of the pedestrian permeability of each segment to the overall pedestrian permeability of Malmö city centre was not assessed. Directing mechanisms can exist in one direction and along a segment of a walking path, but do not necessarily exist in the opposite direction or on a larger scale. The next step would be to explore whether paths function equally well in both directions, and to examine links to the bigger network. The simultaneous coexistence of both mechanisms (Figure 3, b.1), a great variation in the size of passages, and several simultaneous overlaps (Figure 4, segment C) demand a differentiation of the directing/dictating scale to give an accurate description in relation to transport walking. The application of the method and its variables has to be re-evaluated and adjusted, depending on the specific needs of the type of walking being studied. The invited practicing architect pointed out that the application of the VOA and the graphical representation of vistas (Figure 2, 3, and 4) were useful analytical tools, due to its potential to transform the 3-D information of the spatial settings into visually comparable data. However, in order to be suitable for the working conditions of architects and planners, the observation process and graphical representation have to be refined and possibly integrated with applied digital tools, such as parametric design software. The overlaps between vistas could be technically quantified, and time and space available to the pedestrian could be given numerical values and applied as a planning instrument.

In order to capture the relationship between the built environment and frequency of transport walking, both VOA and IMI must be complemented with knowledge on individuals' experience of environmental qualities within the urban form, as in present methods such as NEWS (Saelens et al., 2003) and Ewing and Handy (2009), but could also be further developed by applying perspectives from environmental psychology.

REFERENCES

Alfonzo, M. A. (2005). To walk or not to walk? The hierarchy of walking needs. *Environment and Behaviour,* 37, 808-836.

Alfonzo, M. A., Boarnet, M. G., Day, K., McMillan, T. & Anderson, C. L. (2008). The relationship of neighbourhood built environment features and adult parents' walking. *Journal of Urban Design,* 13, 29-51.

Arvidsson, D., Kawakami, N., Ohlsson, H. & Sundquist, K. (2011). Physical activity and concordance between objective and perceived walkability. *Medicine & Science in Sports & Exercise.*

Benedikt, M. L. (1979). To Take Hold Of Space - Isovists and Isovist Fields. *Environment and Planning B-Planning & Design,* 6, 47-65.

Benjamin, W. & Tiedemann, R. 1999. *The Arcades Project,* Cambridge, Mass [u.a.], Belknap Press.

Boarnet, M. G., Day, K., Alfonzo, M., Forsyth, A. & Oakes, M. (2006). The Irvine-Minnesota inventory to measure built environments: Reliability tests. *American Journal of Preventive Medicine,* 30, 153-159.

Borst, H. C., de Vries, S. I., Graham, J. M. A., van Dongen, J. E. F., Bakker, I. & Miedema, H. M. E. (2009). Influence of environmental street characteristics on walking route choice of elderly people. *Journal of Environmental Psychology,* 29, 477-484.

Brown, B. B., Werner, C. M., Amburgey, J. W. & Szalay, C. (2007). Walkable route perceptions and physical features - Converging evidence for en route walking experiences. *Environment and Behaviour,* 39, 34-61.

Brownson, R. C., Hoehner, C. M., Day, K., Forsyth, A. & Sallis, J. F. (2009). Measuring the Built Environment for Physical Activity State of the Science. *American Journal of Preventive Medicine,* 36, S99-S123.

Cerin, E., Conway, T. L., Saelens, B. E., Frank, L. D. & Sallis, J. F. (2009). Cross-validation of the factorial structure of the Neighbourhood Environment Walkability Scale (NEWS) and its abbreviated form (NEWS-A). *International Journal of Behavioural Nutrition and Physical Activity,* 6.

Cerin, E., Leslie, E., Toit, L. d., Owen, N. & Frank, L. D. (2007a). Destinations that matter: Associations with walking for transport. *Health and Place,* 13, 713-724.

Cerin, E., Macfarlane, D. J., Ko, H. H. & Chan, K. C. A. (2007b). Measuring perceived neighbourhood walkability in Hong Kong. *Cities,* 24, 209-217.

Cerin, E., Saelens, B. E., Sallis, J. F. & Frank, L. D. (2006). Neighbourhood environment walkability scale: Validity and development of a short form. *Medicine and Science in Sports and Exercise,* 38, 1682-1691.

Certeau, M. d. 2002. *The Practice of Everyday Life,* Berkeley, University of California Press.

Cullen, G. 1976. *The Concise Townscape,* London, Architectural P.

Cuthbert, A. R. 2003. *Designing Cities : Critical Readings in Urban Design,* Malden, Mass., Blackwell.

Day, K., Boarnet, M., Alfonzo, M. & Forsyth, A. (2006). The Irvine-Minnesota inventory to measure built environments: Development. *American Journal of Preventive Medicine,* 30, 144-152.

De Nazelle, A., Nieuwenhuijsen, M. J., Antó, J. M., Brauer, M., Briggs, D., Braun-Fahrlander, C., Cavill, N., Cooper, A. R., Desqueyroux, H., Fruin, S., Hoek, G., Panis, L. I., Janssen, N., Jerrett, M., Joffe, M., Andersen, Z. J., van Kempen, E., Kingham, S., Kubesch, N., Leyden, K. M., Marshall, J. D., Matamala, J., Mellios, G., Mendez, M., Nassif, H., Ogilvie, D., Peiró, R., Pérez, K., Rabl, A., Ragettli, M., Rodríguez, D., Rojas, D., Ruiz, P., Sallis, J. F., Terwoert, J., Toussaint, J. F., Tuomisto, J., Zuurbier, M. & Lebret, E. (2011). Improving health through policies that promote active travel: A review of evidence to support integrated health impact assessment. *Environment International,* 37, 766-777.

Ewing, R. & Handy, S. (2009). Measuring the unmeasurable: Urban design qualities related to walkability. *Journal of Urban Design,* 14, 65-84.

Foltête, J. C. & Piombini, A. (2010). Deviations in pedestrian itineraries in urban areas: A method to assess the role of environmental factors. *Environment and Planning B: Planning and Design,* 37, 723-739.

Foster, S. & Giles-Corti, B. (2008). The built environment, neighbourhood crime and constrained physical activity: An exploration of inconsistent findings. *Preventive Medicine,* 47, 241-251.

Foucault, M. & ebrary Inc. 1995. Discipline and Punish the Birth of the Prison. 2nd Vintage Books ed. New York: Vintage Books.

Frank, L. D., Schmid, T. L., Sallis, J. F., Chapman, J. & Saelens, B. E. (2005). Linking objectively measured physical activity with objectively measured urban form: Findings from SMARTRAQ. *American Journal of Preventive Medicine,* 28**,** 117-125.

Gallimore, J. M., Brown, B. B. & Werner, C. M. (2011). Walking routes to school in new urban and suburban neighbourhoods: An environmental walkability analysis of blocks and routes. *Journal of Environmental Psychology,* 31**,** 184-191.

Gibson, J. J. 1986. *The Ecological Approach to Visual Perception,* Hillsdale (N.J.); London, L. Erlbaum.

Glanz, K., Rimer, B. K. & Viswanath, K. 2008. *Health Behaviour and Health Education: Theory, Research, and Practice,* San Francisco, Jossey-Bass.

Hillier, B. (1993). Specifically Architectural Knowledge. *Nordic Journal of Architectural Research***,** 13-37.

Hillier, B. & Hanson, J. 1984. *The Social Logic of Space,* Cambridge, Cambridge Univ. Press.

Kelly, C. E., Tight, M. R., Hodgson, F. C. & Page, M. W. (2010). A comparison of three methods for assessing the walkability of the pedestrian environment. *Journal of Transport Geography.*

Knabb, K. 2006. *Situationist International Anthology,* Berkeley, CA, Bureau of Public Secrets.

Kärrholm, M. (2012). Walking as working: suggestions for a transformative approach to transport walking" (work in progress, March 2012)

Leslie, E., Coffee, N., Frank, L., Owen, N., Bauman, A. & Hugo, G. (2007). Walkability of local communities: Using geographic information systems to objectively assess relevant environmental attributes. *Health and Place,* 13**,** 111-122.

Leslie, E., Saelens, B., Frank, L., Owen, N., Bauman, A., Coffee, N. & Hugo, G. (2005). Residents' perceptions of walkability attributes in objectively different neighbourhoods: a pilot study. *Health & Place,* 11**,** 227-236.

Lilley, K. D. 2009. Urban Morphology. *In:* Rob, K. & Nigel, T. (eds.) *International Encyclopedia of Human Geography.* Oxford: Elsevier.

Mackett, R., Brown, B., Gong, Y., Kitazawa, K. & Paskins, J. (2007). Children's independent movement in the local environment. *Built Environment,* 33**,** 454-468.

Middleton, J. (2010). Sense and the city: Exploring the embodied geographies of urban walking. *Social and Cultural Geography,* 11**,** 575-596.

Middleton, J. (2011). "I'm on autopilot, I just follow the route": Exploring the habits, routines, and decision-making practices of everyday urban mobilities. *Environment and Planning A,* 43**,** 2857-2877.

Owen, N., Cerin, E., Leslie, E., duToit, L., Coffee, N., Frank, L. D., Bauman, A. E., Hugo, G., Saelens, B. E. & Sallis, J. F. (2007). Neighbourhood Walkability and the Walking Behaviour of Australian Adults. *American Journal of Preventive Medicine,* 33, 387-395.

Purciel, M., Neckerman, K. M., Lovasi, G. S., Quinn, J. W., Weiss, C., Bader, M. D. M., Ewing, R. & Rundle, A. (2009). Creating and validating GIS measures of urban design for health research. *Journal of Environmental Psychology,* 29, 457-466.

Robson, C. 2002. *Real World Research: A Resource for Social Scientists and Practitioner-Researchers,* Oxford, Blackwell.

Sadler, S. 1998. *The situationist city* [Online]. Cambridge Mass.: MIT Press. Available: http://www.netlibrary.com/urlapi.asp?action=summary&v=1&bookid=1433 [Accessed].

Saelens, B. E., Sallis, J. F., Black, J. B. & Chen, D. (2003). Neighbourhood-Based Differences in Physical Activity: An Environment Scale Evaluation. *American Journal of Public Health,* 93, 1552-1558.

Schaefer-McDaniel, N., O'Brien Caughy, M., O'Campo, P. & Gearey, W. (2010). Examining methodological details of neighbourhood observations and the relationship to health: A literature review. *Social Science and Medicine,* 70, 277-292.

Shaw, R. & Bransford, J. 1977. *Perceiving, Acting, and Knowing: Toward an Ecological Psychology,* Hillsdale, N.J., Erlbaum.

Southworth, M. (2005). Designing the walkable city. *Journal of Urban Planning and Development,* 131, 246-257.

Stokols, D. (1992). Establishing and Maintaining Healthy Environments: Toward a Social Ecology of Health Promotion. *American Psychologist,* 47, 6-22.

Tykesson, T. L. 2001. *Bostadsmiljöer i Malmö: inventering. D. 1, 1945-1955,* Malmö, Malmö kulturmiljö.

Tykesson, T. L. 2002. *Bostadsmiljöer i Malmö: inventering. D. 2, 1955-1965,* Malmö, Malmö kulturmiljö.

Werner, C. M., Brown, B. B. & Gallimore, J. (2010). Light rail use is more likely on "walkable" blocks: Further support for using micro-level environmental audit measures. *Journal of Environmental Psychology,* 30, 206-214.

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[i] "Théorie de la dérive" was published in Internationale Situationniste #2 (Paris, December 1958). A slightly different version was first published in the Belgian surrealist journal *Les Lèvres Nues* #9 (November 1956) along with accounts of two dérives. This translation by Ken Knabb is from the Situationist International Anthology (Revised and Expanded Edition, 2006. No copyright.)

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