NORDISK ARKITEKTURFORSKNING
NORDIC JOURNAL OF ARCHITECTURAL RESEARCH

1

ISSUE 1 2014

NORDISK ARKITEKTURFORSKNING

Nordic Journal of Architectural Research

1–2014

Nordic Journal of Architectural Research
ISSN: 1893–5281

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Published by SINTEF Academic Press
P O Box 124 Blindern, NO-0314 Oslo, Norway

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Picture on the front cover. House in Lapua, Nothern Finland. Photo: Anni Vartola.

NORDISK ARKITEKTURFORSKNING
NORDIC JOURNAL OF ARCHITECTURAL RESEARCH

FEATURES OF URBAN SPACES AND COMMUTING BICYCLISTS' AESTHETIC EXPERIENCE

HARPA STEFÁNSDÓTTIR

Abstract

The present study provides new insight into how features of urban space stimulate cyclists aesthetic experience when commuting, which features are experienced as aesthetically pleasant and which have the opposite effect. In addition, the study explores what kind of space types contains the most pleasant features and the most unpleasant. The study introduces a special method called bike-through evaluation. It involves engaging groups of cyclists to explore how different types of urban spaces are experienced from an aesthetic point of view with commuting in mind. The experiments were conducted with invited participants who cycled pre-planned routes in Reykjavík and Trondheim, which included up to eight different urban space types. The participants commented on their experience both in writing and through discussions. The information so obtained was then interpreted on the basis of theories within the field of environmental aesthetics. The results clearly demonstrate that the most important features in the urban space regarded as pleasing and found to stimulate aesthetic experience include vegetation, view to nature, historical buildings and places, clearly defined streetscapes, and seeing other people at some distance. In comparison, features that have the opposite effect are auto-dominated places and congested streets with car traffic. In essence, an acceptable instrumental quality of a bicycle route favours experiencing aesthetic qualities.

Keywords:
bicycle commuting, aesthetic experience, urban space, environmental aesthetics.

1. Introduction

Bicycling in a city provides an experience of urban spaces with various sceneries, architecture, vegetation, people, smells and sounds. Although cyclists' experiences might yield to new and important knowledge for the design of cycling-orientated urban spaces, this theme has received little attention in academic research.

The concept of aesthetics is of key importance when we try to understand how a person values the qualitative characteristics of urban space, such as its visual qualities as well as features that affect hearing and smelling senses. The impact of aesthetic features on cycling in the urban environment is primarily related to features that affect emotional reactions related to well-being. Improved well-being has often been associated with recreational cycling but has rarely been considered in studies on commuting by bicycle (Garrard, Rissel and Bauman, 2012). Earlier studies, however, have observed a correlation between cycling as a means of transport and perception of lifestyle quality such as enjoyment (Troelsen, 2005; Gatersleben and Uzzell, 2007; Garrard, Rissel and Bauman, 2012; Smith, 2013).

The design of a cycling-orientated urban space has so far almost exclusively focused on instrumental features such as cycling facilities and networks (Forsyth and Krizek, 2011). The reason may be traced to policies worldwide to help realise the potential of increasing the share of commuting cycling substantially in order to improve the overall sustainability of our transport systems. Consequently, environmental influences on the bicycle as a mode choice have been addressed in many studies (Heinen, van Wee and Maat, 2010). Compact urban form, which brings origins and destinations closer together, is found to be important in this respect (Næss, 2005; Forsyth, Krizek and Rodriguez, 2009). Also, results have consistently shown that the presence of segregated cycle infrastructure stimulates the share of cycling as a travel mode (Abraham, et al., 2002; Tilahun, Levinson and Krizek, 2007; Pucher and Buehler, 2009; Pucher, Dill and Handy, 2010; Larsen and El-Geneidy, 2011). Other key features of urban design (see Carmona, et al., 2010), such as the aesthetic dimension, have received limited attention and the field of urban design has so far been little concerned with cyclists' experiences (for exceptions see Timms and Tight, 2010; Forsyth and Krizek, 2011; Fleming, 2012).

The many studies that have been carried out on how various characteristics of urban spaces are experienced when walking (e.g. Cullen, 1961; Gehl, 1987; 2010; Gehl, Johansen Kaefer and Reigstad, 2006) are not transferable to cyclists since the two modes have different needs and expectations with respect to the environment (Forsyth, Krizek and Rodriguez, 2009; Forsyth and Krizek, 2011). This is especially the case when cycling has a utilitarian purpose (Heinen, van Wee and Maat, 2010). Aesthetic fea-

tures may alter the character of cycling, but do not likely stimulate additional commuting cycling. However, knowledge about the aesthetic experience of commuting cyclists could provide an important background to the design of cycling-orientated urban spaces.

According to several quantitative studies, certain route environments are found to have a positive impact on cyclists' experiences – for example, a beautiful, green and safe environment in inner urban areas (Wahlgren, 2011), off-street and low-traffic residential roads (Abraham, et al., 2002; Tilahun, Levinson and Krizek, 2007) – or a negative impact, for instance, high levels of exhaust fumes and traffic congestion (Wahlgren, 2011).

As none of the earlier studies have specifically examined how features of urban space influence commuting cyclists' aesthetic experience in a qualitative way, the purpose of the present study is to identify physical features of urban space that affect commuting cyclists' aesthetic judgement and to examine how other features influence their aesthetic experience. In addition, it will be examined what «urban space types» include the identified features.

The study has used a new experimental «bike-through evaluation» research method. It involves using the bicycle and engaging groups of cyclists to explore how different urban spaces are experienced from an aesthetic point of view. Pre-planned routes were cycled together with invited participants. The layout of each route included up to eight pre-planned stops within different space types. The definition of each space type was based on its main physical characteristics – both static (such as scale, variety, dominance of use and complexity) and dynamic, such as people and vehicles in motion. At each stop, each participant was asked to give a short evaluation on a special form designed for the study. They were asked to give an overall description of which features they found stimulating and which they found discouraging in the urban space, with a particular focus in bicycle commuting. After the tour, the experiences were discussed in each group. Four tours were organised, one in Trondheim and three in Reykjavík.

The interpretation of the «bike-through» results is based on theories within the field of environmental aesthetics using mainly Russell and colleagues' (Russell and Pratt, 1980; Russell, Ward and Pratt, 1981; Russell, 1988) methodological approach on affective quality.

2 Theoretical framework for evaluation of cyclists' aesthetic experience

2.1 Perception of urban space when cycling

Aesthetic experience refers to a complex relationship between a person's sensuous perception, cognitive understanding and interpretation of the physical environment, which ends with responses to subjective thoughts and feelings during the course of an experience (Cold, 2010; Gobster and Chenoweth, 1990; Markovic, 2012). Judgment of the aesthetic quality of environmental features encompasses a wide range of emotional and critical responses, both positive and negative value judgements of an environment (Russell, 1988).

Riding a bicycle affects how the senses work and how the cyclist pays attention to features in the environment. Jones (2005) and Spinney (2006; 2007; 2009) suggested that kinaesthetic sensing is of special importance when cycling. It enables the sensory organs of the cyclist's body to sense movement in space and spatial qualities (Tuan, 1977; Urry, 2007). When riding a bicycle, the street is a place where visual sense is important, but here it no longer works in isolation from the other senses (Spinney, 2007). The cyclist's focus of attention to the features in urban space is also limited, because he/she is partly occupied by controlling his/her own safety and balance on the bicycle for further movement, and his/her position in respect of other travelling people (Spinney, 2007). The many things that take place in the urban space ahead in a complex situation (heavy traffic, for example) may occupy the cyclist's attention and at the same time reduce his/her awareness of features that have less importance. It is thus possible that a cyclist will not pay attention to aesthetics in complex urban situations.

The possibility to move on continuously is dependent on the territory of the cyclist, his/her possibility to move on without being disturbed by other travellers entering or threatening his/her territory. A segregated cycle infrastructure with priority at intersections, which is an instrumental feature, enables continuous movement by allowing the cyclist to maintain a constant pace. Such instrumental feature along a bicycling route influences the kinaesthetic sensing of a bicyclist.

A theory of a visual aesthetic experience needs to take into account how an individual engages in spatial experience which differs in the case of static versus motional perspectives (Berleant, 1988). Aesthetic theory, as derived from the manner cyclists engage in spatial experience, explores how they perceive features of the urban space when moving at cycling speed. This includes all features that both shape the urban space and are within it, static and moving. A crowded urban space, for example, during the peak hours of the day, will thus most likely be experienced differently from a deserted one.

2.2 Environmental aesthetics

Theories within the field of environmental aesthetics are considered useful for this study in explaining how, why and for what reason commuting cyclists might interpret perceived elements or features of urban space into aesthetic meaning. The field focuses on the appreciation of both natural and human environments (Carlsson, 1998, 2011) and uses scientific methodologies to assist in explaining the relationship between physical stimuli and human response (Nasar, 1988).

In order to identify cyclists' aesthetic experiences, it was found to be convenient for this study to rely on cyclists' aesthetic judgements. A person's judgement of places is described with adjectives which Russell (1988) calls «affective appraisal». Such appraisal occurs when a person judges something as having an affective quality, such as being pleasant, likeable, exciting and so on and thus resembles both emotions and cognitions (Russell, 1988). He calls the objects involved in aesthetic experience «affective components» (Ibid.).

Russell and Pratt (1980) have proposed a verbal scaling system with a circular order, the validation of which was further confirmed in a factor analytic study (Russell, Ward and Pratt, 1981). With this approach, the terms to describe affective qualities of places can be systematically interrelated. The network of these interrelationships has been illustrated with a diagram or, according to Russell (1988), a «spatial metaphor» (figure 1). It consists of two bipolar dimensions. The horizontal axis ranges from extreme unpleasantness through a neutral point to extreme pleasantness.

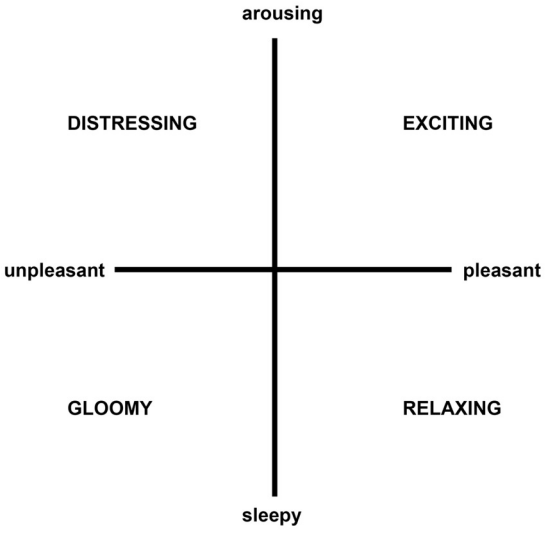
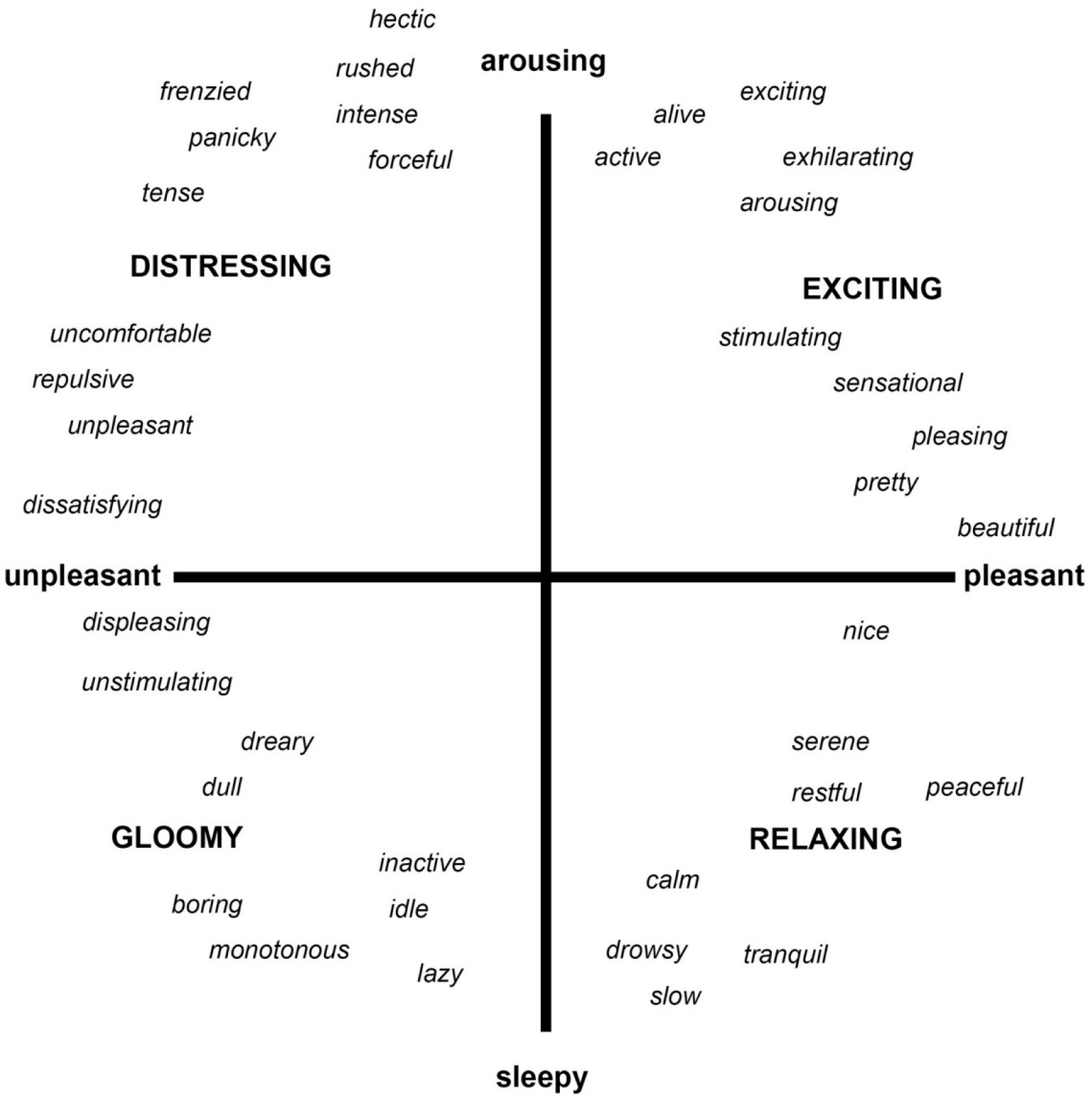


Figure 1
A spatial representation of descriptors of the affective quality of environments (Russell, Ward and Pratt, 1981).

According to this system, the judgement of an element or feature of urban space that is found to be neither pleasant nor unpleasant can go in two opposite directions. The vertical axis concerns the arousing quality of a place, and ranges from sleepy towards extremely arousing. The categorical affective descriptors that include Exciting, Gloomy, Distressing and Relaxing separate the diagram into four main areas (figure 1). Russell (1988) presented a more detailed layout including more refined environmental descriptors within each of the four categorical ones (figure 2). Russell's methodological approach has been applied in this paper in order to systematise the cyclist's judgement of the aesthetic quality of the different environments.

Figure 2
Russell's (1988) 40 descriptors of the affective quality of the environment located in the diagram of figure 1.



Three theories were used to interpret the aesthetic meaning of cyclists' experiences in this study. The first theory, the notion of visual distance, is seen as an important feature in visual perceptual experience. Applying this concept to the urban landscape and environmental design results in two different modes: the «visual landscape» at distance and the «participatory landscape» in close proximity (Berleant, 1988). The second theory reveals the symbolic meaning of the environment. From this viewpoint, the environment can express an associational meaning with respect to, for instance, the shape and proportions of volumes, the degree of enclosure (Lang, 1988) and the dominating use of the space. The third theory involves instrumental determinants. The values of instrumental features for aesthetic experience are reflected by Heath (1988) who has applied Maslow's (1943) «hierarchy of needs». Heath suggested that aesthetic experience of a path or transportation network can be reinforced, if instrumental quality is as expected and reduced if a path lacks such quality. This argument has led the present study to expect that the way in which a cyclist values aesthetic quality is influenced by instrumental values.

3. The bike-through evaluation method

3.1 Mobile methodology

To identify the features in urban space that affect cyclists' aesthetic judgements and to examine how other features influence their aesthetic experiences requires a method that captures the complexity of the phenomenon. Such a method should be rich in qualitative measurements, include kinaesthetic sensing as well as different sensory influences from the urban space that, according to Goodman (1991), include sound, smell, and motion. For these purposes, this study has developed a mobile method termed «bike-through evaluation».

Mobile methodologies focus on the sensing of places when moving in real urban spaces (Sheller and Urry, 2006). The researcher is mobile and while moving through the spaces under focus, he/she either implements or governs the study. Several investigations have made use of mobile methods by walking (see e.g. Hein, 2008; Jones, et al., 2008; Evans and Jones, 2011) but fewer by cycling. Spinney (2006) and Jones (2005) have, however, explored the importance of kinaesthetic sensing when cycling. The usefulness of mobile methodologies lies in the gathering of important qualitative data from informants. As pointed out by Hein, Evans and Jones (2008), the walk-through interview offers great potential for exploring environmental perception. It is a fast and easy way to get an indication about what is positive and what is problematic in a specific environment and is a simple method to obtain viewpoints, experience and dialogue (de Laval, 2006). In addition, it focuses effectively on features in the places under study (Evans and Jones, 2011).

3.2 Implementation of the bike-through tours

The bike-through evaluation research method involved pre-planned bicycle routes. Cyclists were invited to cycle these routes with the researcher. Each route included up to eight space types with different characteristics, and the same number of stops. During the tour, the participants were asked to make individual evaluations on a form specifically designed for the study. The form requested an overall evaluation of both stimulating and discouraging features on each space type with bicycle commuting in mind. In addition, the participants could suggest improvements. At the end of the tour, each participant was asked to write on the evaluation form which street or route part (space type) they liked the most and which one they disliked the most and for what reasons. At the end of every cycling tour, the evaluations, the participants' experiences and any topical issues related to commuting were discussed.

The tours were about 10 km long. Three tours were organised in Reykjavík (May, 2011) and one in Trondheim (September, 2011); each tour had 5–7 participants, the maximum number of participants that could join an in-depth group discussion. An invitation for participation was sent to bicycle-clubs and organisations with interests in bicycle commuting. Altogether 15 cyclists participated in Reykjavík and 7 in Trondheim. The season and the relatively high number of existing groups involved in cycling issues in Reykjavík might explain the difference between the numbers of participants in the two cities. In Reykjavík, local cycling enthusiasts have campaigned for years for a more bicycle-friendly policy. This seems to have created atmosphere that stimulates participation in cycling-related activities. The cyclists enrolled in the study were all experienced commuting cyclists and most of them were middle-aged. The present research method requires that each participant is physically able to cycle 10 km and has 2.5 hours available for the study. These prerequisites may have affected the decision to participate.

The total duration of the trip was about 70 minutes. Each stop lasted about 5 minutes and as the distance of the trip was limited to 10 km it could be cycled within 30 minutes. Three of the tours started just after work during the peak hour. The time was selected to test how congestion affected the cyclists' experience. One tour in Reykjavík was conducted on a Saturday morning to give those who were busy just after the workday an opportunity to participate.

The objective of the layout of each route was to include as many different urban space types as possible. The characteristics of each space type are described in Section 4. The tour in Trondheim, which generally has a hilly landscape, was made through a rather flat area. Slopes require more effort from cyclists and do certainly affect their experiences. Avoiding the hilly landscape in Trondheim made it easier to concentrate on the effect of aesthetic experience and to cover the planned distance within the time limit.

4. Space types

4.1 Classifying space types of post-war cities

The methodological approach to define space types to investigate in the bike-through evaluation was based on the main physical characteristics of urban space. Buildings, natural landscape and vegetation shape the urban space and affect its aesthetic character, for example, by their scale and proportions and by their relation to each other. Their composition can have an effect on a person's aesthetic experience as well as their visual richness, variety, complexity or dominance perceived in an urban space (Porteous, 1996). Dynamic characteristics such as rhythm and speed in which people enter and leave the space, can also influence this experience.

The 10 km route was positioned in the central parts of Reykjavík and Trondheim, because these districts are composed of urban space types of great variety. A route here can, for example, pass along heavy traffic roads, through spaces close to rural areas, along residential streets, through narrow and congested streets in the city centre or through open spaces with a sprawling character.

Reykjavík and Trondheim have a similar urban planning history as do other Nordic and European post-war cities. The dominance of the private car has affected the characteristics of many urban spaces and has had negative consequences. Studies on land use in the city of Reykjavík show that nearly 50% of it is covered by traffic facilities (Sigurdsson, 2004). Across the Western world, the tendency in the last decades has been to optimise road size for automobile capacity without considering the consequences with respect to the scale of the neighbourhood (Calthorpe and Fulton, 2001). Efficiency has been correlated with large, centralised organisations and activities, exemplified by the view that «bigger is better». Suburban sprawl has been described (by Duany, Speck and Plater-Zyberk, 2000) as an abstract system of carefully separated elements of single use where daily needs are located within driving distance.

Urban spaces that possess low-density characteristics can be found around many workplaces within a short distance from the central areas in both Reykjavík and Trondheim. The automobile landscape has become what Urry (2007) calls «dead public spaces» where transport by car takes place between private worlds. Urban spaces where mobility occurs have been largely theorised as relatively meaningless non-places (Augé, 2008). During my conversations with cyclists in Trondheim and Reykjavík, it was pointed out, however, that the routes along the main infrastructure for traffic often provide the most direct passage through cities.

The process of the modern zone planning has often resulted in separated neighbourhood units that can be reached by car or public transport.

This has often resulted in in-between spaces, including vacant fields and former paths or routes that are no longer in use. Research on vacant, little used and mostly unkempt fields and strips is important because to classify them only as barriers, buffer zones or vacant land is to simplistic (Wikstrøm, 2005).

Since Jane Jacobs's (1961) critiques of the 1950s' zoning policies and encouragement for vibrant urban communities with dense, mixed-use neighbourhoods, the discussion about how design can contribute to pleasant and joyful street life and outdoor activity has been growing (followed by, e.g., Whyte, 1980; Appleyard, Gerson and Lintell, 1981; Gehl, 1987). The physical implications of the pedestrian scale (often termed the human scale) may be realised in the form and detail of buildings as they relate to the street (LeGates and Stout, 2007). An example of a contribution of a building to street life is when activities in first floor reflect openness and appeal to pedestrians (Gehl, 1987). Pedestrians are thought to experience narrow streets and small places more intensively than large-scale urban spaces (Gehl, 2010) but this is not necessarily the case with cyclists. Research is required to verify this.

The tendency has been to promote cycling by facilitating routes with special infrastructure. However, cyclists might choose routes other than those actually planned. This might especially be the reality in Trondheim and Reykjavík because it is permitted to cycle everywhere both on traffic roads and on pavements among pedestrians. In Trondheim, for example, many cyclists choose the paths along the river Nidelva although these paths are not marked on the bicycle route map.

4.2 Definition of space types

Table 1 lists eight space types typical to Reykjavík and Trondheim. Their characteristics are described below.

Table 1
Urban space types as defined in this article

Name of space type	Characteristics
	• Upper bullet: main physical characteristics of the urban space (static) Lower bullet: dynamic characteristics (moving)
Cars only	• separate very large buildings, road size for auto-capacity/ direct main route, few details, continuous open space
	• no street life, maximum flow of cars with high speed
Traffic street	• often large separated buildings, few details,
	• motorised traffic has priority over other users in e.g. crossings
Low-density auto-oriented zone	• single-use elements, big car parking areas, unclear definition of streetscape, zoning
	• motorised traffic has priority, unclear pattern of movement
Hidden route	• a street, trail etc. that is not generally used
	• no users at all
Urban greenery	• public green space, human-made
	• no motorised traffic, recreational activity
Residential streets	• often vegetated, quiet
	• calm traffic
Natural space	• within or by the edge of the city, view to nature
	• no motorised traffic, recreational activity
Enclosed streetscape pedestrian priority motorised traffic priority	• relatively narrow, dense, inner city streets, buildings in row define clear streetscape, frequently changing rhythm in streetscape
	• diverse use, activities contribute to street-life

4.2.1 The space type «cars only»

Figures 3-A and 3-B illustrate two urban spaces close to the centres of Reykjavík and Trondheim that are designed with the greatest emphasis on high speed and maximum flow of private cars. These «cars only» space types also have relatively long distances between other activities, resulting in few crossings and continuous high-speed driving.

4.2.3 The space type «traffic street»

Figures 4-A and 4-B show urban spaces that are first of all intended for motorised traffic, which has priority over other transport modes along the street. These «traffic street» space types are located in relation to activities along the street or nearby, such as service buildings, to which accessibility is regulated often with priority for motorised traffic in crossings, which are rather frequent. The scale of the space and the architecture of new urban buildings are influenced by the conditions of motorised transport (Gehl, Johansen Kaefer and Reigstad, 2006).

4.2.3 The space type «low-density auto-orientated zone»

The low-density characteristics around workplaces often reflect the high degree of prioritisation for cars. The environment typically consists of large, isolated buildings surrounded by substantial asphalted areas for car parking. The definition of the streetscape is often unclear and the same applies with the definition of pattern for movement. Figures 5-A and 5-B depict an example of such a space type, here termed «low-density auto-orientated zone».

4.2.4 The «hidden route» space type

Figure 6 shows the space type called «hidden route» and is exemplified by an old street in Reykjavík that is no longer in use, but could serve cyclists well. Studying the experience of a hidden route aimed to explore whether the participants were familiar with routes alternative to those actually planned for cycling and how the unknown would influence their experience. The routes tested were quieter and calmer than the planned routes along traffic roads.

Figure 3
The space type «Cars only»
From Reykjavík: A. New Hringbraut
From Trondheim: B. Havnegata

Figure 4
The space type «Traffic street»
From Reykjavík: A. Sudurlandsbraut
From Trondheim: B. Prinsens gate

Figure 5
The space type «Low-density auto-oriented zone»
From Reykjavík: A. Skeifan, a shopping and commercial area
From Trondheim: A. Havnegata Brattøra, a recently renovated area by the harbour

Figure 6
The space type «Hidden route»
This old street in Reykjavík is not in use any more but could serve cyclists well. It has the potential both to be more direct and to have a better microclimate than another nearby route that runs along a main traffic road.

Figure 7
The space type «Urban greenery»
Laugardalur, Reykjavík

Figure 8
The space type «Residential street»
From Reykjavík: A. Laufásvegur
From Trondheim: B. Nedre Møllenberg gate

Figure 9
The space type «Natural landscape»
From Reykjavík: A. Ægissída
From Tronhdeim: B. Nidelva river

Figure 10
The space type «Enclosed streetscape»
From Reykjavík: A. Hverfisgata, trafficked «Enclosed streetscape»,
B. Laugavegur, pedestrianised «Enclosed streetscape».

4.2.5 The space type «urban greenery»

Figure 7 shows the space type called «urban greenery»; the example is from Reykjavík. This space type refers to human-made green areas within the structure of a city such as urban parks. Paths through parks are generally designed for pedestrians and cyclists and provide a route away from car traffic. The urban space is characterised by vegetation, which is the main element in shaping the urban space. The «urban greenery» space types are generally planned for recreational activities.

4.2.6 The space type «residential street»

The space type «residential street» (figures 8-A and 8-B) refers to the characteristics of the residential streets in the central areas in Reykjavík and Trondheim. Generally the streets do not have separated bicycle lanes, but some are, however, marked on the bicycle route map in Trondheim. The traffic is most often calm, although the streets are dominated by parked cars. The streets are lined by private housing and gardens and limited public activities. Quietness, often also vegetation, is typical for this space type. The manner in which the residential streets connect to the surrounding infrastructure network may be various and the distance between crossings is most often short.

4.2.7 The space type «natural space»

In both Reykjavík and Trondheim, areas with natural landscape have paths that were originally planned as recreational routes. In Trondheim, some of these paths sometimes follow the banks of the river Nidelva (figure 9-A) which runs through the centre of the city down to the adjacent fjord. The view to the natural landscape, the river and the vegetation along it are important characteristics of this urban space.

A continuous path goes along the coast around almost the whole city of Reykjavík (figure 9-B). There are not many workplaces nearby. However, the path connects different areas from the urban fringe to the central areas. This route is characterised by views of the natural landscape, vegetation and the sea. There is no motorised traffic close by.

4.2.8 The space type «enclosed streetscape»

Many inner city streets within the old central parts of Reykjavík and Trondheim are relatively narrow and they are bordered on one or both sides by continuous walls of houses close to the street with a changing rhythm of details in the facades. Often activities in the houses bear relation to the street and contribute to street life. In some cases such streets are the most direct routes through the city centres. In the bike-through evaluation, this space type is called «enclosed streetscape». In some enclosed streetscapes, the car has taken over as the main transport mode (figure 10-A). In other streets, pedestrians are given priority (figure 10-B).

5. Results

5.1 Preliminary studies for interpretation of the results

The participating cyclists were not instructed to comment on aesthetic experience in particular, but only their overall experience in the different urban spaces. Therefore it was not expected that they would make a distinction between features that could be classified as aesthetic, instrumental or kinaesthetic in their evaluations.

In order to ease the interpretation of the results and define a terminology to describe them, the following preliminary study was made. The words used by the participants, both on the written notes and used in the oral discussions, were first grouped by theme into aesthetic, instrumental and kinaesthetic phenomena. Then their use of words was studied to identify which physical features were linked to specific affective qualities and senses. Three categories were formed:
1) The possibility to move continuously (related to kinaesthetic sensing)
2) Stimuli by vision (or lack of such stimuli)
3) Stimuli by sound and smell (or lack of such stimuli)

By identifying affective appraisals in the cyclists' evaluations, both written and oral, an assessment was made as to which physical features were of significance for their aesthetic experience and how they judged the different physical features. The affective appraisals indicate where the linked physical features (affective quality) may be located in Russell's (1988) diagram (see figures 1 and 2). The appraisals were translated by the author from Icelandic and Norwegian to English. As the participants used many of the appraisals with the same meaning as those represented in the diagram of Russell (figure 2), it was easy to do the positioning. In order to adapt Russell's diagram of descriptors to the results of the bike-through evaluation, the original four categories were fine-tuned into eight.

5.2 Aesthetically judged features of the urban space types

The fine-tuned Russell diagram (figure 11) represents a simplified summary of the most frequently mentioned physical features by the participants in the bike-through evaluation that were linked to their aesthetic judgement.

For their aesthetic judgement, the cyclists mostly focused on those physical features that had to do with vegetation, a view to nature, the character of the streetscape and the complexity of the visual stimulation. Also the presence or absence of motorised traffic and the presence or absences of other people were of importance to their experience.

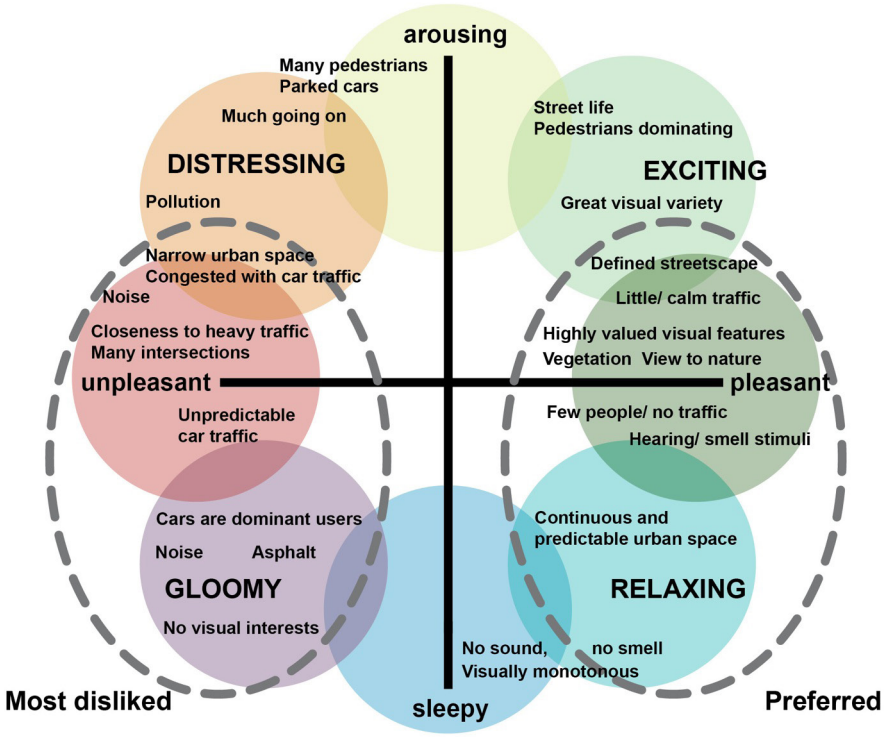


Figure 11
Modified Russell type diagram
The diagram shows the eight categories (coloured circles) used in this study. The most important physical features of the urban space obtained from the bike-through evaluation are shown with small lowercase letters on the diagram. The two grey circles embrace an important outcome of the bike-through evaluation. The circle to the left matches the results of the most disliked routes, ranging from gloomy to unpleasant, and to the right the preferred urban spaces ranging from relaxing to pleasant.

Further, by looking at the cyclists' choice of best and worst streets in the evaluation form, it appears that the best streets included physical features associated with the categories Pleasant and Relaxing while the worst ones included features of the categories Unpleasant and Gloomy. Most of the investigated urban space types included features that influenced aesthetic judgement in more than one category (see figure 12). The following sections present the characteristics in the most aesthetically stimulating urban space types, the most discouraging space types and the ones that are in-between. In addition, the identified features that were judged to bear an aesthetic quality and those experienced as discouraging within the different space types are described.

5.2.1 The categories Pleasant and Relaxing: aesthetically stimulating urban spaces

The results from the bike-through evaluation show that all the space types that contain physical features in the category Pleasant (see figure 11) are participatory landscapes; this is landscapes in close proximity with frequently changing urban space characteristics (Berleant, 1988) and include visually interesting elements that are highly valued. At the same time, the spaces belonging to the Pleasant category were described as being good for the possibility to move continuously. Highly valued features that stimulated vision included historical buildings and places, natural elements (mountains, water, rivers) and vegetation.

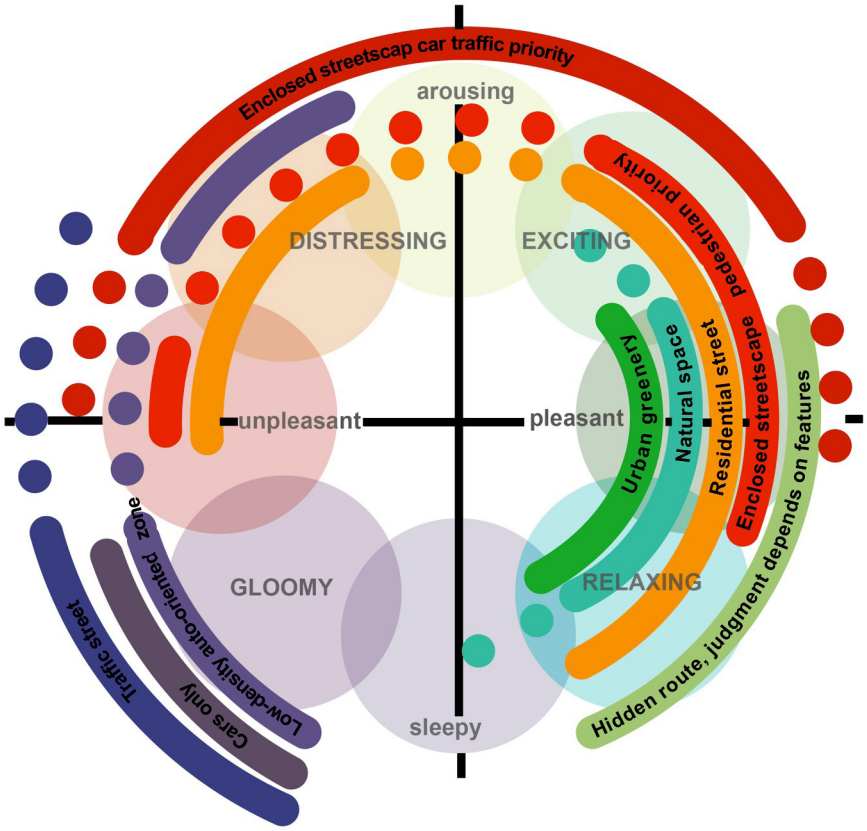


Figure 12
Cyclists' evaluation of space types located in the fine-tuned Russell (1988) diagram
Most of the urban space types investigated included features that influenced aesthetic judgment in more than one category (see the features in figure 7). The text along the curves shows urban space types. The features that characterise each type are generally mentioned by the cyclists participating in the bike-through tours when the curves are continuous but when broken into dots they are sometimes mentioned.

Visual variety, clearly defined streetscapes, gardens and seeing other people at some distance were also found to be stimulating features and thus classified as Pleasant. Either calm traffic only or no traffic close by was preferred. Quietness was thus valued as Pleasant, yet the sound from leaves and birds was appreciated as well as the smell from vegetation and even from coffee shops. Streets with much motorised traffic sometimes had elements in this category, if there were both highly valued visual features and a good possibility to move continuously.

A space type fell into the category Relaxing (see figure 11) when the possibility to move continuously was maximised and nothing was disturbing or demanding the cyclist's attention. Urban spaces that contained Relaxing features always also contained Pleasant ones. Features that stimulated vision fell into the Pleasant category while sound and smell stimuli fell into the Relaxing category. The space types that included features of the Pleasant and Relaxing categories were first and foremost «natural space» and «urban greenery».

The «urban greenery» type (see figure 7) was the best liked among most participants in Reykjavík. Closeness to vegetation was highly appreciated for all senses, especially together with reduced noise and pollutants from car traffic. A male participant in Reykjavík said the atmosphere

changed when a row of trees separated the bicycle path from the traffic street by a small distance. Then you are in *«paradise, noise is reduced, wind is reduced, and the stress goes. You're not in traffic anymore.»* Good possibility to move continuously was, however, at the same time very important. Too narrow spaces shaped with trees where the urban space in front had no predictable continuity were found to have disadvantages. Views to water and mountains were frequently described with the appraisal «beautiful» by the cyclists. These elements, the absence of motorised traffic together with very good possibilities for continuous movement, made the «natural space» type an attractive alternative in good weather in both cities. In addition to very positive comments about aesthetic qualities, the separate bicycle path along the «natural space» of Ægissída in Reykjavík (figure 9-B) was described as a «bicycle freeway» where you *«do not experience traffic lights and it is easy to predict travel time.»* Some participants in Reykjavík maintained, though, that they would not always choose the routes along the coast because of wind and the length of the route compared to other alternatives. A man pointed out that he often chose longer and more beautiful routes in good weather, particularly on the way home.

The «natural space» of the path along the river Nidelva in Trondheim (figure 9-A) was also appreciated for commuting purpose. Some participants said this route was their favourite, being both effective and beautiful at the same time. One participant wrote on the evaluation form: *«nice traffic-free surroundings along the beautiful river, few people and easy to ride.»* It was however pointed out by a female participant that she would not use this route on a rainy day like the day when the bicycle tour took place. *«There are holes and puddles in the gravel surface and you can become dirty. I'm not so afraid in general to have dirty clothes. But if I'm on my way to work, I would sacrifice the experience of nature if there was a lot of mud there.»*

The «hidden route» by Old Njardargata in Reykjavík (figure 6) included features that were judged as aesthetically stimulating by the cyclists. The route was appreciated because it was far away from traffic and had a view over natural areas. The cyclists were not familiar with this route, except one female participant who said that she used it quite often because of the distance from car traffic and because it was calm.

From the perspective of aesthetic experience, the space type «residential street» included very positive qualities from the participants' viewpoint. However, it was mentioned that it also included negative instrumental features due to parked cars that could be reversed at any time and stop signs and speed bumps that disturb continuous movement. In addition, the residential streets in the test were found sometimes to lack direct network connections.

5.2.2 From the category Gloomy to Unpleasant: aesthetically discouraging urban spaces

The results show that an urban space that fell into the categories Gloomy and Unpleasant lacked stimuli for vision, sound and smell. Sometimes such urban spaces were also called asphalt desert by the participants in Trondheim. First of all they were found to be dominated by car traffic. The street types «cars only» and «traffic street» (figure 3) fell into the Gloomy and Unpleasant categories. The space type «low-density auto-orientated zone» (see table 1) ranges from the category Gloomy to Distressing.

Thinking about the need to move on and one's own safety required the most attention in the urban spaces categorised as Unpleasant. The worst circumstances were found in narrow spaces that were also congested with motorised traffic with no separate bicycle lane.

A Gloomy urban space was described as having little to experience for cyclists other than closeness to car traffic. The cyclists did not feel that their safety was threatened by the traffic in the Gloomy urban space. Their territory was seldom disturbed, because this urban space most often had separate bicycle paths. However, many intersections, detours and stops impeded continuous movement and both slowed down cyclists' speed and made their trip longer. At the same time car traffic was made easier. The cyclists said this underlined the priority of the car. An example of a Gloomy urban space is the upper part of Laugavegur and the first part of Sudurlandsbraut in Reykjavík («traffic street» , figure 4-A), which was described with the appraisal «boring». The participants described the urban space also as «monotonous» with heavy traffic close by, many intersections and traffic lights.

The «low-density auto-orientated zones» tested – Skeifan in Reykjavík (figure 5-A) and Brattøra in Trondheim (figure 5-B) – range from Gloomy to Distressing. One participant said of Skeifan: *«Biking in this area requires full attention. It is not fun. Traffic is very aggressive.» Another participant said: «It is an inefficient route, boring and uncomfortable. You try to get out of the area as fast as possible. It is confusing what is what, parking or street. Cars can come from every direction.»* Both Skeifan and Brattøra were commonly classified as the worst streets. The participants in Trondheim were very dissatisfied because they experienced that their needs were not reflected in the recent design of the traffic system in Brattøra. They thought that it was obvious that the motorised traffic had priority and that the cyclists were on the premises of pedestrians, being forced to bicycle along the pavement and taking detours because of the many roundabouts through which the cars drive easily. Sometimes cyclists were also forced to dismount the bicycle and to walk over the walkways whilst pulling the bicycle along.

5.2.3 From the category Distressing through Arousing to Exciting

When an urban space fell into the category of Distressing, stimulation by vision or sound was of limited importance. The reason was due to cars and pedestrians, as well as many intersections and stops that interfered with continuous movement of cyclists and required their attention. It was also pointed out that cars that were parked might start reversing.

The space types «enclosed streetscapes» as well as the «residential streets» range from the category Pleasant to Unpleasant. The aesthetic appraisals used by the participants that belong to the categories Exciting-Arousing (see figures 11 and 12) refers to visual qualities only. Those included variety in both streetscape and street life. Their negative experience included pedestrians who often moved in an unpredictable manner.

The «enclosed streetscapes» that were full of pedestrians were experienced differently from those congested with car traffic. This can best be explained by comparing Laugavegur shopping street (figure 10-B) and Hverfisgata (figure 10-A), which are two parallel streets in the city centre of Reykjavík. Both streets have similarly scaled rows of small houses on the sides and are direct routes through the city centre close to many facilities. The former street is rather crowded with pedestrians on the pavements and a unidirectional lane with slow car traffic. The latter street, with one lane in each direction and pavements on both sides, was very congested with private cars, pedestrians and buses when the bike tours took place. None of the streets had any separate bicycle lane. Both routes were cycled in the peak hour. Hverfisgata was experienced by most of the participants as the worst part of the tour. The highly appreciated visual features mentioned were of no value to some of the cyclists. At the same time, most of the cyclists said they felt insecure on the street which they described as «too narrow», with pollution and heavy traffic.
Laugavegur shopping street (figure 10-B) was also found to be aesthetically attractive in many ways. The disadvantage mentioned was that it was not possible to achieve a continuous speed because of the many pedestrians, heavy traffic and cars reversing all the time. Yet, the participants who had cycled the street before emphasised that it was a good alternative early in the morning before other traffic became too heavy, because the route was direct, wind-shielded and aesthetically attractive.

6. Conclusions

This study has demonstrated how features in urban space stimulate cyclists' aesthetic experience when commuting. The features of the urban space that are experienced as aesthetically pleasant from the viewpoint of the participating cyclists have been identified as well as those which have the adverse effect. The present study substantiates the results of earlier research on this topic.

An attempt was made to divide the varied and complex urban spaces into types on the basis of their main physical characteristics, both static and moving, in order to facilitate analysis of their features judged of importance for aesthetic experience. Eight types were defined (table 1).

The methodology adapted to achieve the goal of this study has been called «bike-through evaluation». It leads to qualitative understanding of the stimulating and discouraging features of the different urban space types that influence aesthetic experience.

The results of the bike-through tours clearly demonstrate that visual features which stimulate pleasant aesthetic experience include vegetation, views to nature, historical buildings and places, clearly defined streetscapes and seeing other people at some distance. For stimuli by sound and smell, either calm traffic only or no traffic close by are preferred. Quietness is thus valued as pleasant, yet the sound from leaves and birds is appreciated, as well as the smell from vegetation. Lack of the aesthetically stimulating features just mentioned creates a boring and displeasing urban space. Overwhelming dominance of motorised traffic and an obvious priority of cars clearly had negative visual, sound and smell influences as well as aesthetically negative symbolic meaning.

Of the eight urban space types listed in table 1, those that were considered most attractive in every respect were «urban greenery» and «natural space». Good possibility to move continuously was, however, at the same time very important. Too narrow spaces shaped with trees where the urban space in front had no predictable continuity were found to have disadvantages. In addition, open spaces of the «natural space» type were often windy and gravel paths instrumentally unfavourable in rain. The «residential street» also had many aesthetically stimulating features, but many instrumental disadvantages. «Hidden routes» had variable characteristics. Therefore they need to be judged in each case. The street types «cars only» and «traffic street» were regarded as discouraging from an aesthetic viewpoint, but often they were found to have positive instrumental features such as separate and continuous bicycle-lanes. The type «low-density auto-orientated zone» was characterised by obvious priority of motorised traffic. Cyclists felt that they were not welcome in this zone. The «enclosed streetscape» was experienced in different ways depending on how it was occupied by different user groups and how crowded it was.

The space types regarded as worst overall were the «low-density auto-orientated zone» and the «enclosed streetscape» with congested traffic. The former zone lacked aesthetically stimulating features and was instrumentally unfavourable. The latter suffered, in some of the spaces tested, from the fact that the cyclist's attention was so much focused on working out the space ahead for continuous movement that he/she lacked capacity to observe features that were in other cases judged as aesthetically Pleasant. Distance view, for example, had no value when there were instrumental obstructions in the participatory landscape.

Based on the above it is suggested that instrumental improvements along bicycle routes would favour experiencing the quality of the urban space, not only from an instrumental viewpoint but also from an aesthetic one. By being less affected by the disturbing surroundings, cyclists would have better opportunity to experience features with aesthetic quality. Thinking about the need to move and one's own safety required most of the attention in the urban spaces categorised as Unpleasant. The worst circumstances were found in narrow spaces that were also congested with motorised traffic with no separate bicycle lane.

When cyclists have all their important instrumental needs fulfilled, as was the case in an urban space with aesthetically Pleasant and Relaxing features, the enjoyment of cycling may be maximised. The preferred urban space for commuting by bicycle is plotted below the horizontal line on the diagram in figure 11 as being both Pleasant and Relaxing whereas the «enclosed streetscape», which is the densest of the eight space types, is plotted above the horizontal line. This type is considered to be the most favourable to pedestrians and it is positive for urban densification and sustainability, but it possesses some disadvantages for cyclists. Commuting cyclists most often cycle during the peak hour. For this reason, the traffic congestion of any kind may contribute to their negative experience of this urban space type. Although visual stimulation in the «enclosed streetscape» is appreciated by cyclists, it is important that planners bear in mind that commuting cyclists prefer a Relaxed urban space, rather than Exciting, which involves a predictable space ahead. It is, however, important to be aware that if cycling becomes very monotonous, no senses are stimulated and no attention is required. In that case, the urban space will move towards the category Sleepy. This could be dangerous if cyclists are no longer aware of unexpected events that could occur on the way.

Most of the participating cyclists had both used the bicycle for commuting regularly for a long time and were familiar with many different route possibilities in the cities. This gave very qualitative viewpoints for the group discussions. However, their experience might have influenced

their viewpoints. For other groups of cyclists further research is needed, for example, those with limited experience.

Neither is the value of the serial experience of changing urban spaces for aesthetic experience reflected in this study. Further research is also needed for that purpose.

In summary: the present study shows that aesthetic experience of commuting cyclists is a complex phenomenon. The urban space that stimulates best aesthetic experience has at the same time features judged as being aesthetically stimulating and features that do not reduce aesthetic experience.

Acknowledgement

The paper is part of a PhD study, funded by The Norwegian University of Life Sciences, Department of Landscape Architecture and Spatial Planning.

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