

The extent of children's independent mobility and the number of actualized affordances as criteria for child-friendly environments

Marketta Kyttä*

Centre for Urban and Regional Studies, Helsinki University of Technology, P.O. Box 9300, 02015, Finland

Abstract

Diversity of environmental resources and access to play and exploration have been regarded as the two central criteria of a child-friendly environment (Moore, 1986). The former has been operationalized in this article by the number of actualized, positive affordances (Gibson, 1979; Heft, 1989) and the latter by the degree of independent mobility. A hypothetical model in which the degree of independent mobility and the number of actualized affordances covary in four varying types of children's environments was constructed. The latter are called Bullerby (the ideal environment), Wasteland, Cell, and Glasshouse. The model was applied in the interpretation of the research data from eight different neighborhoods of various levels of urbanization, in Finland and Belarus. The subjects ($n = 223$) were 8–9-year-old children, who were studied by using individual interviews and questionnaires. The results indicate that all of the hypothesized environment types appeared in the data. Each neighborhood had a unique combination of affordances and independent mobility in terms of the model. The Bullerby type of setting abounded in the Finnish communities. The Cell, Wasteland and Glasshouse were the most common types of environment in the Belarushian data. In general, the proportion of Bullerby-type settings decreased and the glasshouse-type increased as the degree of urbanization augmented. The models and measures applied need further elaboration and testing in different environments and with varying groups of children. The co-variation of the actualized affordances and the degree of independent mobility can be considered a significant indicator in the assessment of child-friendly environments.

© 2003 Elsevier Ltd. All rights reserved.

1. Children's independent mobility and the actualized affordances of the environment—an intriguing relationship

Over a decade ago Wohlwill and Heft (1987, 318) claimed that research should concern the ways children achieve control over their environment through object manipulation and environmental exploration. Until then the freedom of children to explore the environment and to create an individual relationship with it had mainly been taken for granted. The situation has changed in the present world (Gaster, 1992). The possibilities for children to move around independently in the neighborhood have decreased in many countries (see below). Spatial mobility restrictions apply mostly to children in developed countries, whereas the free play of children in developing countries is restricted by other factors, such as child labor (Punch, 2000).

In my previous papers I have analysed children's environments through the concept of affordances (Kyttä,

2002; Kyttä, Kaaja, & Horelli, 2002). This article expands the analysis by focusing simultaneously on children's independent mobility and the actualization of affordances in different types of children's environments. According to Moore (1986, 234), "Access to and diversity [of resources] emerge as the most important themes in child-environment policy". Opportunities to move freely and a variety of activity settings appear also as criteria of environmental quality as defined by children themselves (Chawla, 2002). In this paper, access and diversity are indexed, respectively, by the degree of independent mobility and by the number of actualized, positive affordances within that area of mobility.

My aim in this article is to examine the interrelationship between independent mobility and the actualization of affordances. As a part of the search for criteria of child-friendly environments, I focus especially on the question how these two are related to one another in different environmental contexts. I approach the question by creating and applying a hypothetical model of four different types of environments that are based on the co-variation of independent mobility and of the actualization of affordances. I use this interpretative

*Tel.: +358-9-451-4426; fax: +358-9-451-2140.

E-mail address: marketta.kytta@hut.fi (M. Kyttä).

model to assist in comparing data from three Finnish and five Belarusian neighborhoods of various levels of urbanization.

2. Independent mobility in different environments

In research on children's independent mobility at least three types of definitions and operationalizations have been applied. In the earliest studies, mobility was analysed by measuring the territorial range of children. Territorial range means the geographical distance from children's home to places where children are allowed to wander when playing and socializing (van Vliet, 1983). Later on, independent mobility was operationalized as 'a license' to move around independently in the environment. The degree of a mobility license refers to sets of rules defined by parents concerning, for example, permission to cross roads or to ride a bicycle independently (Hillman, Adams, & Whitelegg, 1990; Kytta, 1997; O'Brien, Jones, & Sloan, 2000). This approach was complemented by studies on the degree of licenses or prohibitions, to go to certain places like the homes of peers or shops (Woolley, Spencer, Dunn, & Rowley, 1999; Prezza et al., 2001). Studies using the third type of definitions have striven to measure the level of children's actual mobility within a certain period of time. This can be done, for example, by using mobility diaries (Kytta, 1997; Tillberg Mattson, 2002).

Children's degrees of a license to move around independently have diminished during the last decades in many countries, for example in Britain (Hillman et al., 1990; O'Brien et al., 2000), in Australia (Tranter, 1993; Tandy, 1999), in the USA (Gaster, 1992), in Sweden (Björklid, 2002a), and in Finland (Syvänen, 1991). Mobility restrictions also affect children's journeys from home to school. In Italy, for instance, 71% of 7- to 12-year-old children are always accompanied by adults on journeys to and from school (Prezza et al., 2001). Mobility restrictions affect younger children and girls most often (Hillman & Adams, 1992; Prezza et al., 2001). Also the size and the density of a city are connected to the opportunities for independent mobility. A consistent result of many studies is that children who live in rural or lower-density environments enjoy more degrees of a license to move around than do children in high-density city environments (Heurlin-Norinder, 1996; Jones, 2000; Kytta, 1997; Nilheim, 1999; van der Spek & Noyon, 1997; O'Brien et al., 2000). On the other hand, some studies on territorial range (Matthews, Limb, & Taylor, 2000a; Matthews, Taylor, Sherwood, Tucker, & Limb, 2000b) and on actual mobility (Tillberg Mattson, 2002) have not corroborated the superior possibilities of rural children to move around independently compared to urban children. The neighborhood may also have an impact on children's

independent mobility. The quality of the organization of the traffic, for example the enhancement of safety by creating traffic-separated areas, is connected to children's mobility (Björklid, 2002b). Prezza et al. (2001) found that the most independent children living in Rome, were those who lived in apartment buildings with courtyards, near the parks, and in new neighborhoods. Peers can also stimulate a child to move around independently (Berg & Medrich, 1980) and the community as a whole, if the responsibility of children's supervision is collective (Hillman et al., 1990).

Studies carried out in different countries indicate that the license of Finnish children to move around independently are higher than those of children in many other countries (Kytta, 1997; Hillman et al., 1990). The other extreme, children with relatively low degrees of a license, can be found in Australia (Tranter, 1993), Italy (Giuliani, Alparone, & Mayer, 1997; Prezza et al., 2001), and Portugal (Arez & Neto, 1999). Mobility restrictions are mostly due to increases in the volumes of traffic (Hillman et al., 1990; Björklid, 2002a), parents' conceptions of social dangers (Blakely, 1994; Valentine, 1995, 1997), and the unruliness of children (Holloway & Valentine, 2000). Also practical reasons, such as convenience or weather conditions (Gatersleben, Leach, & Uzzell, 2001) or school imposed restrictions (Granville, Laird, Barber, & Rait, 2002) appear as a reason for parents to drive children to school instead of walking. In the European context, the perception of social dangers is higher in middle European countries than in Scandinavian countries (Johansson, 2002). Children themselves seem to fear people more than traffic (Giuliani et al., 1997).

Children should not be seen as passively obeying the mobility restrictions of their parents. They can become skilful negotiators for greater extent of their license for moving around (Valentine, 1997). This is one reason why actual mobility and the degree of a mobility license should be distinguished. The distinction between the "Field of promoted action" and the "Field of free action" in the next section is one attempt to resolve this issue.

Children's levels of independent mobility influence their physical, social, cognitive and emotional development. Hüttenmoser (1995) was able to show a decline in the motor and social development of 5-year olds who were not able to play independently outdoors, in the streets and in yards. Also other studies have emphasized the importance of spontaneous outdoor play for children's motor development and physical health (Armstrong, 1993; Davis & Jones, 1996). Prezza et al. (2001) found that children who were more spatially independent played more often with their peers, both indoors and outdoors. Mobility restrictions can also affect the development of emotional bonds between children and the natural environment (Kong, 2000;

Bixler, Floyd, & Hammitt, 2002), and the development of children's sense of responsibility for the environment (Palmborg & Kuru, 2000). In a study of children living in a low-income area of inner-city London, where children's mobility was restricted, 90% of the children could not name a favorite place (Corbishley, 1995). Matthews et al. (2000a, b), who studied rural children in the UK found that social places were more important to these children than were natural places. One reason for this was that the children's access to the natural environment was restricted by parental fears and by the fencing-off of private land. Nevertheless, Korpela, Kyttä, and Hartig (2002) found no association between mobility licenses and the type of the favorite place or its distance from home. Finally, some studies have analysed the effects of mobility restrictions on the development of independence and identity formation, but empirical research on this topic has so far been scarce (Kegerreis, 1993; Noschis, 1992).

Few previous studies have focused on the connection between independent mobility and the ability to recognize and use environmental possibilities and activities. Hüttenmoser and Degen-Zimmermann (1995) found that 5-year olds who played independently in the neighborhood were referring to a more diverse and rich set of activities and play than were children of the same age who only played in playgrounds. A great number of studies have, however, indicated that actual mobility promotes the acquiring, processing and structuring of environmental knowledge (Biel & Torell, 1977; Biel, 1982; Blades, 1989; Rissotto & Tonucci, 2002).

Besides the impact of mobility restrictions on children's development, even broader influences on society can be found. The decline in children's independent mobility increases the time that parents use for chauffeuring (Tillberg Mattson, 2002), and thus diminishes their free time. Children's mobility restrictions may exacerbate the parents' work load, especially that of mothers (Gershuny, 1993). In many countries, traffic jams connected to travel to and from school have created serious problems (Bradshaw, 1999). A decline in children's independent mobility can as a whole be seen as a constraint for pro-environmental travel-mode choices (Johansson, 2002).

These detrimental effects of children's mobility restrictions have led to projects that aim to increase children's independent mobility, for example, in getting to and from school (Tonucci & Rissotto, 2001; Kids walk to school, 2002; International walk to school organisation, 2002; Kids on the move, 2002) or more generally in cities (Spaces for the youth platform, 2002). Even though transport demand and mobility management have interested transport researchers for quite a while, the issue of the management of children's mobility has just recently entered the field (EPOMM, 2002; MOST, 2002).

3. Actualization of affordances

“Affordance” is a central construct of ecological perceptual psychology. It is generally defined as the physical opportunities and dangers which the organism perceives while acting in a specific setting (Gibson, 1979/1986; Heft, 1997). This article focuses on the positive affordances of the environment. Objects afford grasping, twisting, throwing, surfaces afford running, climbing, etc. The concept has the potential to be extended to comprise even emotional, social, and cultural opportunities that the individual perceives in the environment. As it comprises features of both the environment and of the individual, it is located at the interface between the setting and the person (Gibson, 1979, p. 129).

The environment has to provide something that the individual can perceive as offering the potential for activity, but the perception emerges only when the different characteristics of the individual, such as his or her physical dimensions and abilities, social needs and personal intentions, are matched with the environmental features. It is viable to see affordances in terms of varying stages or levels rather than as either/or phenomena (Greeno, 1994). The first level comprises the potential affordances of the environment, which are specified relative to some individual and in principle available to be perceived. The set of potential affordances of the environment is infinite. In contrast actualized affordances (cf. Heft, 1989) are that subset of the former that the individual perceives, utilizes or shapes (Kyttä, 2002). Actualized affordances are revealed through actions of the individual, or through self-report. The present study will be focusing on actualized affordances.

We can further differentiate among actualized affordances in terms of those that can be considered *actively* actualized affordances, namely used and shaped affordances, and those that are actualized *passively*, i.e. perceived affordances. Within the process of actualization, affordances are first perceived, then possibly used or shaped. In the last case the selection of potential affordances for other actors is also modified (Kyttä, 2002).

As many individual characteristics, social and cultural rules and factors as well as practices regulate which affordances can be perceived, utilized or shaped (Reed, 1993), I have constructed a schema which clarifies how some of these social and cultural factors affect the actualization of affordances.

The schema present the ecological environment, i.e. the perceivable, meaningful environment, as consisting of potential affordances. The potential affordances are divided into three subsets which reflect the rules that structure the actualization of affordances. Inspired by Reed (1993, 1996), I refer to the first subset as the *Field of promoted action* (FPA). Loveland (1991) held that

culturally defined and socially approved affordances constitute a subset of all potential affordances. The field of promoted action regulates which affordances can be actualized as well as the time, place and manner in which they can be actualized in a socially approved way (see Fig. 1).

It is possible not only to actively promote the actualization of affordances, but also to actively restrict the process (see Ihanainen, 1991). I refer to this subset of potential affordances as the *Field of constrained action* (FCA). The actualization of affordances can also be limited through the design of objects and spaces so that not all users are able to actualize the potential affordances (Costall, 1995). The environment can be unfriendly in general or to specific user-groups, like people with disabilities.

The third subset will be referred to as the *Field of free action* (FFA) in accordance with Reed (1993). Even if children primarily learn to perceive things they have been actively encouraged to perceive, i.e. to explore the field of promoted action, there always exist affordances a child discovers independently, often to the surprise of their parents. Children frequently do not know how their parents will react to the actualization of their discoveries. The quality and quantity of the individual's independently actualized affordances vary according to the development of his perceptual, motoric and social skills in context. In addition, the personality traits, personal preferences and skills of the individual may have an effect on the independent discovery of affordances.

The fields of promoted and constrained action overlap the field of free action (FFA). The actualization of some affordances in the field of free action are socially promoted and others socially constrained. In the latter case, the affordances can still become actualized in 'unsociable' ways, either deliberately or not. The fields

of promoted, free and constrained action also extend into the set of potential affordances. This relates to the fact that as affordances are being shaped (either in a socially approved way or otherwise) the shaping of the set of potential affordances makes it available to other operators as well. When the environment changes as a result of the shaping of the affordances or as a result of urban planning, the set of potential affordances of the environment expands.

The fields of promoted, constrained and free action are closely related to the activities of children. At different stages of their development, children variably remain inside, in between or outside of these fields—in fact, they often engage in playful activities that move from one field to another. Children may also strive to enlarge the scope of the field of free action. For example, Moore (1986) noticed that children often prefer places outside the control of their parents.

I presume that the degree of independent mobility of children is related to the extent of all three fields of action. Naturally, there are a number of other socio-cultural factors that define the fields and their extent. Various indicators of independent mobility emphasize these fields in slightly different ways. The territorial range applies to all three of the fields, the degree of a mobility license mainly pertain to the extensiveness of the FPA and FCA, and actual mobility primarily applies to the FFA. Because independent mobility influence the extent of these fields, the possibilities for independent mobility can be presumed to be linked with the actualization of affordances.

4. The variation of environments as a function of independent mobility and actualized affordances

To examine the connection between the actualization of affordances and the possibilities for independent mobility, and their significance for the quality of the child friendliness of the environment, I have developed a model in Fig. 2. The model is built on the idea that the covariation of independent mobility and the actualization of affordances define four qualitatively different types of children's environments. The names of the hypothetical environmental types are: *Bullerby*¹

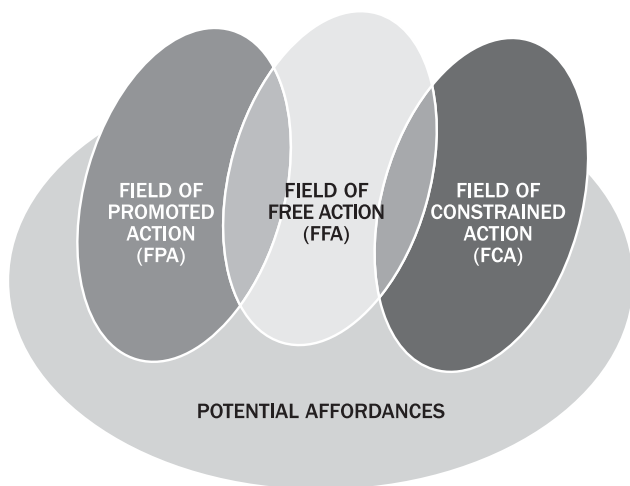


Fig. 1. A schema of the environment as potential affordances, the actualization of which is regulated by the fields of promoted, free, and constrained action.

¹ 'Bullerby' can be literally translated as a noisy village. It is used by the famous Swedish writer Astrid Lindgren (<http://www.astridlindgren.se/>) in a number of her children's novels where she describes the life of a group of children living in this Swedish village. English editions of these books include "The Children of Bullerby", "Christmas in Noisy Village" and "Springtime in Noisy Village", where 'Bullerby' is sometimes not translated in English. I chose this label for the ideal situation of children because Bullerby offers children possibilities to take part in all everyday activities of a village and it provides children important tasks and roles in the community. I also wanted to stress that a 'normal' environment will do. We do not necessarily have to design special places or activities for children, if

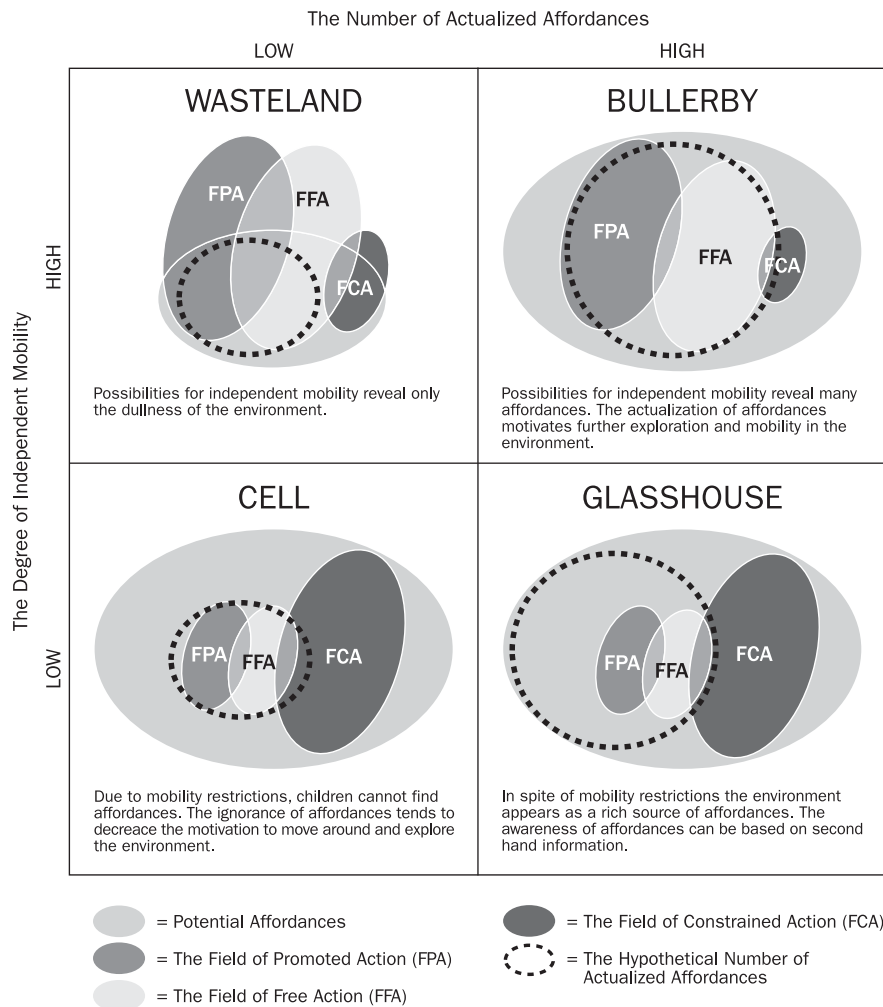


Fig. 2. A model for describing four hypothetical types of environments that emerge from the co-variation of children's independent mobility and the number of actualized affordances.

(the ideal environment), *Wasteland*,² *Cell* and *Glasshouse*. The varying environmental situations of the model are interpreted on the basis of the fields of promoted, free and constrained action (cf. Fig. 1).

Gibson's ecological approach to perception emphasizes the significance of action and exploration to

(footnote continued)

children have access to everyday settings and activities. Other candidates for the label of the ideal situation were for example "Meadow", "Pasture" and "Oasis", but they all hinted that the ideal environment could be only a natural setting.

²Another candidate for the label of this environmental type was 'The Desert'. I did not use it because people living close to a desert know that a desert can be full of affordances. 'Wasteland' does not refer here to the kind of environment that is often mentioned in child-environment studies, namely a 'vacant lot'-type of environment (Pyle, 2002). Those are areas that have no specific, defined uses. They might be wild, leftover places with a great deal of biodiversity. These places can be very special to children, because they offer possibilities for adventure and they can be rich in affordances. If the access to them is not restricted they are actually a good example of Bullerby type of environments.

perception. Therefore, the types of environments in the model that represent a linear connection between mobility and affordances, i.e. Bullerby and Cell, will probably be the most widely spread types in the four-fold model. Extensive mobility licenses will probably correlate with an ample supply of affordances, whereas restricted mobility licenses will result in a small number of perceived affordances. However, also the two other environment types, *Wasteland* and *Glasshouse*, have to be taken into account.

As the model will be applied to examine the existence and distribution of the different environment types of child friendliness in my research data, a more detailed description of the varying hypothetical settings is suitable here. The opportunities for the actualization of affordances vary in these four environments. Theoretically, they should be most extensive in the Bullerby- and glasshouse-types and least extensive in wasteland- and cell-environments. Bullerby, which is the ideal representation of a child-friendly setting, should have more extensive fields of promoted and free action than the

Glasshouse, but the number of possible actualized affordances should be the same. The situation is, however, different in the number of *actively* actualized affordances. In Bullerby the affordances are not only perceived but also utilized and possibly shaped. An example of a Bullerby-type environment could be a rural village or an urban area or any diverse environment that children can explore. In the Glasshouse a large number of affordances remain passively perceived as the limited size of the fields of promoted and free action make the actualization of affordances difficult. A present day example of such an environment for children could be an old European urban milieu full of things that are fascinating but impossible for children to independently utilize. The environment is diverse and attractive, but it cannot be accessed freely. An extreme example of this kind of an environment is a place riddled with landmines where children are forced to play in a very restricted area.

There are essential differences also between the wasteland- and the cell-environment types. In Wasteland, the extensive fields of promoted and free action do not result in a large number of actualized affordances, because the environment is empty of things to discover; its affordances are few and/or nondiverse. Living environments that are too dull, such as sleepy suburbs, can be of this type, especially in cases where the territorial range of children does not extend to the greenery surrounding the suburb (see Kytta, 2002). In the cell environment the restricted fields of free and promoted action makes it impossible for children to explore the affordances of the environment. Thus the potential affordances are not even perceived, let alone used or shaped. This kind of an environment can be any setting, where children are locked inside and they cannot receive, for instance, second-hand information about the enticing affordances of the outdoor environment.

One must bear in mind that the model of the four types of environments that I have introduced is always influenced, to a certain degree by the individual experiences and the way of life of children in their contexts. The same physical environment can appear as a Bullerby-type environment to one child and as a cell-type environment to another. The physical, social and cultural environments form an inseparable entity, the adaptation to which is partly dependent on a child's individual characteristics (cf. Bronfenbrenner, 1992).

5. Method

5.1. Subjects

The study data were based on individual interviews and questionnaires administered to 8- to 9-year-old children and questionnaires administered to their

parents in Finland ($n = 80$) and in Belarus ($n = 147$). Eight to nine year olds were chosen to represent children in their middle childhood (6–11 years) who typically appreciate diverse neighborhood resources. (Chawla, 1992).

All of the children were attending the same (second) grade. The average age of the children was 8.1 years; the mean age of the Finnish children was 8.5 years and that of the Belarushian children 8 years. Unfortunately, in Finland the age was coded in months and in Belarus in years. Permission to undertake the study was sought from the parents before interviewing the children. Of the selected children, 95% were allowed to take part in the interviews. Among the Finnish children, 2% were not interviewed because of insufficient Finnish language skills (these children were of foreign origin). The questionnaires were completed and returned by 80% of the Finnish parents and by 86% of the Belarushian parents. Children's questionnaires were returned by 93% of the Finnish children and by all the Belarushian children. Table 1 shows the number of girls and boys who participated in the different parts of the study.

5.2. Measures

Actualized affordances were studied by conducting individual, semi-structured interviews with the children. The degree of a mobility license was explored through the questionnaires for the children and the parents. Actual mobility was studied through the questionnaires for the children.

5.3. The scale for actualized affordances

The number of actualized affordances was measured using a scale developed earlier (Kytta, 2002). The scale included 29 different affordances³ and was developed based on individual interviews with children (see Table 2). The original affordance interview was derived from Heft's (1988) functional taxonomy of children's outdoor environments, complemented by a subscale of affordances for sociality (Gaver, 1996). That subscale was inspired by van Ansel's (1984/1985) activity categories for children's outdoor play. The Cronbach's alpha for the 2-item Actualized Affordances Scale was $\alpha = 0.85$.

³The 29 affordances included in the scale were the following: structures that afford cycling, running, skipping, skating, playing hopscotch, skiing, playing football, playing ice-hockey, playing tennis or badminton, coasting down, skateboarding, throwing, digging, building of structures, using plants in play, swinging on, hanging, climbing, being in peace and quiet, moulding, building of snow, swimming, fishing, role playing, playing rule games, playing home, playing war, being noisy, and following/sharing adult's activities.

After factor analysis the following 6 affordances were excluded from the scale (loadings below 0.30): water games, jumping down from, jumping over, looking out from, hiding and playing with animals.

Table 1
Subjects participating in the study

Communities	Affordance interview			Children's questionnaire			Parental questionnaire		
	Girls	Boys	Subtotal	Girls	Boys	Subtotal	Girls	Boys	Subtotal
<i>Finland</i>									
Rural village	9	11	20	9	11	20	8	9	17
Small town	16	14	30	16	14	30	13	12	25
City	15	15	30	14	14	28	13	11	24
<i>Belarus</i>									
Rural village	14	14	28	14	13	27	11	12	23
Small town	21	9	30	21	9	30	20	8	28
Suburb	18	12	30	17	12	29	17	11	28
City	16	13	29	16	13	29	15	12	27
Contaminated area	18	12	30	18	12	30	14	10	24
Total	127	100	227	125	98	223	111	85	196

Table 2
A functional taxonomy of affordances used in the study and which was the basis of the Affordance Scale

Environmental qualities that support certain affordances	Affordances	Environmental opportunities for sociality	Affordances for sociality
Flat, relatively smooth surfaces	<ul style="list-style-type: none"> • Affords cycling • Affords running • Affords skipping • Affords skating • Affords playing hopscotch • Affords skiing 		<ul style="list-style-type: none"> • Affords role playing • Affords playing rule games • Affords playing home • Affords playing war • Affords being noisy • Affords following/sharing adult's businesses
Relatively smooth slopes	<ul style="list-style-type: none"> • Affords coasting down • Affords skateboarding 		
Graspable/detached objects	<ul style="list-style-type: none"> • Affords throwing • Affords digging • Affords building of structures • Affords using plants in play 		
Nonrigid, attached object	<ul style="list-style-type: none"> • Affords swinging on • Affords hanging 		
Climbable feature Shelter	<ul style="list-style-type: none"> • Affords climbing • Affords being in peace and quiet 		
Mouldable material (dirt, sand, snow)	<ul style="list-style-type: none"> • Affords moulding something • Affords building of snow 		
Water	<ul style="list-style-type: none"> • Affords swimming • Affords fishing 		

In the version of the scale used in this study, the different levels of affordances, namely perceived, used and shaped affordances were combined into a dichotomous variable for actualized affordances that indicated either their presence (coded as 1) or absence (coded as 0). The distinction between actively and passively

actualized affordances has not been made here like in an earlier article by Kytta (2002). The scale was applied separately to the actualized affordances of the neighborhood (the child's residence's yard and immediate surroundings) and to those of places outside the immediate neighborhood.

5.4. The scale for the degree of a mobility license

The degree of the mobility license of children were studied by using questionnaires administered to the children and to their parents. The questionnaire was developed by Hillman et al. (1990). Some minor changes were made to adjust the questions to the Finnish and Belarushian cultures.

The parental questionnaire included five questions concerning the mobility license. Parents were asked if they allow the child to return from school alone, go to leisure activities alone, to cross main roads alone, to go out alone after dark and to travel alone on the bus. The children's questionnaire included one further question on the mobility license: The children were asked if they were allowed to ride a bicycle alone on main roads. Factor analysis of these six dichotomous items (principal axis factoring with varimax rotation) produced one scale of interest. One variable, namely the license to use buses, had a loading of less than 0.30 and was excluded from the scale. The Cronbach's alpha for the License Scale with the remaining five items was $\alpha = 0.72$.

5.5. The scale for actual mobility

The actual mobility of children was studied by using data from the questionnaires for children, which included questions about the actual mobility of the children during the previous weekend and the school journeys of the current day. The children were asked to mark from a list of 16 different activities,⁴ those activities that they did on their own or with their parents during the previous weekend. They were also able to tell about 3 other activities not included in the list. Finally, the children were asked if they came to the school that morning alone or with a friend, and with whom they would go home from school. The total list of a maximum of 21 activities made up the scale for actual mobility. The Cronbach's alpha for the 21-item Actual Mobility Scale was $\alpha = 0.71$.

5.6. Procedure

The children were interviewed individually in local elementary schools during lessons. The interview lasted from 45 min to an hour. The Finnish children were interviewed by the author, and the Belarushian children were interviewed by local architectural students. In the latter case the structured interview questionnaire was translated from English into Russian and the author

⁴The activities were going to a playground, to a park, to the forest, to swim, to play in a yard, go for a walk, to cycle around, go to Sunday school, visit friends, visit grown-ups, visit a summer cottage, go to shops, to a library, to a youth club, to the cinema or to a football match.

primed the students for the interviews. The interviews were translated later into English.

The parental and children's questionnaires on mobility were translated from English into Finnish and into Belarushian. The children filled in the questionnaires at school under the supervision of their teachers. Because the questionnaire for children included questions concerning activities during the weekend, the questionnaire was completed on Monday morning. Children were asked to take another questionnaire (the parental questionnaire) in an envelope home to their parents. The parents returned the sealed letters containing the completed questionnaire to the school teacher, who sent them either directly to the researcher (in Finland) or via the interviewers (in Belarus).

The Finnish data were collected between 1994 and 1999, and the Belarushian data in 1997. To minimize the effects of varying seasonal and weather conditions, administration of the interviews and the questionnaires took place during the last two weeks of May.

5.7. Communities

Communities in Finland (see Fig. 3) and Belarus (see Fig. 4) were chosen for the study because the countries resemble each other in terms of geography and climate. The two countries also share some cultural similarities, for example a strong tradition of keeping summer cottages. Nevertheless, some substantial political and economical differences exist between the countries. Finland is a Nordic welfare country while Belarus struggles with political and economical difficulties after the Sovjet era.

In both countries the research settings included urban, small town and rural environments. In Belarus the settings included also a suburban environment and a town contaminated in the Chernobyl accident in 1986.

The Finnish communities: The neighborhood of Töölö in the center of Helsinki (city population of 500,000 inhabitants) was selected to represent the most *urban* environment that can be found in Finland. Töölö is a densely built area intersected by three main roads that carry heavy traffic. Töölö has some 26,000 inhabitants and it can be characterized as an upper-middle-class area. Töölö was mainly built in the 1920s and the 1930s. The majority of the houses are six-story buildings. Both commercial and public services in the area are diverse. Töölö is situated by the sea and there are several public parks in the area.

The town of Kitee in eastern Finland represents the *small town* environment in this study. Kitee is a typical Finnish rural town with 11,000 inhabitants, 6000 of whom live in the main village. In the center of the town there are no buildings more than three stories in height. The town is located by a lake. There are also many accessible green areas in the surroundings.



Fig. 3. The Finnish communities: (a) The Finnish city, Töölö; (b) the Finnish small town, Kitee; (c) the Finnish rural village, Luomankylä.

Two small villages, Harjankylä and Luomankylä in Kauhajoki in the western part of Finland, were chosen to represent the *rural environment* in this study. Harjankylä has about 740 inhabitants, Luomankylä has 430 inhabitants, and the whole municipality, Kauhajoki, has a population of about 15,000. Each village has a small elementary school accommodating from 4 to 6 grades, but there are not many other services, not even a grocery store. The majority of dwellings are small wooden one-story farmhouses. The density of the villages is very low and every house has a garden. There are many open fields, forests and quiet roads nearby. Both villages are intersected by a river.

The Belarushian communities: The *urban environment* is a district of Minsk, the capital of Belarus (population 1,610,000). This district is an industrial area with a population of 120,000. Most of the people are factory workers. The public outdoor environment has little to offer to the children. There are few playgrounds and the schools are old and in bad condition. The houses in the area are mainly two- or three-story buildings.

The area representative of the *suburban* environment, Uruchia, is located in the eastern part of Minsk. Uruchia has about 19,000 inhabitants. Most of the area was built up in the late 1980s, but construction work is still going on. The traffic in the area is quite heavy because of the proximity to the main road between Moscow and Minsk. The building density is high; the majority of houses are nine-story buildings.

The *contaminated community*, Kalinkovichy, lies in the southwestern part of Belarus. The town has a population of about 45,000. Architecturally, Kalinkovichy has both village and town features. Next to small wooden houses can be found big modern apartment buildings. At the outskirts of the town lies a large park with playgrounds, but few courtyards have playgrounds for children. In the spring of 1986, after the Chernobyl accident, Belarus received 70% of all the radioactive fall-out from the accident, contaminating 23% of the land area. Kalinkovichy is part of the affected area (Zone V) where the accident caused a social, economic and environmental crisis. The level of contamination at Kalinkovichy is not among the highest recorded, being



Fig. 4. The Belarusian communities: (a) The Belarusian city, Minsk; (b) the Belarusian small town, Niasviz; (c) the Belarusian rural village, Ilya; (d) the Belarusian suburb, Uruchia; (e) the Belarusian contaminated area, Kalinkovichy.

1–15 Ci/km² of Cesium 137. This level of contamination allows the inhabitants continue to live in the area, without the mandatory relocation that took place in the most severely contaminated areas (Klimova, 1996).

Niasviz, the place representing the *small town* environment in Belarus, has about 15,000 inhabitants. The town is located 112 km southwest of Minsk. Niasviz is one of the historical and cultural centers of Belarus. A river divides the town into two parts: the northwest (historical), and the southeast where most of the housing

is situated. The majority of the dwellings are one-story detached houses, all of them built in the last 50 years. An old palace with a park lies nearby.

The representative *rural village*, Ilya, is situated near Vileika, about 60 km from Minsk. Ilya has about 2000 inhabitants, of whom most work in agriculture. The village is situated on a hill, with a small river running through. The dwellings are mainly small, one-story private wooden houses surrounded by gardens. There is a big school in the village, which is attended also by

Table 3

The average number of actualized affordances, the scores of the Mobility License Scale and the Actual Mobility Scale in different communities in Finland and Belarus

	Actualized affordances of the neighborhood (max 29)	Actualized affordances outside the immediate neighborhood (max 29)	Mobility licence score (max 5)	Actual mobility score (max 21)
Finland: Rural village	23.70	1.85	4.76	5.15
Finland: Small town	19.47	2.27	4.28	5.67
Finland: City	17.33	8.10	3.13	3.50
Belarus: Rural village	11.07	3.46	2.92	7.75
Belarus: Small town	13.57	2.57	2.34	2.87
Belarus: City	11.28	4.90	0.59	5.17
Belarus: Suburb	10.33	4.87	1.29	4.17
Belarus: Contaminated area	10.63	8.6	1.42	5.83

children from other small villages. There are sports grounds close to the school.

As the degree of urbanization is used as one of the background variables in the analyses, the Finnish and Belarushian communities were grouped on a four-step scale measuring the degree of urbanization. Value 1 referred to a rural village, 2 to a small town, 3 to a suburb, and 4 to a city. The contaminated Belarushian area was categorized as a small town.

5.8. Statistical analysis

All computations were done using the SPSS program, version 10.0. Factor analysis was used to construct the scales for the mobility licenses and actualized affordances, applying the principal-axis factoring method and varimax rotation. Analysis of variance (ANOVA) was used for comparisons among the communities, and independent-samples *t*-tests were used to compare the two countries. The interconnections between mobility license, actual mobility and actualized affordances were analysed by using Spearman's correlations. These relationships were further studied with structural equation modeling and the AMOS program, version 4.

6. Results

6.1. Actualized affordances, the degree of mobility license and actual mobility in different communities

The Finnish and Belarushian samples were analysed separately, because a context sensitive study should not combine data from two clearly different countries (Bronfenbrenner, 1992) and especially because the Belarushian sample included the contaminated area.

The Affordance Scale scores for actualized affordances in the neighborhood differed both among the Finnish $F(3, 79) = 13.2, p < 0.001$ and among the Belarushian communities $F(5, 146) = 3.6, p = 0.007$

(see Table 3). On average, the Finnish rural children found the greatest and the city children the smallest number of affordances in the neighborhood. The differences among the Finnish communities were significant in all cases except between the city and the small town. In Belarus, the children living in the small town found the greatest and the children in the suburb the smallest number of affordances in the neighborhood. The differences among the Belarushian communities were significant only between the extremes.⁵

A comparison of the scores for actualized affordances outside the immediate neighborhood revealed parallel results. The differences among the Finnish communities $F(3, 79) = 26.3, p < 0.001$ and among the Belarushian communities $F(5, 146) = 13.1, p < 0.001$ were significant. The Finnish city had significantly more affordances outside the immediate neighborhood than both the rural village and the small town. In Belarus, the affordance score for the contaminated area exceeded significantly those of all the other communities.⁶

The average neighborhood actualized affordance score was higher in Finland ($M = 19.7, s.d. = 4.4$) than in Belarus ($M = 11.4, s.d. = 4.9$). The Finnish community with the lowest neighborhood affordance score, i.e., the city, had a neighborhood score higher than those of all Belarushian communities $t(225) = 14.2, p < 0.001$. The two countries did not differ in the average score for actualized affordances outside the immediate neighborhood $t(225) = -0.94, p = 0.351$. No gender differences in the neighborhood affordance scores

⁵Tukey's test for the Finnish communities: rural village/city $p < 0.001$, rural village/small town $p = 0.003$. Tukey's test for the Belarushian communities: small town/suburb $p = 0.006$, small town/contaminated area $p = 0.017$.

⁶Tukey's test for the Finnish communities: small town/city $p < 0.001$, city/rural village $p < 0.001$. Tukey's test for the Belarushian communities: contaminated area/small town $p < 0.001$, contaminated area/suburb $p < 0.001$, contaminated area/rural village $p < 0.001$, contaminated area/city $p < 0.001$. Other differences between the communities were nonsignificant.

Table 4

Some examples from the interviews with the Finnish children. Children's comments can be located as representing the fields of promoted, free and constrained action that regulate the actualization of affordances

Field of promoted action	Field of free action	Field of constrained action
“My mom put some spruce branches on the flower beds for the winter so in the spring we can take them and use them for building a hut.” Finnish girl, 9 years old, rural village	“At grandma's place I can do whatever I want. Here in the city there is so much noise, over there it's peaceful.” Finnish boy, 8 years old, Kitee	“Mom doesn't let me go to Sibelius Park because I was once almost run over by a bicycle and mom is afraid it will happen again.” Finnish girl, 9 years old, city
“Now that they are fixing the windows (in our backyard) we can find nails and all kinds of other things. I can build things and the workmen lend me the hammer.” Finnish girl, 8 years old, city	“We are not supposed to go to the place where they dry the harvest. There are some high places over there that we can fall from, but we quite often go there anyway to play war games.” Finnish boy, 9 years old, rural village	“We used to play with slings (sling clots of clay at each other) but we are not allowed to do that anymore as we are getting new clothes all the time.” Finnish boy, 8 years old, city
“I go skiing in the bog when a boy first makes the tracks.” Finnish girl, 9 years old, small town	“I am not allowed to cross one street, there is a place on Mannerheimintie with no traffic lights but I cross the street there, too.” Finnish girl, 8 years old, city	“I make noise in the backyard even though people don't like it. In the forest it's ok to make noise.” Finnish boy, 9 years old, city
“The janitor makes three huge piles of snow behind a big one so we can build snow castles.” Finnish girl, 8 years old, city	“I climb to see the view from trees and roof tops. I do it in secret as I am not really allowed to do so .” Finnish boy, 8 years old, small town	

$t(225) = 0.686$, $p = 0.493$ were found, nor in the scores of affordances outside the immediate neighborhood $t(225) = 0.174$, $p = 0.862$.

The mobility license scale scores of the children living in different communities differed in Finland $F(3, 65) = 27.51$, $p < 0.001$ and in Belarus $F(5, 131) = 22.7$, $p < 0.001$. A trend in both countries was that license scores were highest for children living in the least urbanized communities. In the Finnish sample there were significant differences between the city and the small town and between the city and the rural village, but not between the small town and the rural village. In Belarus there were significant differences between all communities except between the rural village and the small town, between the contaminated area and the suburb and between the suburb and the city.⁷

The communities in these countries differed also in the share of the actual mobility scale score (Finland, $F(3, 79) = 8.4$, $p = 0.001$; Belarus $F(5, 146) = 12.2$, $p < 0.001$). The actual mobility score of the children did not vary systematically according to the degree of urbanization of the communities. The differences between the Finnish communities were significant in all cases except between the rural village and the small town. In Belarus the clearest differences were between the rural village and the other communities but also the

small town differed from the city and the contaminated area.⁸

The two countries differed in their average License Scale scores $t(196) = 12.8$, $p = 0.001$ but not in their scores on the Actual Mobility Scale $t(225) = -0.97$, $p < 0.331$. The average mobility license scores of the Finnish children were higher than those of the Belarushian children ($M = 4.0$, $s.d. = 1.0$ versus $M = 1.7$, $s.d. = 1.3$, respectively). There were no gender differences in the scores on the License Scale $t(196) = 1.4$, $p = 0.153$, nor on the Actual Mobility Scale $t(225) = 1.9$, $p = 0.06$.

The correlation matrix shown later (Table 6) indicates that in both countries the mobility license scores and the actual mobility scores correlated significantly positively, but the correlation was higher in the Finnish data (0.42) than in the Belarushian (0.17) data. The absolute differences between the scores of the Mobility License and the Actual Mobility Scales were on average more pronounced among Belarushian than among Finnish children ($M = 3.4$, $s.d. = 3.2$ versus $M = 0.7$, $s.d. = 2.1$ respectively, $t(196) = -6.2$, $p < 0.001$).

6.2. Factors affecting the actualization of affordances

The schema shown in Fig. 1 is a theoretical representation of the ways that sociocultural factors

⁷Tukey's test for the Finnish communities: the city/the small town: $p < 0.001$, the city/the rural village $p < 0.001$, the small town/the rural village $p = 0.103$. Tukey's test for the Belarushian communities: small town/suburb $p < 0.001$, small town/contaminated area $p = 0.006$, small town/city $p < 0.001$, suburb/rural village $p < 0.001$, rural village/contaminated area $p < 0.001$, city/contaminated area $p = 0.023$, city/rural village $p < 0.001$.

⁸Tukey's test for the Finnish communities: small town/city $p < 0.001$, rural village/city $p = 0.023$. Tukey's test for the Belarushian communities: rural village/small town $p < 0.001$, rural village/suburb $p < 0.001$ and rural village/city $p = 0.005$, small town/city $p = 0.015$, small town/contaminated area $p < 0.001$.

Table 5

Reasons given by parents for restricting mobility licenses of their children. The reasons were given in response to three questions concerning trips to school and back, going to hobby activities, and going out after dark

	Finland: Rural village	Finland: Small town	Finland: City	Finland: Total	Belarus: Rural village	Belarus: Small town	Belarus: Contaminated area	Belarus: Suburb	Belarus: City	Belarus: Total
Number of parents that restricted the mobility of children	<i>n</i> = 2	<i>n</i> = 8	<i>n</i> = 18	<i>n</i> = 28	<i>n</i> = 21	<i>n</i> = 27	<i>n</i> = 24	<i>n</i> = 28	<i>n</i> = 27	<i>n</i> = 127
<i>Reasons</i>										
Traffic danger	2 100.0%	4 50.0%	10 55.6%	16 57.1%	4 19.0%	9 33.3%	10 41.7%	5 17.9%	7 25.9%	35 27.6%
Child unreliable or too young	0 0%	2 25.0%	4 22.2%	6 21.4%	10 47.6%	8 29.6%	6 25.0%	4 14.3%	5 18.5%	33 26.0%
Fear of assault or molestation by adult	0 0%	1 12.5%	8 44.4%	9 32.1%	7 33.3%	13 48.1%	18 75.0%	25 89.3%	25 92.6%	88 69.3%
School too far away	0 0%	0 0%	0 0%	0 0%	2 9.5%	1 3.7%	0 0%	4 14.3%	1 3.7%	8 6.3%
Fear of bullying by other children	0 0%	0 0%	0 0%	0 0%	5 23.8%	0 0%	3 12.5%	0 0%	2 7.4%	10 7.9%
Environmental pollution	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	1 4.2%	0 0%	0 0%	0 1%
Other reason	0 0%	0 0%	1 1.1%	1 3.6%	1 4.8%	2 7.4%	3 12.5%	0 0%	1 3.7%	7 5.5%

Note: The percentages are calculated as the proportion of parents who restricted the degree of the mobility license of their children. The percentages indicate the proportion of parents who gave these reasons as an answer to any of the three questions: coming home from school, going to leisure, and going out after dark.

can regulate the actualization of affordances. Table 4 includes excerpts from interviews that represent the fields of promoted, free and constrained action. Although this study does not involve a qualitative analysis of the data, the interviews indicate that all the proposed fields were included in the data. The excerpts are from interviews with Finnish children because the qualitative data were available only in the Finnish material.

In Table 5 are listed the reasons the parents gave for restricting the degree of a mobility license of their children. These reasons were asked about in connection with three questions—*coming home from school, going to leisure, and going out after dark*—concerning the mobility license. The percentages in the table represent the appearance of different types of reasons in responses to any of these three questions.

In Finland an average of 57% of the parents restricted the mobility licenses of their children, and traffic-related reasons were the most common justification for the restriction of mobility licenses. In Belarus the most common reason for 69% of the parents was fear of danger caused by other adults. The fear of such social danger increased as the degree of urbanization became higher in both countries. Social fears were most common in Belarushian suburbs (92%). In Finland fear of adults is referred to less frequently than in Belarus ($\chi^2 = 13, 5$; *df.* = 1; *N* = 155; *p* < 0.001). The two countries differed also in fears related to traffic, these

being more common in Finland than in Belarus ($\chi^2 = 9, 1$; *df.* = 1; *N* = 155; *p* < 0.003).

References to the child, to his unreliability or young age, as well as to the length of the school trip or to fears of the child being bullied were more often made in Belarus than in Finland, but the differences between the countries were not significant. Only one inhabitant in the contaminated area in Belarus indicated contamination of the environment as the reason for restricted mobility licenses. Other reasons included teachers not allowing their students to walk home unaccompanied (Belarus).

6.3. The interrelationship between the degree of the mobility license and the actualization of affordances

In the examination of the interrelationship between the actualization of affordances and independent mobility, the latter will be represented by the mobility license indicator, as it performed better in the comparison of different countries and communities than the indicator for actual mobility. The Actual Mobility Scale measured mobility only during one weekend and one weekday, which makes it vulnerable to random variation.

Fig. 5 shows the co-variation of the mobility license scores and the scores for actualized affordances of the neighborhood in the Finnish and Belarushian data. The score of the Affordance Scale is presented in X-axis and

Table 6
The distribution of different environmental types in the Finnish and the Belarushian data

	Finland			Belarus					
	<i>n</i>			<i>n</i>					
	%			%					
		Rural village	Small town	City	Rural village	Small town	Contaminated area	Suburb	City
Wasteland			9 14%				30 23%		
	0 0%	3 12%	6 25%	13 54%	8 28%	4 17%	4 14%	1 4%	
Bullerby			52 79%				10 8%		
	17 100%	22 88%	13 54%	4 17%	5 17%	1 4%	0 0%	0 0%	
Cell			1 2%				73 55%		
	0 0%	0 0%	1 4%	6 25%	8 28%	16 67%	22 79%	21 78%	
Glasshouse			4 6%				19 14%		
	0 0%	0 0%	4 17%	1 4%	8 28%	3 13%	2 7%	5 19%	

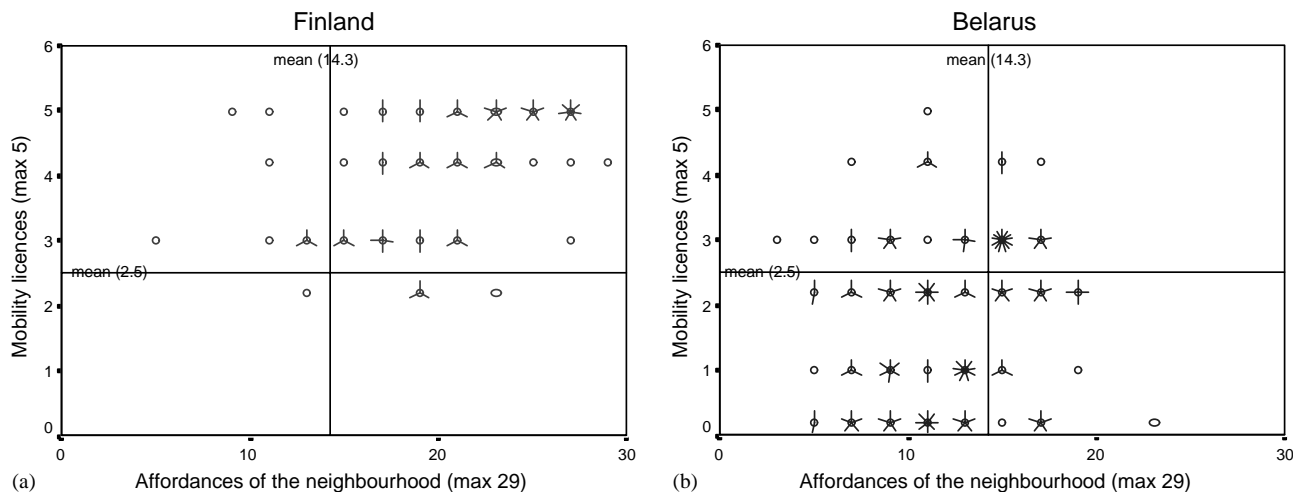


Fig. 5. The co-variation between the scores of children in the Mobility License Scale and in the Affordance Scale. The figure includes lines showing the average of both variables for the entire data set. Note: The petal number of a scatter plot is equal to the number of cases in the cell.

the score of the Mobility License scale in Y-axis. The means of both sum variables drawn from the entire data set have been used to demarcate the four fields that represent the four different types of environments in the hypothetical model depicted in Fig. 2.

As Table 6 indicates, the two countries varied significantly in the appearance of the different types of environments ($\chi^2 = 109,7$; $df. = 3$; $N = 198$; $p < 0.001$). In the Finnish data 79% of the children referred to their environment as being of the Bullerby type. The second most common type of environment according

to the children’s perceptions was Wasteland (9%). In the Belarushian data the children’s perceptions of the environment were divided into these different types more equally, with the Cell representing 55%, Wasteland 23%, Glasshouse 14% and Bullerby 8% of the evaluations.

The communities also varied in their division into different types of environments: the Finnish with $\chi^2 = 109,7$; $df. = 3$; $N = 198$; $p < 0.001$ and the Belarushian with $\chi^2 = 109,7$; $df. = 3$; $N = 198$; $p < 0.001$. In all the Finnish communities Bullerby was the most common

type of environments; 100% in rural villages, 88% in small towns and 54% in cities. In Finnish cities the Wasteland type of environment was also prominent. In Belarus Bullerby was not the most common environment type in any of the communities. The Cell was the most common type in Belarushian suburbs, contaminated areas and cities. In rural villages the most common type of environment was the Wasteland. In small towns none of the types of environments figured prominently.

Table 7 examines the correlations between all three sum variables and background variables, children’s gender and the degree of urbanization. As the variables correlate significantly, it is possible to further analyse the data using structural equation modeling (SEM). The significant differences in the sum variables of the averages in the Finnish and Belarushian data suggest that from here on the countries should be dealt with separately in the analyses. The Finnish and Belarushian data were studied separately using SEM yet with the same nomological net.

Fig. 6 introduces the results of the structural equation modeling analysis of the Finnish data. In the Finnish data the degree of urbanization was a significant

indicator of the children’s mobility scores and of the actual mobility scores. The indicators were negative, i.e. the higher the degree of urbanization, the lower the mobility licence and the actual mobility scores of children. Mobility licence scores predicted the actualized affordance scores: the higher the mobility scores, the higher the score of actualized affordances of the neighborhood. The indicator between mobility licence scores and score for actualized affordances outside the neighborhood was negative. The higher the child’s mobility licence score, the less he or she found affordances elsewhere. One must note that the tool measuring the actualized affordances does not distinguish between affordances found through independent mobility or through being given transportation. Affordances elsewhere can be accessed by the use of car, for instance. This SEM ($n = 80$) $\chi^2 = 36.0$, $df = 6$, $p < 0.001$, $RMSEA = 0.252$, $NFI = 0.965$, $CFI = 0.970$.

The SEM for the Belarushian data had less significant indicators than did that for the Finnish data (see Fig. 7). The indicator between the degree of urbanization and the mobility licence scores was negative, as was the case with the Finnish data. Gender predicted children’s

Table 7
The Spearman’s correlation coefficients between variables in the Finnish/Belarushian data

	Gender	Degree of urbanization	Mobility licence	Actual mobility	Affordances of the neighborhood	Affordances elsewhere
Gender	1					
Degree of urbanization		1				
Mobility licence		-0.67**/-0.59**	1			
Actual mobility	-/0.19*	-0.33**/-0.21*	0.42**/0.17*	1		
Affordances of the neighborhood		-0.52**/-	0.45**/0.17*	0.32**/-	1	
Affordances elsewhere		0.56**/-	-0.44**/-	-0.26*/0.20*	-0.31**/-0.39**	1

Only significant correlations are shown.

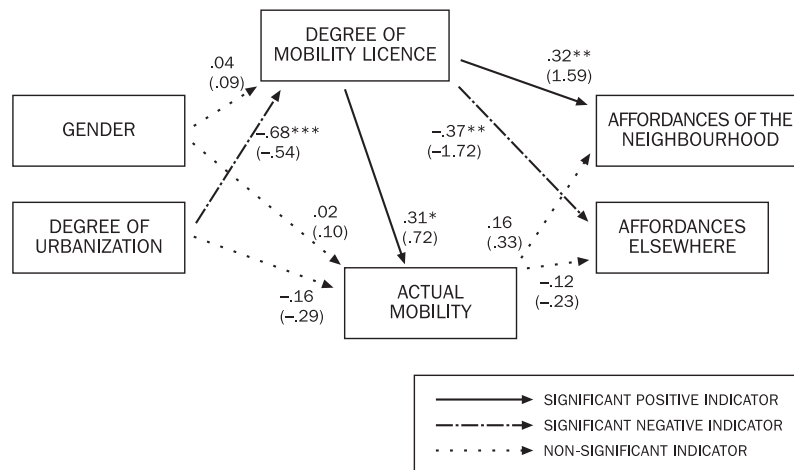


Fig. 6. SEM for the Finnish data.

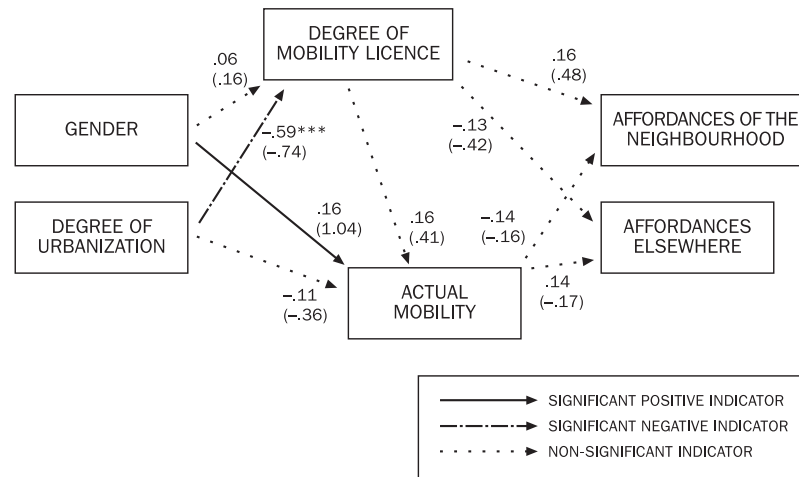


Fig. 7. SEM for the Belarusian data.

actual mobility scores, showing that boys were more active than girls. The indicators between mobility license scores and actual mobility scores on the one hand and the both actualized affordances scores on the other hand were not significant. For the Belarusian data $n = 147$ and for the model $\chi^2 = 23.2$, $df. = 6$, $p = 0.001$, $RMSEA = 0.140$, $CFI = 0.988$.

Residuals with absolute values over 3 were found in the Finnish model between the degree of urbanization and affordance scores (both for the neighborhood and elsewhere) as well as between the scores for affordances in the neighborhood and for affordances elsewhere. The Belarusian data exhibited high residuals with the latter.

7. Discussion

The aim of this article has been the examining of the interrelationship between the degree of children’s independent mobility and the actualization of affordances in the context of the child-friendliness of the environment. To facilitate the analysis, a model of four hypothetical types of environments was created. The model comprises varying types of child-friendliness in terms of variation in degree of children’s independent mobility and the actualization of affordances. In accordance with the emphasis of functional activity in Gibson’s ecological perceptual psychology, where “we must perceive in order to move, but we must also move in order to perceive” (Gibson, 1979, 223), I proposed that the two extremes, the positive and negative types of child-friendly environments, the Bullerby and the Cell, would figure prominently in the empirical data. This proved to be true as 68% of the children’s combined scores in Mobility Licence and Affordance Scales represented these environment types.

The Bullerby-type environment involves a positive cyclical interrelationship between mobility licenses and the actualization of affordances. The more mobility licenses the children have, the more likely they actualize affordances in the neighborhood. Actualized affordances in turn motivate children to be mobile. Thus the Bullerby environment can be considered an ideal context for children’s development at least in the light of research. In the Bullerby context, children are able to interact effectively with their environment and utilize opportunities within the environment to perform independently at a level appropriate to their physical and cognitive capabilities. Also Trancik and Evans (1995) have explained the construction of environmental competence in a similar fashion. Bullerby can also function as a zone of proximal development (Vygotsky, 1986). This means that children are presented with a series of graduated zones of challenge which are slightly above their current levels of functioning. More extensive fields of free and promoted action guarantee more graduated zones of challenge. The Finnish communities primarily offered the Bullerby type of environments, regardless of the degree of urbanization. In both the Finnish and Belarusian data, the percentage of Bullerby-type environments decreased as the degree of urbanization increased.

The cell type of environment includes a negative cycle in which the granting of few mobility licenses makes it impossible to actualize affordances. Little knowledge of affordances tends to result in decreased interest in mobility in the environment. The Cell was the most common type of environment in the Belarusian city, suburb and contaminated area. In the Finnish data, this type was only found in the city. The wasteland- and glasshouse-type environments also figured prominently in the Belarusian data. The wasteland type was especially conspicuous in the rural village. Wasteland

environments were also encountered in the Finnish city. A sleepy suburb can be an example of a wasteland environment, but according to these data, even urban areas or rural villages can in some cases be experienced in this way. The nondiversity of the affordances of an environment may play a role in the fact that good possibilities for independent mobility sometimes reveal only the dullness of the environment.

The glasshouse environment type was the least prominent in this study. In spite of mobility restrictions, children's environments appeared to offer a rich source of affordances. The data seem to suggest that the glasshouse type of environment becomes more common as the degree of urbanization increases. It is also possible that this type of environment becomes more common in the future, if children's mobility licenses continue to decrease in number and their knowledge of the environment is more often based on second-hand information rather than on independent exploration of the setting. For example, information of affordances of the environment from the media may maintain the notion that the environment is a rich source of affordances.

The four-fold model in Fig. 2 comprised two dimensions. The model could be further developed by adding a third dimension that accommodates, for instance, the personal importance of various types of affordances to a child. As a first step towards this kind of enlargement of the model, even the negative affordances and demands could be added to the model (Miller, Shim, & Holden, 1998). Also, a more detailed distinction between actively and passively actualized affordances would. Such an advanced model could shed some light on the motivational basis of the activity in the environment. It could also add to the model personal ways of dealing with various affordances (cf. Bronfenbrenner, 1992).

Both the number of actualized affordances and the mobility licenses of the children were significantly higher in Finland than in Belarus. A small number of mobility licenses may explain the small number of actualized affordances (see Kytä, 2002). The structural equation modeling revealed, however, that the mobility licenses given by the Finnish parents were a mediating factor (Evans & Lepore, 1992) between the degree of urbanization and the actualization of affordances. A high degree of urbanization tends to lead to a decrease in children's mobility licenses, which in turn affects the likelihood of actualized affordances. A corresponding mediating role for mobility licenses was not found in the Belarushian data. It is possible that the indicators used to measure mobility licenses and the actualization of affordances work better in the Finnish environment than in the Belarushian one. The indicators used were possibly ones that are sensitive, in particular, to the characteristics of Finnish environments. The indicators were not, however, developed for this research but were modifications

of those developed by British and American researchers. The hypothesis concerning the mediating role of mobility licenses or actual mobility in the actualization of affordances requires further research with more extensive data and with better tested indicators.

Especially, the indicator for actual mobility should be examined with a critical eye as the indicator measured mobility during one weekend and one weekday; this makes it vulnerable to random variation. The deviation was significant in both the Finnish and the Belarushian data. A more suitable measure of actual mobility would be the diary method, but the latter may be unsuitable for children under 10 years of age. The best method for doing research on the independent mobility of children would naturally be to combine the three different techniques: the measurement of actual mobility, the recording of mobility licenses and determining the territorial range. All indicators should be further contextualized. The use of GIS- and GPS-technologies should be taken advantage of (see Depeau, 2002).

The difference between mobility licenses and actual mobility is particularly significant in the Belarushian data. The parents strove to restrict the independent mobility of their children, but in fact, the children moved around a lot. The finding may not be reliable and may be due to the lack of suitable indicators, but it may also reflect the play of Belarushian children between the fields of promoted and free action. A corresponding difference was not found in the Finnish data. It is possible that the division between the official and the unofficial sphere typical to the Russian culture (Sailas, Susiluoto, & Valkonen, 1996) is manifested here. The mobility licenses may thus reflect the adults' present notions regarding good parenting which they want to bring forth whereas actual mobility reflects the realities of everyday life.

Mobility licenses and actual mobility, even at best, insufficiently reflect the fields of promoted, free and constrained action. There are various other factors that regulate the extensiveness of these fields. For example, the social processes through which children are kept out of certain spaces and environments define these fields (Matthews et al., 2000a, b; O'Brien et al., 2000). Sociocultural factors may also become apparent as we look at the so-called polymorphic or monomorphic spaces in the environment. Monomorphic spaces are strongly classified spaces that are dominated by one single use that excludes the possibility of other uses. This is the case with gardens, which are too "precious" for children to run about in. Polymorphic places are weakly classified and they can sustain alternative uses by children even in the presence of the dominant use, for example, barns and sport fields where access by children is not seen as problematic (Jones, 2000). The actualization of versatile affordances is naturally more likely in polymorphic spaces. In the hypothetical model

presented in this article, the wasteland environment represents a monomorphic space in which even mobility licenses do not facilitate the actualization of affordances due to the non-versatility of the affordances. In future research there is reason to emphasize analysis of the role of various sociocultural factors that regulate the fields of promoted, free and constrained action.

It is possible that the degree of urbanization affects the actualization of affordances in ways other than solely through mobility licenses. A clear causal connection between the degree of urbanization and actualized affordances is not, however, theoretically possible as actualized affordances always represent someone's personal experiences of the environment. Mediative variables, such as the degree of the mobility license, is needed to express the relationship between the degree of urbanization and the number of affordances. For this reason, the degree of urbanization can be thought to directly affect the availability of potential affordances rather than the number of actualized affordances. The potential affordances can be affected by many factors in addition to the degree of urbanization. For example, the degree of urban density, as well as the planning and design solutions by which it is achieved can have an effect (see Kytä et al., 1998). Also the extent of areas free from housing and road networks (see van Andel, 1998) can influence the number of potential affordances.

An interesting question is whether it is possible to influence the number and quality of actualized affordances for children and the child friendliness of the setting by means of planning. Children may themselves try to shape the affordances by participating in the planning process. There is evidence that this might increase the fit between the existing affordances of the environment and their own affordance preferences (Horelli, 1998; Kytä et al., 2002).

To sum up, to the two central criteria of a child-friendly environment—diversity and access—have gained depth by operationalizing them as the degree of independent mobility and the actualization of affordances in varying types of children's contexts. The environmental types that emerge as a covariation of the two criteria seem to represent different types and stages of child friendliness of environments. In spite of the need for further elaboration and testing of the model and its concepts, the results allow to conclude that the intriguing interrelationship between independent mobility and affordances contributes to the complex task of defining what child-friendly environments consist of and how they can be studied.

Acknowledgements

This research was financially supported by the Finnish Academy of Sciences, by the Anna S. Elonen

Foundation, and by the Kauhajoki Cultural Foundation. I am thankful to Alex Stetsko, Vladzimir Litvinov, Z'mitier Murashka, Ludzmila Bratennikava, Dmitry Davidovits, Eugene Morozov, Alesya Belaya and Katya Naumava for conducting the interviews in Belarus, and to Raisa Sulamaa for translating the interviews. Liisa Horelli supervised the research and offered valuable comments on the earlier versions of the manuscript. I also warmly thank Harry Heft, David Uzzell, William Dennisuk, Sari Tähtinen and Rob Schields for their helpful suggestions.

References

- Arez, A., & Neto, C. (1999). The study of independent mobility and perception of the physical environment in rural and urban children. *Paper presented at IPA Congress*, Lisbon, Portugal.
- Armstrong, N. (1993). Independent mobility and children's physical development. In M. Hillman (Ed.), *Children' Transport and the Quality of Life* (pp. 35–43). London: Policy Studies Institute.
- Biel, A. (1982). Children's spatial representation of their neighborhood: A step towards a general spatial competence. *Journal of Environmental Psychology*, 2(3), 193–200.
- Biel, A., & Torell, G. (1977). *The mapped environment: cognitive aspect of children's drawings*. Göteborg Psychological Report, 7(7).
- Berg, M., & Medrich, E. (1980). Children in four neighborhoods: The physical environment and its effect on play and play patterns. *Environment and Behavior*, 12(3), 320–348.
- Bixler, R. D., Floyd, M. F., & Hammitt, W. E. (2002). Environmental socialization. Quantitative tests of the childhood play hypothesis. *Environment and Behavior*, 34(6), 795–818.
- Björklid, P. (2002a). Trafikmiljöstress i föräldarperspektiv. Temaprogrammet Barn Miljö Trafik. Forskningsgruppen för miljöpsykologi och pedagogik. Lärarhögskolan i Stockholm.
- Björklid, P. (2002b). Parental restrictions and children's independent mobility. *Paper presented at IAPS 17*, A Coruna, July 23–27, 2002.
- Blades, M. (1989). Children's ability to learn about the environment from direct experience and from spatial representations. *Children's Environments Quarterly*, 6(2/3), 4–14.
- Blakely, K. S. (1994). Parents' conceptions of social dangers to children in the urban environment. *Children's Environments*, 11(1), 16–25.
- Bradshaw, R. (1999). *Research into levels of activity relating to school travel initiatives*. Transport studies group, University of Westminster.
- Bronfenbrenner, U. (1992). Ecological systems theory. In R. Vasta (Ed.), *Six theories of child development: Revised formulations and current issues* (pp. 187–249). London & Philadelphia: Jessica Kingsley.
- Chawla, L. (1992). Childhood place attachments. In I. Altman, & S. M. Low (Eds.), *Place attachment. Human behavior and environment. Advances in theory and research*, Vol. 12. New York: Plenum Press.
- Chawla, L. (2002). *Growing up in an urbanising world*. London: Earthscan Publications Ltd.
- Corbishey, P. (1995). A Parish Listens to its children. *Children's Environments*, 12(4), 414–426.
- Costall, A. (1995). Soziazing affordances. *Theory and Psychology*, 5(4), 467–481.
- Davis, A., & Jones, L. J. (1996). Children in the urban environment: An issue for the new public health agenda. *Health and Place*, 2(2), 107–113.
- Depeau, S. (2002). From accident reality to the perception of risk. *Paper presented at the 17th conference of the international*

- association for people-environment studies, 23–27 July, 2002, A Coruña, Spain.
- EPOMM (2002). *European platform on mobility management*. <http://www.epommweb.org/>.
- Evans, G. W., & Lepore, S. J. (1992). Conceptual and analytic issues in crowding research. *Journal of Environmental Psychology, 12*, 163–173.
- Gaster, S. (1992). Historical changes in children's access to US cities: A critical review. *Children's Environments, 9*(2), 23–36.
- Gatersleben, B., Leach, R., & Uzzell, D. (2001). *Travel to school; Results of a survey among junior and secondary school children and their parents in Ash*. Unpublished internal report, University of Surrey, Guildford, UK.
- Gaver, W. W. (1996). Situating action II: Affordances for interaction: The social is material for design. *Ecological Psychology, 8*(2), 111–129.
- Gershuny, J. (1993). Escorting children: Impact on parental lifestyle. In M. Hillman (Ed.), *Children's transport and the quality of life*. London: Policy Studies Institute.
- Gibson, J. J. (1979/1986). *The ecological approach to visual perception*. Hillsdale, New Jersey: Lawrence Erlbaum Associates (Originally published 1979).
- Giuliani, V., Alparone, F., & Mayer, S. (1997). *Children's appropriation of urban spaces*. Paper presented at the *Urban Childhood Conference*, 9–12 June, Trondheim, Norway.
- Granville, S., Laird, A., Barber, M., & Rait, F. (2002). *Why do parents drive their children to school?* Transport Research Series. Scottish Executive Central Research Unit.
- Greeno, J. G. (1994). Gibson's affordances. *Psychological Review, 101*(2), 336–342.
- Heft, H. (1988). Affordances of children's environments: A functional approach to environmental description. *Children's Environments Quarterly, 5*(3), 29–37.
- Heft, H. (1989). Affordances and the body: An intentional analysis of Gibson's ecological approach to visual perception. *Journal for the Theory of Social Behaviour, 19*(1), 1–30.
- Heft, H. (1997). The relevance of Gibson's ecological approach to perception for environment-behavior studies. In G. T. Moore, & R. W. Marans (Eds.), *Advances in environment, behavior and design*, Vol. 4. New York: Plenum Press.
- Heurilin-Norinder, M. (1996). Children, environment and independent mobility. Paper presented at *IAPS 14*, Stockholm, Sweden.
- Hillman, M., & Adams, J. (1992). Children's freedom and safety. *Children's Environments, 9*(2), 10–22.
- Hillman, M., Adams, J., & Whitelegg, J. (1990). *One false move... A study of children's independent mobility*. London: Publications of the Policy Studies Institute.
- Holloway, S. L., & Valentine, G. (2000). Children's geographies and the new social studies of childhood. In S. L. Holloway, & G. Valentine (Eds.), *Children's geographies. Playing, living, learning*. London: Routledge.
- Horelli, L. (1998). Creating childfriendly environments—case studies on children's participation in three European countries. *Childhood, 5*(2), 225–239.
- Hüttenmoser, M. (1995). Children and their living surroundings: Empirical investigations into the significance of living surroundings for the everyday life and development of children. *Children's Environments, 12*(4), 403–413.
- Hüttenmoser, M., & Degen-Zimmermann (1995). *Lebensräume für Kinder* (Living Space for Children). National research programme, Cities and Transport No 70. Zürich: Marie Meierhofer-Institut für das Kind.
- Ihanainen, P. (1991). *Koulun ja opetuksen uudistaminen: kohti gibsonilaista diskursssia*. [The renewal of schooling and teaching: towards a gibsonian discourse]. Licentiate work, University of Jyväskylä, Department of Education.
- International walk to school organisation (2002). <http://www.iwalk-toschool.org/about.htm>.
- Johansson, M. (2002). Social dangers as constraints for pro-environmental travel modes—the perception of parents in England and Sweden. Paper presented at the 17th conference of the international association for people-environment studies, 23–27 July, 2002, A Coruña, Spain.
- Jones, O. (2000). Melting geography. Purity, disorder, childhood and space. In S. L. Holloway, & G. Valentine (Eds.), *Children's geographies. Playing, living learning* (pp. 29–47). London: Routledge.
- Kegerreis (1993). Independent mobility and children's mental and emotional development. In: M. Hillman (Ed.), *Children's transport and the quality of life* (pp. 28–34). London: Policy Studies Institute.
- Kids on the move (2002). Directorate-General for the Environment. European Commission. Belgium: Office for Official Publications of the European Communities.
- Kids walk to school (2002). <http://www.cdc.gov/nccdphp/dnpa/kids-walk/>.
- Klimova, T. (1996). Living environment in areas with special conditions. In *Belarus: environment for people* (pp. 142–167). National human development report, UNDP, United Nations.
- Kong, L. (2000). Nature's dangers, nature's pleasures. Urban children and the natural world. In S. L. Holloway, & G. Valentine (Eds.), *Children's geographies. Playing, living, learning* (pp. 257–271). London: Routledge.
- Korpela, K., Kyttä, M., & Hartig, T. (2002). Children's favorite places. Restorative experience, self-regulation, and children's place preferences. *Journal of Environmental Psychology, 22*, 387–398.
- Kyttä, M. (1997). Children's independent mobility in urban, small town, and rural environments. In: Camstra (Ed.), *Growing up in a changing urban landscape* (pp. 41–52). Assen: Van Gorcum.
- Kyttä, M. (2002). The affordances of children's environments. *Journal of Environmental Psychology, 22*, 109–123.
- Kyttä, M., Kaaja, M., & Horelli, L. (1998). Neighborhood density as part of the creation of child-friendly environments. Paper presented in the 24th International Congress of Applied Psychology, San Francisco.
- Kyttä, M., Kaaja, M., & Horelli, L. (2002, forthcoming). An internet-based design game as a mediator of children's environmental visions. *Environment & Behavior*.
- Loveland, K. A. (1991). Social affordances and interaction II: Autism and the affordances of the human environment. *Ecological Psychology, 3*(2), 99–119.
- Matthews, H., Limb, M., & Taylor, M. (2000). The 'street as thirdspace'. In S. L. Holloway, & G. Valentine (Eds.), *Children's geographies. Playing, living, learning* (pp. 63–79). London: Routledge.
- Matthews, H., Taylor, M., Sherwood, K., Tucker, F., & Limb, M. (2000a). Growing-up in the countryside: Children and the rural idyll. *Journal of Rural Studies, 16*, 141–153.
- Miller, P. C., Shim, J. E., & Holden, G. W. (1998b). Immediate contextual influences on maternal behavior: Environmental affordances and demands. *Journal of Environmental Psychology, 18*, 387–398.
- Moore, R. (1986). *Childhood's domain. Play and place in child development*. London: Croom Helm.
- MOST (2002). *European projects related to mobility management*. <http://mo.st/index.msie.html>.
- Nilheim, J. (1999). *Kan ni gå ut och leka?* Barns utomhusmiljö i Stockholms nybyggda innerstad. [Can you go out and play?] Publication no. 99–93. Stockholm: Royal Institute of Technology.
- Noschis, K. (1992). Child development theory and planning for neighborhood play. *Children's Environments, 9*(2), 3–9.
- O'Brien, M., Jones, D., & Sloan, D. (2000). Children's independent spatial mobility in the urban public realm. *Childhood, 7*(3), 257–277.

- Palmberg, I., & Kuru, J. (2000). Outdoor activities as a basis for environmental responsibility. *The Journal of Environmental Education*, 31(4), 32–36.
- Prezza, M., Stefania, P., Morabito, C., Cinzia, S., Alparone, F. R., & Guiliani, M. V. (2001). The influence of psychosocial and urban factors on children's independent mobility and relationship to peer frequentation. *Journal of Community and Applied Social Psychology*, 11(Number 6), 435–450.
- Punch, S. (2000). Children's strategies for creating playspaces: Negotiating independence in rural Bolivia. In S. L. Holloway, & G. Valentine (Eds.), *Children's geographies. Playing, living, learning* (pp. 48–62). London: Routledge.
- Pyle, R. M. (2002). Eden in a vacant lot: Special places, species, and kids in the neighborhood of life. In P. H. Kahn, & S. R. Kellert (Eds.), *Children and nature. Psychological, sociocultural, and evolutionary investigations* (pp. 305–328). Cambridge: The MIT Press.
- Reed, E. S. (1993). The intention to use a specific affordance: A conceptual framework for psychology. In R. H. Wozniak, & K. W. Fischer (Eds.), *Development in context. Acting and thinking in specific environments* (pp. 45–76). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Reed, E. S. (1996). Selves, values, cultures. In E. S. Reed, E. Turiel, & T. Brown (Eds.), *Values and knowledge* (pp. 1–15). Mahwah, NJ: Lawrence Erlbaum.
- Rissotto, A., & Tonucci, F. (2002). Freedom of movement and environmental knowledge in elementary school children. *Journal of Environmental Psychology*, 22(1), 65–77.
- Sailas, A., Susiluoto, I., & Valkonen, M. (1996). *Venäjä, jäättiläinen tuulijolla*. [Russia, the giant astray]. Helsinki: Edita.
- Spaces for the youth platform (2002). <http://www.ruimtevoorde-jeugd.nl/>.
- Syvänen, M. (1991). Lasten elintilan kaventuminen. [The decreasing life space of children]. In ym. Santalahti (Ed.), *Auto, terveys ja ympäristö* (pp. 167–177). Helsinki: Gaudeamus.
- Tandy, C. A. (1999). Children's diminishing play space: A study of intergenerational change in children's use of their neighborhoods. *Australian Geographical Studies*, 37(2), 154–164.
- Tillberg Mattson, K. (2002). Children's (in)dependent mobility and parent's chauffeuring in the town and the countryside. *Tijdschrift voor Economische en Sociale Geografie*, 93(4), forthcoming.
- Tonucci, F., & Rissotto, A. (2001). *The children's city. A new way of conceiving the city in which the child is considered a parameter*. An unpublished manuscript, Istituto di Psicologia, Rome, Italy.
- Trancik, A. M., & Evans, G. W. (1995). Spaces fit for children: Competency in the design of daycare center environments. *Children's Environments*, 12(3), 311–319.
- Tranter, P. (1993). *Children's mobility in Canberra: Confinement or independence?* Monograph series No. 7, Department of Geography and Oceanography. University College, Australian Defence Force Academy, Canberra.
- Valentine, G. (1995). *Stranger-danger: The impact of parental fears on children's use of space*. Paper presented at the International conference, building identities, Amsterdam, The Netherlands.
- Valentine, G. (1997). "Oh yes I can." "Oh no you can't.": Children and parents' understandings of kids' competence to negotiate public space safely. *Antipode*, 29, 65–89.
- van Anel, J. (1984/1985). Effects on children's outdoor behavior of physical changes in a Leiden neighborhood. *Children's Environments Quarterly*, 1(4), 46–54.
- van Anel, J. (1998). Children's use of neighborhood public space in relation to density. *Paper presented in the 24th International Congress of Applied Psychology*, San Francisco, August 9–14, 1998.
- van der Spek, M., & Noyon, R. (1997). Children's freedom of movement in the streets. In: Camstra (Ed.), *Growing up in a changing urban landscape* (pp. 24–40). Assen: Van Gorcum.
- van Vliet, W. (1983). Exploring the fourth environment. An examination of the home range of city and suburban teenagers. *Environment and Behavior*, 15(5), 567–588.
- Vygotsky, L. S. (1986). *Thought and language*. Cambridge, MA: The MIT Press.
- Wohlwill, J. F., & Heft, H. (1987). The Physical environment and the development of the child. In D. Stokols, & I. Altman (Eds.), *Handbook of environmental psychology* (pp. 281–328). New York: Wiley.
- Woolley, H., Spencer, C., Dunn, J., & Rowley, G. (1999). The child as citizen: Experiences of British town and city centers. *Journal of Urban Design*, 4(3), 255–282.