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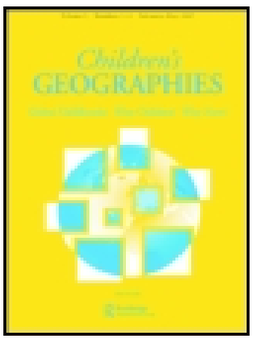

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Children as urbanites: mapping the affordances and behavior settings of urban environments for Finnish and Japanese children

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ABSTRACT

Increasingly, children are residing in urban environments, yet little is known about the urban affordances for children. A place-based approach was employed to map the urban experiences of over 1300 children residing in Helsinki (Finland) and in Tokyo (Japan) in terms of meaningful places (affordances), travel mode and accompaniment to these places. Shared affordances were considered behavior settings, and audited on-site by trained experts for their main function, land use, openness, and communality. Significant differences were found between countries for all affordance categories. Although differences in behavior settings were observed between countries, a number of patterns emerged: outdoor settings and those with shared communality were the most prevalent behavior settings, traffic settings were predominantly evaluated negatively and commercial and indoor settings most positively. Findings suggest that although the context is important, independent mobility and the possibility to actualize environmental affordances seem to be fundamental in both contexts as the key criteria for environmental child-friendliness.

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Urban environment; public participation GIS; independent mobility; affordances; behavior settings

1. Introduction

Urbanization is increasing globally, with a concurrent shift towards families and children residing in urban environments (Karsten 2003; Lilius 2014). Already more than half (53%) of the global population live in urban environments (The World Bank 2016), that have traditionally been built without the child in mind, and instead have prioritized efficient motorized transport, largely to the detriment of their most vulnerable users. Children's spaces in modern cities have also become institutionalized; restricted to playgrounds, schoolyards and other places especially designed for children (Zeiher 2001; Kyttä 2008). While the presence of children in the local environment can contribute to community social capital and cohesion (Tranter and Pawson 2001; Franklin 2002; Badland and Oliver 2011), equal possibilities for children to use all amenities of public space have gradually deteriorated (Kyttä 2008).

Children's independent mobility and the possibility to actualize environmental affordances can be seen as the most crucial and the most threatening aspects of environmental child-friendliness in modern societies (Kyttä 2004; Broberg, Kyttä, and Fagerholm 2013). Although independent mobility

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has received increasing attention in the last decade (Kyttä 2008), less is known of the affordance dimension. In particular, little is known about how children use urban amenities in cases when their spontaneous use of urban space is possible. In a truly child-friendly urban environment, children enjoy equal possibilities to use all amenities of public space (cf. Zeiher 2001).

This study focuses on two urban contexts in Helsinki (Finland) and in Tokyo (Japan), where children still enjoy relatively high degrees of freedom to move around and use urban space without adult supervision. A place-based methodological approach was used to map the experiences of over 1300 children and to characterize the places important for children. The results are used to discuss how the findings can increase our understanding about the various ways children form their relationship with urban environments.

1.1. Children in urban environments

Urban environments can play a crucial role in child health, wellbeing, and development. A child-friendly environment provides children opportunities for play, physical activity, active transport, social interaction, and independent mobility (Broberg, Kyttä, and Fagerholm 2013; Hooper, Ivory, and Fougere 2015; Oliver et al. 2015). For children residing in urban environments, their local neighborhoods are important for enabling them to play, be independent, and experience the outdoors in ways that may not be achieved in their home environments. This is partly because urban dwellings typically comprise little or no green/outdoor space and small parcel lots (Veitch et al. 2006). The current paper focuses on gaining perspectives from urban children residing in Japan and Finland, countries with comparatively high levels of children's independent mobility. A recent 16-country comparison of children's independent mobility by Shaw et al. (2015) revealed that children both in Japan and Finland enjoy higher licenses for independent mobility and higher actual independent mobility to school and weekend activities than most of the comparison nations. Accordingly, Japan and Finland were considered optimal settings in which to conduct this research. The choice of countries with exceptional high children's independent mobility was a deliberate approach because children's spontaneous usage of urban spaces can only be studied in contexts that allow the active engagement of children. Also, the relationship between independent mobility and environmental knowledge and spatial and cartographic skills has been recognized there (Cornell et al. 2001; Rissotto and Tonucci 2002). Japanese and Finnish children may be ideally equipped to clearly communicate issues around urban environments that matter for them.

1.2. Examining children's usage of urban environments: a place-based approach

In the analysis of the characteristics of the physical environment that offer children intriguing possibilities for various activities, rich experiences and social interactions, we applied the concept of affordance by James J. Gibson ([1979]1986). The term *affordance* has traditionally referred to the perceived functional opportunities and restrictions concerning a person's actions in a given environment (Gibson [1979]1986; Heft et al. 2014). However, it can be expanded to include also the emotional and social opportunities and restrictions that an environment offers for an individual (Kyttä 2008). This concept breaks the subject–object dichotomy: an affordance is not a characteristic of the environment, nor a characteristic of the individual, but rather something between them. An environment has to provide something that a child can perceive as an opportunity, but such a perception emerges only when the characteristics of the child, such as his or her physical dimensions or abilities, social needs, and personal intentions, are matched with the environmental features (Kyttä 2006). To explore positive and negative functional, social and emotional/contextual affordances for children, a special place-based methodological approach is appropriate. In this study, children identify affordances by mapping them with online Public Participation Geographic Information System (PPGIS) tool (Brown and Kyttä 2014).

For this research, a relevant unit of analysis is not only an individual child and his/her perceived environmental affordances but also the 'hot spot' places in an urban environment that are important for many children. Here, the concept of *behavior setting* by Barker (1968) is useful. Behaviors always occur somewhere, in some social and cultural context, where a dynamic, yet stable pattern of actions is generated by joint participation of two or more individuals with the support of affordances (Heft et al. 2014). Behavior setting refers to a set of social codes of behavior in a given context (Barker 1968). The place forms a physical and social system in which action at a given time takes place according to norms, rules, and practices. For example, a football field as a behavior setting is a complex collection of rules developed in the course of the history of the game. Football is played in specific places at certain times when two teams get together. According to our interpretation, the clusters of affordances that are identified by a group of children can be defined as a behavior setting. These shared affordances located in a certain place comprise an additional, socio-cultural layer for our place-based analysis. To understand what kind of urban places the behavioral settings actually are, an expert audit to all behavior settings was conducted.

This study aims to explore children's various ways of using urban space, finding affordances, and forming behavior settings in Helsinki and Tokyo. Firstly, we corroborated the degree of independent mobility of children before analyzing the usage of urban space by children in these two contexts. Then, we analyzed what kind of affordances Finnish and Japanese children had identified, how affordances had located in the urban fabric, and how children had reached these affordances. Lastly, we investigated the behavior settings both by studying them as clusters of shared affordances and by conducting expert audits to the behavior settings.

2. Methods

A two-stage process was undertaken to study the use of urban space, affordances and behavioral settings of children in both countries. Firstly, a cross-sectional online mapping survey of children's neighborhood perceptions, use, and preferences was conducted using a public participation GIS method, softGIS. To study the hotspots of positive and negative affordances (i.e. behavior settings), an on-site expert audit of marked behavior settings was conducted.

2.1. SoftGIS methodology for the study of children's affordances in urban environments

The Internet-based softGIS survey (Kahila and Kyttä 2009; Kyttä and Kahila 2011) was used to study children's independent mobility and affordances. This methodology enables the mapping of environmental experiences and daily behavior practices with respect to specific locations, which promotes the simultaneous analysis of the experiential knowledge and the register-based GIS data or expert audits. The methodology has been successfully used in several earlier studies among children and young people (Kyttä, Broberg, and Kahila 2012b; Broberg, Kyttä, and Fagerholm 2013; Broberg, Salminen, and Kyttä 2013; Broberg and Sarjala 2015).

The Japanese and Finnish versions of the survey were created in close co-operation with researchers from the two countries (Figure 1). The respondents used Internet interface to mark places on a map that were meaningful for them. After each place marking, the respondents could specify which affordances they perceive in the place. Children were also asked to describe how accessible these places were, in terms of independent mobility and active transport and to mark their home and to answer questions concerning their mobility licenses.

Neighborhoods representing various urban structures were selected for study areas in Japan and Finland. The Finnish neighborhoods varied from inner-city urban core areas to suburbs built in the 1950s, and fringe areas dominated by single-family housing. The following schools in Helsinki metropolitan area were invited to participate: Kartanonkoski, Vantaankoski and Veromäki schools from the city of Vantaa; Martinkallio, Kirkkojärvi, Vanttila, Kalajärvi, Juvanpuisto, Maininki, Ruusutorppa and Tähtiniitty schools from the city of Espoo and Aleksis Kivi, Kallio, Taivallahti and

Figure 1. The softGIS survey platform used with Finnish (A) and Japanese (B) children. www.softgis.fi/children.

Yhtenäiskoulu schools from the city of Helsinki. Out of these 15 schools, eight had both elementary and secondary levels (i.e. school grades from 1 to 9), four were secondary schools (grades 7–9) and two elementary schools (grades 1–6). All children in grades 5 and 8 (approximately 11 and 14 years of age, respectively) were eligible to participate. The data were collected in all year 5 and 8 classes of participating schools during between 10/2011 and 2/2012. Data collection occurred in computer-equipped classrooms, led by a trained research assistant. The Ethics Board from the Education Board of the cities of Helsinki, Espoo and Vantaa approved the research, and informed consent was gathered from both the responding children and their parents.

The Japanese study areas were Mastudo City in Chiba and Setagaya City in Tokyo. Matsudo is a major bedroom community of greater Tokyo with relatively low density in Japanese scale and mixed structure. The second study area, Setagaya, is a rather densely populated urban area well connected to the central business districts of Tokyo. In Japan, a total of five schools participated: two elementary and three junior high schools. The schools were Kogane Elementary School and Kogane-minami Junior High School from Matsudo; and Mishuku Junior High School and Taishido Elementary and Junior High Schools in Setagaya. The data were collected during 11–12/2011 and 6/2012 among 5th and 8th graders. The respondents attended the survey in the computer-equipped rooms of the schools, accompanied and guided by one or two research assistants. Permits from the local education boards in both Setagaya and Matsudo were applied. No direct permits from parents or students were needed in the Japanese system. In some schools, problems were encountered with the Internet connection, but in these cases, the pupils were instructed to fill in the questionnaire at home.

2.2. Measures

Independent mobility: Children's overall independent mobility was assessed through parental mobility licenses (Kyttä et al. 2015). A 7-index scale included a list of things children were allowed to do alone: (1) to walk or ride to clubs or activity places, (2) to go to the city center or shopping malls, (3) to go to parks or sports facilities, (4) to use public transportation, (5) to ride a bike, (6) to be outside after dark, and (7) to walk or ride to friends' places. All these questions were answered using a dichotomous scale (0 = no, 1 = yes). A mobility license score (value range 0–7) was computed by summing the seven items.

Affordance taxonomy: The affordance taxonomy used in this study was based on previous studies by Broberg, Kyttä, and Fagerholm (2013) and Kyttä, Broberg, and Kahila (2012a), and included functional, social and emotional/contextual affordances (see Table 2). The respondents were asked to: 'Think of the places in your environment that are good or bad for doing things, that have good or bad social atmosphere, or where you feel good or bad.' The location of the meaningful place was marked on the map. After each place marking, the respondents could specify the affordance of the

place by defining whether the place was functionally, emotionally/contextually or socially meaningful for them. One or more reasons could be chosen. The affordance lists in the three categories included equal amounts of positive and negative affordances. Short structured inquiries on transport mode, frequency of visits and travel accompaniment were attached to entries, and additional free descriptions were allowed. The method made it possible to simultaneously collect geo-located data on the ways children use urban space as well as more qualitative, experiential information of places and affordances.

Behavior settings: The definition of behavior settings was a place where at least two children had mapped meaningful places. All these behavior settings were visited by one of two experts for auditing (see below).

2.3. Expert assessment of behavior settings

Two architects who had doctoral degrees in children's environments visited all identified behavior settings in Helsinki and Tokyo. After both experts made their individual observations, they shared their views and constructed a categorical scale for quantitative assessment of all marked settings. As shown in Table 1, the behavior settings were classified based on their land use, their physical openness (indoor, outdoor, or a combination of both), and their communality from the viewpoint of user groups (meant for children only vs. children and adults use them together).

2.4. Statistical analysis

Statistical analyses were undertaken in IBM SPSS Statistics 22. In the descriptive analyses of children's independent mobility, affordances and behavior settings, Chi-square, independent samples *t*-tests and ANOVA were used to identify meaningful differences between groups. The geographical analysis was conducted in ArcMap 10.3.1.

3. Results

3.1. Participants and their independent mobility

A total of 919 Finnish and 556 Japanese children were invited to participate in the study. After those children were excluded whose parents did not give to permit to participate, did not want themselves to participate or who did not complete the survey, the final dataset included 850 pupils from Finland and 491 from Japan (86% and 88% response rate, respectively). Overall, 1341 children Finnish and Japanese primary (fifth grade) and secondary (eighth grade) school children participated in the study. In both countries, there were approximately two times as many eighth graders as fifth graders, in Japan 339/151 and in Finland 531/312 children, respectively. There were no gender-related differences between the two countries. The overall mean ages did not differ significantly in the two countries ($t = -0.69$, df = 1332, n.s.), the average age of the participants being 12.7 years (SD = 1.55) in Japan and 12.8 years (SD = 1.54) in Finland. As hypothesized, children both in Finland and Japan enjoyed high degrees of independent mobility, although this was significantly higher for Finnish children ($\text{mean}_{\text{Finland}} = 5.8$ and $\text{mean}_{\text{Japan}} = 5.0$ of a maximum 7.0; $t = -8.3$, df = 1318, $p < .001$).

3.2. Affordances of the urban environment

Respondents marked a total of 3836 meaningful places across the two countries (2114_{Finland} and 1722_{Japan}). Japanese children marked on average more places (3.5) per child than Finnish children (2.5) ($t = 3.4$, df = 930, $p < .001$). Out of these places, 3749 (97.7%) were within a range of 20 kilometers from children's homes. Only the places marked within this range were considered for further analyses, as this captured most places that could feasibly be accessed rather frequently and thus these places could be part of children's daily lives.

Table 1. The classification of behavior settings used in the expert audit.

	Openness		Communality		
Place function	Indoor	Outdoor	Child-specific	Shared	Land use
Shopping mall	*			*	Commercial
Small shop	*			*	Commercial
Bookstore	*			*	Commercial
Game/DVD shop	*			*	Commercial
Karaoke	*			*	Commercial
McDonald's/Restaurant	*			*	Commercial
School	*	*	*		Educational
Cram school	*		*		Educational
Library	*			*	Educational
Field		*		*	Nature
Forest		*		*	Nature
Beach		*		*	Nature
River bank		*		*	Nature
Pond		*		*	Nature
Biotope		*		*	Nature
Sports hall	*			*	Recreational
Sports field		*	*		Recreational
Park		*		*	Recreational
Parking lot		*		*	Traffic
Street		*		*	Traffic
Train station	*	*		*	Traffic
Vacant lot		*		*	Other
Construction site		*		*	Other
Shrine/church	* (Fin)	* (Jap)		*	Other

On their meaningful places, children identified the total of 13,264 affordances. On average, the Finnish children marked significantly more positive affordances than Japanese children ($\text{mean}_{\text{Finland}} = 3.32$, $\text{mean}_{\text{Japan}} = 2.70$, $t = -7.33$, $\text{df} = 3584$, $p = .000$). The number of negative affordances did not differ between the countries. The distribution of affordances across the three main categories differed: Both positive ($t = -6.96$, $\text{df} = 3487$, $p < .001$) and negative ($t = -2.31$, $\text{df} = 3539$, $p = .021$) *social* affordances were marked significantly more often in Finland than in Japan ($\text{mean}_{\text{Finland}} = 0.98$, $\text{mean}_{\text{Japan}} = 0.56$ and $\text{mean}_{\text{Finland}} = 0.17$, $\text{mean}_{\text{Japan}} = 0.12$, respectively). Also positive *emotional/contextual* affordances were marked significantly more in Finland ($\text{mean}_{\text{Finland}} = 1.51$, $\text{mean}_{\text{Japan}} = 1.12$, $t = -4.54$, $\text{df} = 3586$, $p < .001$) while positive *functional* affordances were identified more often in Japan ($\text{mean}_{\text{Finland}} = 0.84$, $\text{mean}_{\text{Japan}} = 1.00$, $t = 3.17$, $\text{df} = 3497$, $p = .002$).

A more detailed analysis of affordances revealed that the two countries were significantly different in most of the subcategories of the affordances (Table 2). As part of positive social affordances, Finnish children marked significantly more affordances to meet friends and boys and girls, be themselves, and to be with animals than their Japanese peers. Among positive emotional affordances, Finnish children marked more places that afford good memories, fresh air, and experiences of beauty and cheerfulness. In terms of functional affordances, the Japanese children marked significantly more affordances for recreational and competitive sports and games while Finnish children marked more affordances for exploration. In the case of negative affordances, the difference between the two countries was significant only for a limited number of subcategories. Finnish children marked significantly more often places with bad memories and Japanese children marked more dangerous places.

3.3. The location of children's meaningful places and their accessibility

The average distance from children's home to their closest marked meaningful place was longer in Finland compared to Japan (2.39 km vs. 1.06 km respectively, $t = -13.8$, $\text{df} = 3688$, $p < .001$). The same pattern was found for average distance from school to their closest meaningful place (3.86 km vs. 1.24 km, $t = -9.6$, $\text{df} = 3688$, $p < .001$). In Japan, 75% of meaningful places were within 1

km from home, while in Finland this was significantly less (53%). Figure 2 shows the higher concentration of meaningful places around schools in Japan compared with Finland. The home–place distances were also significantly correlated with home–school distances ($r = 0.32$, $p < .0001$) in the dataset from both countries.

To further study how accessible meaningful places were for children in Japan and Finland, we compared the travel modes that children use to reach these places. The tendency to use motorized travel modes was higher in Finland, where 33.1% of journeys were made inactively compared to Japan, where only 9.3% of journeys were made with motorized travel modes and the vast majority (90.7%) of affordances were reached using active travel modes (walking, cycling). These travel mode-related differences were highly significant ($X^2 = 289.9$, df = 3, $p < .0001$). Even when considering only affordances that were within the range of 2000 m from home (considered a distance that allows cycling or walking), Finnish children had still a higher tendency to use motorized travel modes compared to their Japanese peers (10.5% vs. 2.5%, $X^2 = 75.0$, df = 1, $p < .0001$). We also studied how often Japanese and Finnish children accessed their affordances alone, with friends, and with an adult. The share of affordances that were reached accompanied by adults was higher in Japan (12.9%) compared to Finland (6.9%) ($X^2 = 36.5$, df = 2, $p < .001$). Finally, considering the frequency of visitation of affordances, Finnish children had significantly more daily or weekly visits than their Japanese counterparts (82% vs. 62%; $X^2 = 182.8$, df = 2, $p < .001$).

3.4. Behavior settings

A total of 189 places were marked by more than one child in the softGIS survey and were thus treated as behavior settings. 79 behavior settings with 870 meaningful places were marked in Japan, and 110 behavior settings with 779 meaningful places were marked in Finland. In the expert audits, the behavior settings were classified in terms of their openness, communality and land use. The behavior settings did not differ in the two countries in terms of their openness or communality: The behavior settings were most often in outdoor places and were shared with other user groups. There were, however, differences between the countries across different land-use categories ($X^2 = 248.4$, df = 6, $p < .0001$): Behavior settings representing commercial, recreational, and traffic land uses had a higher share in Japan, while natural, educational and other (vacant lot, construction site) places were characterizing the Finnish behavior settings (Table 3).

The type of behavior settings differed between the age groups. In relation to the openness of places, primary school children used more outdoor and hybrid places, while secondary age group marked more indoor settings ($X^2 = 75.6$, df = 2, $p < .0001$). Also the prevalence of behavior settings by land use varied ($X^2 = 131.5$, df = 6, $p < .0001$): Educational, recreational, natural, religious and other land uses were more popular among primary school-aged children, while commercial and traffic land uses were more frequently reported by secondary school pupils. Also, gender contributed to some land-use related differences ($X^2 = 42.5$, df = 5, $p < .0001$); educational, commercial, natural, and traffic land uses were more popular among girls, while recreational, religious and other places were more popular among boys. There were no gender or age differences in the communality of places.

Because each behavior setting consisted of affordances marked by two or more children, it was also possible to evaluate the experiences of children in these settings (Table 3, the right column). An analysis of positive and negative affordances revealed that outdoor places were significantly more positively perceived in Finland while hybrid places received more positive commenting in Japan. Shared places were perceived more positively in Finland while child-specific places were more positively rated in Japan. Finally, in relation to the various land-use categories, recreational and natural settings were experienced more positively in Finland while in Japan the educational and religious settings were perceived more positively. Indoor and commercial settings were perceived very positively in both countries and traffic environments least positively compared to all other categories.

Table 2. Proportion of affordances marked, by subcategories and country.

	Social				Emotional/contextual					Functional				
	% Japan	% Finland	% Total	sig. (*p*)		% Japan	% Finland	% Total	sig. (*p*)		% Japan	% Finland	% Total	sig. (*p*)
Positive affordances														
meet friends	11.9	20.5	16.5	**.000**	feel good place	16.7	19.5	18.2	**.030**	hanging out	22.3	18.1	20	**.002**
Lively	12.1	12.5	12.3	.714	relaxing	18.9	15.7	17.2	**.012**	recreational sports	16.4	10	12.9	**.000**
be myself	6.3	14.6	10.8	**.000**	good memories	11.6	22	17.2	**.000**	competitive sports	13.4	6.9	9.9	**.000**
make new friends	6.1	8.5	7.4	**.006**	safe	13.3	16.5	15	**.008**	city life	11.5	8.3	9.7	**.001**
meet boys & girls	0.7	11.3	6.4	**.000**	exciting	11.7	15.2	13.6	**.002**	games	13.8	4.6	8.8	**.000**
no control	4.7	6.6	5.7	**.014**	cheerful	9.6	14.9	12.5	**.000**	nature	8.3	6.8	7.5	.079
be with adults	3.9	6.1	5.1	**.002**	fresh air	6.6	13.9	10.5	**.000**	moving around	6.3	8.6	7.5	**.011**
privacy	2.9	4	3.5	0.084	calm	10.4	9.7	10	.503	exploring	4	8.4	6.4	**.000**
be with animals	0.8	4.8	2.5	**.000**	clean	8	11.2	9.7	**.001**	chores	2.5	6.9	4.9	**.000**
impress others	0	0	0		beautiful	4.4	9.6	7.2	**.000**	other activities	2.4	5.1	3.9	**.000**
Negative affordances														
strict control	4.7	6.6	5.7	**.014**	bad memories	11.6	22	17.2	**.000**	nothing to do	2.5	1.3	1.9	**.008**
unpleasant gangs	0.9	2	1.5	**.007**	dangerous	6.3	2.8	4.4	**.000**	bad condition	1.1	1.1	1.1	.982
arguing	1	1.7	1.4	.059	dirty	3.4	2.8	3.1	.337	forced to go	0.2	0.9	0.6	**.003**
scary adults	1	1.5	1.3	.125	boring	2.7	3.5	3.1	.182	Parent's don't allow	0.5	0.3	0.4	.275
hectic & crowded	1	1.1	1.1	.763	stressful	3.5	2.7	3.1	.178	extreme weather	0.3	0.5	0.4	.325
bullying	0.7	1.2	1	.083	noisy	3.3	2.7	3	.295	physical barriers	0.2	0.4	0.3	.212
feel outsider	0.5	0.7	0.6	.632	polluted air	2.8	2.2	2.5	.274	company needed	0.4	0.1	0.2	.053
no one around	0.7	0.5	0.6	.419	feel bad place	2.2	2.4	2.3	.719	cannot afford	0.2	0.2	0.2	.710
lonely	0.6	0.5	0.6	.717	ugly	1.8	2.4	2.1	.212	closed	0.1	0.2	0.2	.693
kids not tolerated	0.2	0.5	0.4	.190	sad	1.8	1.5	1.7	.529	traffic danger	0	0	0	

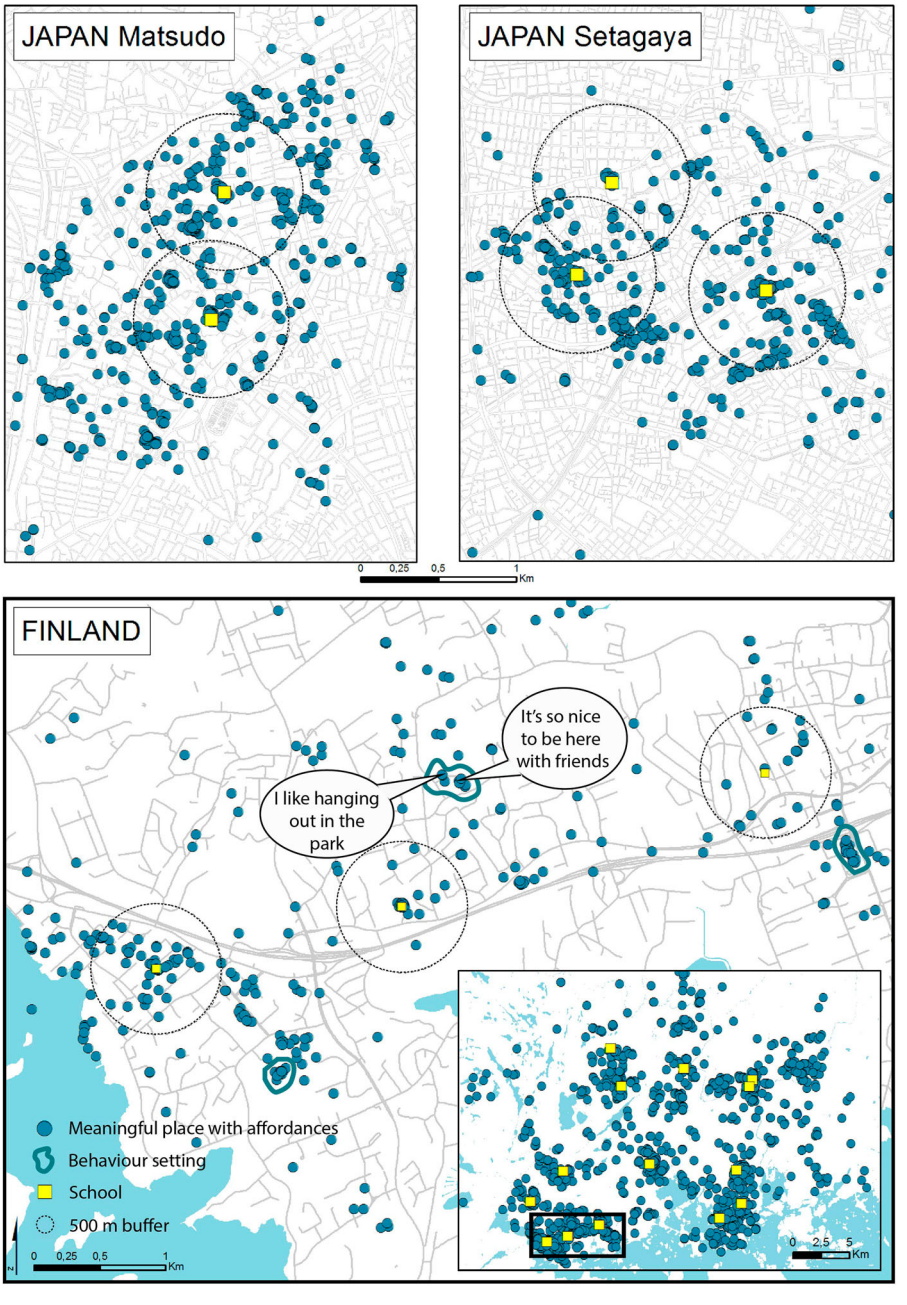

Figure 2. The meaningful places located in Finland further away from home and school than in Japan.

4. Discussion

This study aimed to identify and evaluate affordances and behavior settings of relevance to children residing in urban areas in Finland and Japan. These settings were purposively selected because of their comparatively high levels of independent mobility and the hypothesis that children with greater levels of independent mobility would have sufficient spatial knowledge and skills to appropriately map meaningful places. The current study findings agree with the recent multi-country study of

children's independent mobility (Shaw et al. 2015), whereby children from Finland and Japan had high levels of parental license for independent mobility and were actively using these mobility possibilities in their everyday life.

Individual participants shared information about an extremely diverse range of affordances across both countries. This aligns with earlier research suggesting children visit a wide and diverse range of destinations in their local environments (Badland et al. 2015; Loebach and Gilliland 2016). Significant differences were observed between countries for all factors examined: number of affordances marked was higher in Japan; distance from home to affordance was higher in Finland; the proportion of affordances within 1000 m from home was higher in Japan; social affordances were higher in Finland while functional and emotional/contextual affordances were higher in Japan; almost all trips were made actively in Japan compared with 67% in Finland; adult accompaniment was higher in Japan; and frequency of visitation was greater in the Finnish group.

Reasons for these differences are unclear – it is likely that the considerable social and cultural differences between the countries in terms of parental directives for their child's license for freedom and subsequent engagement with their local environments may help explain this somewhat. For example, there are differences between the two countries in regard to how the mobility patterns have changed, safety concerns of parents, and community responses to these concerns. In Finland, car trips for school journeys and leisure activities increased between 1998–1999 and 2004–2005 (WSP LT Consultants Ltd 2016 National Travel Survey 2006). Traffic danger, convenience and an opportunity to spend time with their child have been cited as main reasons for parents driving their child to or from school (Kyttä et al. 2015), although there are few reported measures to improve children's independent experiences of their local environments (Fyhri et al. 2011; Kyttä et al. 2015).

In contrast, a study in Japan revealed that the amount of children's car trips reduced during the last three decades (Susilo and Waygood 2012). While convenience and traffic danger are also important reasons for collecting a child, fear of strange adults is also a very common concern in Japan (Malone and Rudner 2011). Safety programs in schools are widespread and school communities typically have initiated many activities (e.g. patrolling school journeys, surveillance cameras, warning buzzers carried by students, children's safe houses, and 'security eyes' by parent–teacher associations) to improve children's safety during home–school travel (Drianda and Kinoshita 2011; Fujita 2011; Mori, Armada, and Willcox 2012).

Other lifestyle differences among children and their families also occur. In Finland, children have more free time to spend alone, with friends and family compared to Japanese children who have longer school days and more organized activities (Omiya, Saito, and Kyttä 2010). Kinoshita (2009) notes that Japanese children's gathering places have become increasingly concentrated in

Table 3. Distribution of behavior settings by their type (in relation to the total number of behavior settings) and the share of positive affordances (in relation to the total number of affordances).

		The type of behavior setting			The share of positive affordances within the behavior setting		
		Finland *n* (%)	Japan *n* (%)	Difference between the countries	Finland *n* (%)	Japan *n* (%)	Difference between the countries
Openness	Indoor	30.9%	34.2%	n.s.	94.4%	91.3%	n.s.
	Outdoor	57.3%	58.2%		89.3%	75.0%	$X^2 = 23.4$, df = 1, $p = .000$
	Both	11.8%	7.6%		60.8%	78.9%	$X^2 = 16.5$, df = 1, $p = .000$
Communality	Shared	78.2%	83.5%	n.s.	92.0%	81.9%	$X^2 = 24.6$, df = 1, $p = .000$
	Child specific	21.8%	16.5%		65.9%	79.9%	$X^2 = 12.4$, df = 1, $p = .000$
Land use	Educational	22.9%	16.5%	$X^2 = 24.6$, df = 5, $p = .000$	65.1%	80.8%	$X^2 = 16.2$, df = 1, $p = .000$
	Commercial	21.9%	26.6%		96.0%	94.2%	n.s.
	Recreational	27.6%	30.4%		95.1%	86.3%	$X^2 = 8.1$, df = 1, $p = .005$
	Natural	22.9%	3.8%		90.3%	46.0%	$X^2 = 36.0$ df = 1, $p = .000$
	Traffic	3.8%	15.2%		33.3%	42.9%	n.s.
	Religious	1.0%	7.6%		25.0%	79.6%	$X^2 = 6.0$ df = 1, $p = .015$

the school and the local government provides after-school programs such as clubs and lessons. In Finland after-school activities are organized only for the youngest pupils, and beyond that most children spend the afternoons alone or with friends.

We conceptualized clusters of affordances as behavior settings, drawing from Barker's (1968) ecological social psychology. While the data collected do not facilitate understanding the elements of time or social practices and rules, this clustering of affordances is still helpful, to generate understandings related to settings that may be of most relevance to children. Although earlier research has suggested a reduction in children's time spent outdoors (Clements 2004; Karsten 2005), outdoor settings and those with shared communality were the most prevalent behavior settings marked across both countries. As this is the first study of its kind, it is challenging to make direct comparisons with previous research. The high number of affordances and behavior settings identified in the current study suggests that these settings were highly accessed by this population.

Similarities between countries were also observed in terms of positive or negative subcategories of affordance dimensions, whereby predominantly negative subcategories were chosen for traffic settings, and the inverse was found for indoor settings. It is worth noting that in the current study, outdoor settings also rated highly, with the proportion of positive comments for Japan and Finland being 75% and 89%, respectively. This suggests that factors other than the level of 'openness' may be more important in terms of affording positive experiences for urban children. Traffic safety is a key factor of importance for children's use and experiences of their local environment. A recent study in New Zealand among 9–12-year-old children revealed a number of traffic concerns, with children's aspirations for a safer and more child-friendly environment encompassing slower traffic, more pedestrian crossings, and less traffic overall (Carroll et al. 2015). Likewise, an examination of children's play spaces in Japan and Indonesia revealed that optimal neighborhood spaces for children in terms of being safe and fun were parks that were car-free (Drianda and Kinoshita 2015). Commercial and indoor settings were evaluated most positively in both countries. Indoor consumption settings such as shopping malls can offer unanticipated positive experiences for youth, including the opportunity to freely 'hang out', be independent, and 'actively do nothing', in settings considered safe by parents (Pyyry 2016).

Differences between the countries were also observed. In Japan, commercial, recreation, and traffic behavior settings were most prevalently marked, and hybrid and child-specific settings were most positively rated. While some earlier research has reported reductions in the use of public street spaces by children (Karsten 2005), recent studies have suggested a resurgence in children's occupation of these settings may be occurring (Tranter and Doyle 1996; Carroll et al. 2015). For Finland, natural and education settings were most prevalent, and shared settings had the most positive responses. The most striking differences were observed for religious and natural land-use categories: religious settings were perceived positively by 80% Japanese but by only 25% Finnish participants, while this pattern for natural settings was 46% for Japanese versus 90% for Finnish children.

4.1. Strengths and limitations

Utilizing a child-centered, place-based PPGIS approach facilitated the identification of settings that may not have been captured using alternative methods. For example, 15% of behavior settings marked by children in Japan were categorized as 'traffic' land use and this proportion was significantly greater than in the Finnish sample (4%). Yet, traffic settings were almost entirely perceived negatively. This finding is of importance as it helps to show that children are capable of identifying opportunities and restrictions that adults may not otherwise see, despite an environment that may be considered child-unfriendly. It is possible that there were built environment differences between the countries that necessitated Japanese children's use of such traffic settings. In the face of restricted environmental opportunities, traffic settings may provide important behavior settings and affordances for the Japanese children. This links well with Oldenburg's third places theory in recognizing settings such as thresholds or transitory spaces as being of utmost importance to children's

experiences and use of their local neighborhood (Oldenburg 1989). Using more traditional methods for capturing information from children may not have yielded such insights (Rasmussen 2004).

The PPGIS approach also allowed the simultaneous analysis of the experiential, place-based knowledge from children and the objective, environmental characteristics. While the expert audit of behavior setting was strength, further analysis on the objective characteristics (e.g. derived from local GIS datasets) would be helpful. Unfortunately, these commensurate 'hard' GIS data were not available from both locations. Another limitation was that pre-determined responses for the positive and negative affordances were used. Although the used affordance taxonomy was partially based on earlier (mainly Finnish) studies, it is possible that it lacked contextual sensitivity, especially in Japan. A two-step procedure could be useful here: a qualitative study in each context could precede the large-scale PPGIS survey and might help ensure that all relevant environmental affordances in each context have been recognized. While the sample was large, representativeness was not established. The findings are specific to the Japanese and Finnish urban contexts only, and results cannot be generalized to other locations.

5. Conclusion

Together these findings help to generate an understanding of the different ways in which children actualize affordances and form behavior settings if they enjoy the freedom to actively use urban space. Recalling this group as a whole has an extremely high level of independence compared with findings from other industrialized nations, we see a pattern emerge whereby it is not necessarily about the context, but how the child actualizes and harnesses the opportunities available to them. Here, Kyttä's (2004) model of environmental child-friendliness can help to understand this phenomenon. According to that model, both independent mobility and the possibility to actualize environmental affordances are fundamental characteristics of child-friendly setting. The active role of the material and social environment that promote both the independent mobility and the actualization of a rich variety of affordances should not be underestimated.

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