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Associations between children's outdoor activities, parental restrictions, and related factors: An empirical study in a Japanese city

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Abstract

This study examines the relationship between parental restrictions and children's outdoor activities and identifies the factors that influence these restrictions. A questionnaire survey of 464 children and 359 parents in an elementary school in Tsukuba City, Japan, revealed that parental restrictions could make children's outdoor activities more structured and supervised. Moreover, strict parental restrictions can change the nature of children's outdoor activities from playing with other children to playing with the accompaniment of adults, and can change their location from public open spaces to private territorial spaces. The results also show that the degree of parental restriction is affected by perceived crime danger at children's playgrounds, social relationships with neighbors, and children's demographic characteristics. Based on these results, this study examines the role of urban planning in the improvement of children's outdoor activities.

Keywords:

Children, Outdoor activity, Independent mobility, Parental restriction, Fear, Crime

1. Introduction

Physical activity is important not only for children's physical development but also for their mental development (Biddle *et al.*, 2004; Boreham and Riddoch, 2001; Ekelund *et al.*, 2004; Page *et al.*, 2005). As mentioned in numerous studies, outdoor, unstructured, unsupervised physical activities and active free play are important for the development of children's autonomy, environmental cognition, and social skills (Burdette and Whitaker, 2005; Fjortoft and Sageie, 2000; Hart, 1979; Moore, 1986; Prezza *et al.*, 2001; Rissotto and Tonucci, 2002). Such activities are also important for one's physical and mental health after one has reached maturity, as there is some evidence supporting the finding that physical and mental development in childhood has a long-lasting effect on physical and mental health in adulthood (Prezza and Pacilli, 2007; Sallis *et al.*, 1992).

In recent years, however, children's activities are reported to be decreasing in many developed countries, including the United Kingdom, Italy, the Netherlands, Finland, the United States, and Australia (Hillman *et al.*, 1990; Horelli, 2001; Karsten, 2005; Kyttä, 2004; Malone, 2007; Prezza and Pacilli, 2007). For example, in the United Kingdom, the proportion of 10- to 11-year-olds who generally walked to school without being accompanied by their parents dropped considerably from 94% in 1970 to 54% in 1990 (Hillman *et al.*, 1990) and to 47% in 1998 (O'Brien *et al.*, 2000). This decrease in the independent mobility of children, which results from tight parental restrictions, is one of the biggest reasons for the decrease in their physical activities (Hillman, 2006; Valentine and McKendrick, 1997). Indeed, it has been empirically shown that children with tight parental restrictions spend less time playing outside than other children (Mackett *et al.*, 2007; Page *et al.*, 2010; Wen *et al.*, 2009). Children whose activities are strictly restricted by their parents are sometimes referred to as "bubble wrapped kids" (Malone, 2007). Although appropriate parental restrictions can make children safe, the current academic discussion in developed countries regards parental restriction as overreaction to actual risk and as having a harmful effect on the sound development of children (Gill, 2007).

Why do parents "bubble wrap" their children? In summarizing previous studies, the factors that influence parental restrictions can be divided into three categories. The first factor is the demographic characteristics of the children. Parental restriction tends to be most strict when children are female, young, or members of an ethnic minority (Blakely, 1994; O'Brien *et al.*, 2000; Prezza *et al.*, 2001). The second factor is the physical and social environment of neighborhoods. Parents living in urbanized, playground-less, dangerous, or economically disadvantaged areas tend to

constrain their children strictly (O'Brien *et al.*, 2000; Prezza *et al.*, 2001; Prezza *et al.*, 2005). The third is relationships between parents and neighborhoods. Parental restriction tends to tighten when parents perceive danger, especially from traffic or crime, or perceive a lack of "sense of community" and neighborhood relations (Carver *et al.*, 2008; Carver *et al.*, 2010; Prezza *et al.*, 2001; Prezza *et al.*, 2005; Valentine and McKendrick, 1997; Veitch *et al.*, 2006). That is, parents tend to restrict children's outdoor activities when they perceive a high risk of their children becoming victims of crimes and traffic accidents, due to the vulnerability of children, the existence of danger, and the lack of help from neighborhood residents when dangerous incidents occur.

Japan is known for its safeness against crimes and traffic accidents. Indeed, the victimization rate of ten conventional crime types in Japan is the second lowest of the Organization for Economic Cooperation and Development (OECD) countries (Van Dijk *et al.*, 2008). Japan also has one of the lowest mortality rates associated with traffic accidents of any developed country in the world (International Road Federation, 2010). Owing to this safe environment, most children in Japan can still walk to and from school without their parents' accompaniment. Recently, however, rapidly rising parental fear, especially regarding crime, has constrained children's independent behavior. According to a recent public opinion survey, 74% of Japanese parents "often" or "sometimes" fear the victimization of their children (Cabinet Office, 2006). Although no public opinion survey has focused on parental fear of children being in traffic accidents, one survey of 1,875 parents conducted by the National Research Institute of Police Science in Japan shows that the number of parents who fear child victimization in traffic accidents is as high as the number of parents who fear child victimization from crime (National Research Institute of Police Science, 2008). "Bubble wrapped kids" may therefore be born even in Japan because of heightened parental fear for children.

Urban planning can help solve social problems through improving social and physical environments. In order to achieve this, it is necessary to reveal the mechanisms or structures of social problems based on empirical data. Thus, it is also necessary to identify the associations between children's outdoor activities, parental restrictions, and related factors.

Considerable qualitative and quantitative studies have been conducted to identify the factors that shape parental restrictions, as reviewed above, and to examine the effects of parental restrictions on children's outdoor activities. However, there are some limitations to these existing studies. Firstly, the majority of previous studies have surveyed either children or parents only. Parental restrictions perceived by children are not always equal to actual parental restrictions. Similarly, children's outdoor activities

as perceived by parents may only be partial. It is necessary to survey both children and parents in order to identify the true relationship between children's outdoor activities and parental restrictions. Secondly, few studies associate children's outdoor activities and parental restrictions with actual physical space. The spatial relationships between children's outdoor activities and parental restrictions are unclear because most existing studies have been based on normal questionnaire surveys. It is therefore necessary to reveal the specific places in which children's outdoor activities are blocked by parental restrictions in order to constructively discuss the improvement of playgrounds from the aspect of spatial planning. Thirdly, few studies comprehensively discuss the association between children's outdoor activities, parental restrictions, and other related factors, although some hypotheses can be developed by combining separate studies. Because various factors play a role in shaping parental restrictions and because parental restrictions on children's activities can ultimately have significant consequences for the sound development of children, it is important to comprehensively investigate the relationships between children's outdoor activities, parental restrictions, and related factors.

Finally, most previous studies of children's independent mobility have been conducted in Western countries. In particular, few such studies have been conducted in Asian countries (Lin and Chang, 2010). It is important to accumulate studies in other countries for the overall body of knowledge in urban planning, since the relationship between children's activities and parental restrictions can reflect diverse cultural contexts. Therefore, the present study was conducted in Japan with the goal of overcoming the difficulties of the previous studies.

The purpose of this study was to identify the associations between children's outdoor activities, parental restrictions, and related factors in Japan from cognitive and spatial viewpoints, using questionnaire surveys containing maps that were conducted with both children and parents. The study aimed to answer the following research questions:

- 1) How does parental restriction affect children's outdoor activities in Japan?
- 2) By what factors is parental restriction shaped?

2. Methods

2.1 Study area

The study was conducted at an elementary school located in Tsukuba City, Ibaraki Prefecture, Japan. Tsukuba City is located about 50 km northeast of Tokyo, and

is one of several suburban cities around metropolitan Tokyo. Tsukuba City has built a new railway system and has been rapidly urbanizing. Due to its increasing population and changing traditional community relationships, parental fear has been rising and children's social and physical environments have changed. Thus, Tsukuba City is an ideal study site in which to examine the effects of urbanization on parental restrictions and children's outdoor activities.

The school in which the study was conducted is located in a rural area, but includes two newly developed residential areas (Fig. 1). About 72% of the children who attend the school live in these two residential areas and the population densities of these areas are higher than those of other areas are. The school district includes several shrines (*jinja*) and coppices (*satoyama*) where children usually play. Additionally, four block parks and two neighborhood parks are located in the two residential areas (Fig. 1). It is difficult for adults to supervise their children in many places because about 60.8% of the land use of the school district consists of agricultural and wooded areas. Due to these physical characteristics, parental fear about children walking to and from school is high, even though serious crimes against children have not actually occurred in the area. In order to relieve parental fear, teachers accompany children when they go home from school on weekdays.

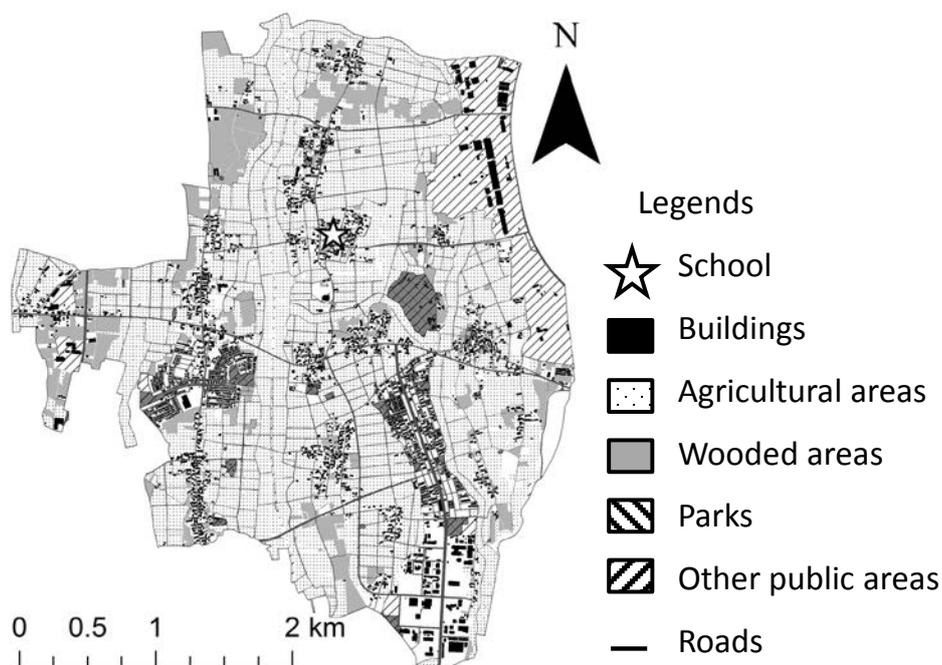


Figure 1. Map of the study area

2.2 Procedure

A questionnaire survey was conducted at the elementary school in 2009. Prior to the study, the objective of the survey was explained to the educational committee of Tsukuba City, the director of the school, and all parents of children in the school. The subjects of the study were all of the schoolchildren aged 6 to 12 years ($n = 540$) and their parents ($n = 400$). The questionnaire consisted of two separate booklets. One was designed to be answered by both children and parents, while the other was designed for parents only. Both questionnaires were assigned household identification numbers and merged for data analysis. Children were asked to answer with their parents' help when it was difficult to understand questions. Additionally, a map of the school district was attached to the questionnaire in order to directly identify answers to some questions.

Of the 540 questionnaires distributed to the children, 464 were returned. Of the 400 questionnaires distributed to the parents, 359 were returned (the response rates were 85.9% and 89.8%, respectively). A more detailed profile of respondents is shown in Table 1.

Table 1. Profiles of respondents

Children (N = 464)	
Gender	
Boy	234 (51.0%)
Girl	225 (49.0%)
School Year	
1st (6–7 years old)	68 (14.7%)
2nd (7–8 years old)	82 (17.7%)
3rd (8–9 years old)	96 (20.7%)
4th (9–10 years old)	81 (17.5%)
5th (10–11 years old)	72 (15.5%)
6th (11–12 years old)	65 (14.0%)
Parents (N = 359)	
Gender	
Male	34 (10.5%)
Female	290 (89.5%)
Average age	38.06 (SD = 4.34)
Average length of residence (yrs)	9.61 (SD = 10.67)
Residential area	
Newly developed area	234 (72.1%)
Other area	88 (27.3%)
Household income per year	
Less than 3 million yen	22 (8.4%)
3–6 million yen	84 (31.9%)
6–9 million yen	101 (38.4%)
More than 9 million yen	56 (21.3%)
Car ownership	327 (97.9%)
House type	
Private owned single family house	290 (87.1%)
Rented single family house	13 (3.9%)
Rented apartment house	30 (9.0%)

*There are missing values in each category.

2.3 Measurements

Children were asked to answer questions about their outdoor activities and parents were asked to answer questions about the extent of their restrictions on their children's outdoor activities. Most questions were answered by selecting corresponding

numbers on scales, while some questions required that answers be made using an attached map. Variables in the data and their descriptive statistics are shown in Table 2.

Table 2. Descriptive statistical values of variables

Variables/Subscale name	Content	Response format for choices	% of Y	Min	Max	Mean	SD
Children's outdoor activities							
Types of activities experienced by children	Playing tag or hide-and- seek	Y/N	90.9%				
	Playing ball games		86.6%				
	Playing with playground equipment		81.5%				
	Playing with sand box		74.4%				
	Gathering natural plants or climbing trees		72.8%			-	
	Catching insects		62.7%				
	Playing with handheld game machines (outdoors)		45.7%				
	Exploring unknown places		45.0%				
	Playing with trading cards (outdoors)		37.5%				
	Number of types of activities			-	0	9	5.97
Playmates	Friends of the same age	Y/N	81.9%				
	Brothers and sisters		53.9%				
	Friends in lower classes		32.1%				
	Friends in upper classes		31.7%			-	
	Parents		18.5%				
	Grandparents		10.8%				
Number of playmates			-	0	6	2.29	1.2
Playgrounds	Their houses (outdoors)	Y/N	90.7%				
	Friends' houses (outdoors)		83.2%				
	Parks		79.1%				
	Roads		53.2%				
	Vacant lots		30.4%				
	Children's recreational facilities (outdoors)		22.0%			-	
	The schoolyard after school		18.3%				
	Stores		11.2%				
	Coppices		10.6%				
	Shrines and temples		1.5%				
Number of playgrounds			-	0	8	4.00	1.5
Locations of playgrounds			-	1	3	2.36	0.8

Table 2. Descriptive statistical values of variables (Cnt.)

Variables/Subscale name	Content	Response format for choices	% of Y	Min	Max	Mean	SD
Parental restriction and its factors							
<i>Parental Restrictions</i> (<i>alpha</i> = 0.73)	Coming home from school	always, often, sometimes, never	-	1	4	1.68	1.06
	Going to friends' houses					2.01	0.91
	Going to neighborhood parks					2.01	0.99
<i>Crime danger perception</i> (<i>alpha</i> = 0.75)	Parks	very safe, relatively safe, neither, relatively	-	1	5	3.39	0.80
	Shrines					3.98	0.74
	Route to and from school	dangerous, very dangerous				3.68	0.78
	Other roads					3.87	0.73
<i>Traffic danger perception</i> (<i>alpha</i> = 0.81)	The traffic is heavy in this school district	strongly disagree, relatively				3.19	0.70
	There is a risk of road accidents on the roads of this school district	disagree, relatively	-	1	4	3.18	0.66
	There are dangerous intersections in this school district	agree, strongly agree				2.94	0.75
	Drivers do not respect the traffic rules in this school district					3.10	0.74
<i>Neighborhood network size</i> (<i>alpha</i> = 0.75)	Say hello to each other	none, one, two to three, four to five, more than six	-	1	5	4.74	0.65
	Have short conversations when they meet on the street					4.00	1.03
	Borrow and lend daily goods					3.28	1.15
<i>Sense of community</i> (<i>alpha</i> = 0.67)	I can identify people who live in this school district	strongly disagree, relatively				2.93	1.13
	Residents in this school district can solve problems on their own	disagree, relatively	-	1	4	3.00	0.88
	Residents in this school district do not know each other [R]	agree, strongly				2.99	0.92
	It is bothersome to socialize in this school district [R]	agree				3.50	0.86
Residential environment	Newly developed residential areas	Y/N	73.5%				
	Other areas		26.5%				
Locations of playgrounds where parents allow children to play			-	1	3	1.42	0.66
Locations of playgrounds where parents prohibit children from playing			-	1	3	1.52	0.73

2.3.1 Children's outdoor activities

2.3.1.1 Types of activities experienced by children

Nine types of children's outdoor activities ("playing tag or hide-and-seek," "playing ball games," "playing with playground equipment," "playing with sand box," "gathering natural plants or climbing trees," "catching insects," "playing with handheld game machines (outdoors)," "exploring unknown places," and "playing with trading cards (outdoors)") were selected from previous studies conducted in Japan (Kajiki *et al.*, 2002; Sato and Nakamura, 1986). The children were asked whether they had experienced each type of outdoor activity (multiple answers were allowed).

2.3.1.2 Playmates

The questionnaire asked children about their usual playmates based on six categories. The children were allowed to choose as many categories as applied to them. The six playmate categories were "friends of the same age," "brothers and sisters," "friends in lower classes," "friends in upper classes," "parents," and "grandparents."

2.3.1.3 Playgrounds

The questionnaire presented ten types of places in which children often play, including "their houses (outdoors)," "friends' houses (outdoors)," "parks," "roads," "vacant lots," "children's recreational facilities (outdoors)," "the schoolyard after school," "stores," "coppices," and "shrines and temples," and asked children to identify as many places as applied to them.

2.3.1.4 Location of playgrounds

In addition to types of playmates and playgrounds, our survey also investigated the actual locations of playgrounds in order to analyze the spatial relationships between parental restrictions and children's playgrounds. The children were asked to indicate the places where they often played by placing stickers on a map. The size of each sticker was five millimeters in radius and the size of the map was 297 millimeters × 420 millimeters (A3 size). Each respondent received a number of maps to cover the entire school district. The map was created by the authors using existing GIS data with a scale of 1:5,000. The children could each indicate up to three places.

2.3.2 Parental restrictions and related factors

2.3.2.1 Parental restrictions

Parental restrictions on children's outdoor activities were measured by asking parents to rate the extent of restrictions on their children's everyday activities, in

keeping with previous studies (Hillman *et al.*, 1990; Prezza, 2007). The questionnaire covered three types of activities that could be restricted by parents to some extent: “coming home from school,” “going to friends’ houses,” and “going to neighborhood parks.” The parents chose how often they allowed each activity to be done without accompaniment by adults from the following response categories: “always,” “often,” “sometimes,” and “never.” Parental responses were converted to scores, with “always” as 1 and “never” as 4. A factor analysis was conducted to create a summary measure that represented the extent of parental restrictions on children’s outdoor activities. After checking that the internal consistency of the responses was acceptable (Cronbach’s $\alpha = 0.73$), a factor score was used in subsequent regression analyses.

2.3.2.2 Crime danger perception

The questionnaire evaluated parental perceptions of safety in terms of crime victimization. In particular, perceived safety was assessed for four typical public playgrounds (“parks,” “shrines,” “route to and from school,” and “other roads”) using a five-point scale ranging from “very safe” (1) to “very dangerous” (4). We calculated a factor score that represented parents’ crime danger perception of the four places and included it in subsequent regression models (Cronbach’s $\alpha = 0.75$).

2.3.2.3 Traffic danger perception

In addition to perceived safety from crime at distinct locations, we also assessed parental perception of traffic danger in the study area. Four statements (“the traffic is heavy in this school district,” “there is a risk of road accidents on the roads of this school district,” “there are dangerous intersections in this school district,” and “drivers do not respect the traffic rules in this school district”) were rated by parents using a four-point scale from “strongly disagree” (1) to “strongly agree” (4) (Prezza *et al.*, 2005). Similar to crime danger perception, we calculated a factor score and used it as a traffic danger perception score (Cronbach’s $\alpha = 0.81$).

2.3.2.4 Neighborhood network size

Parental perceptions of neighborhood social support in case of dangerous situations involving children are negatively associated with the extent of parental restrictions. Parents can let their children go out more easily if they have a large circle of acquaintances in their neighborhood, as they thereby perceive the existence of other people who can care for their children (Huttenmoser, 1995; Prezza *et al.*, 2005). We adapted survey questions that measured neighborhood network sizes from previous surveys, such as the General Social Survey (GSS) in the U.S., and simplified them in

order to reflect Japanese cultural contexts. Parents were asked to list the number of acquaintances who “say hello to each other,” “have short conversations when they meet on the street,” and “borrow and lend daily goods” in their neighborhood using a five-point scale ranging from “none” (1) to “more than six” (5). A factor score was calculated that represented the breadth of parents’ neighborhood network sizes (Cronbach’s $\alpha = 0.75$).

2.3.2.5 Sense of community

The degree of “sense of community” can also be a significant component of social support, along with neighborhood network size. Previous studies that measured sense of community were referred to in this study, and their question wordings were simplified in order to accommodate Japanese cultural contexts (McMillan and Chavis, 1986; Sasao *et al.*, 2003). In particular, the following four questions were used to measure parents’ “sense of community”: “I can identify people who live in this school district,” “residents in this school district can solve problems on their own,” “residents in this school district do not know each other,” and, “it is bothersome to socialize in this school district.” The last two questions were reverse coded before a factor analysis. The parents rated each question using a five-point scale that ranged from “strongly disagree” (1) to “strongly agree” (5). A factor score was calculated and used as the score of the parents’ “sense of community” (Cronbach’s $\alpha = 0.67$).

2.3.2.6 Residential environment

Types of children’s outdoor activities differed considerably between the two newly developed residential areas and other areas in the school district. Children living in the two new areas have many playmates and parks close to their homes, while children in other areas do not. These differences may affect parental restrictions. Therefore, we asked parents to write down the names of their neighborhoods and created a dummy variable by categorizing the answers into “newly developed areas” and “other areas.”

2.3.2.7 Locations of playgrounds where parents allow and prohibit children’s play

One of the critical limitations of the previous studies that examined parental restrictions was that they only evaluated parental restrictions in a general form and failed to examine restrictions in real spaces. It is reasonable to assume that parents do not restrict children’s activities within the entire area of a school district. Rather, parental restrictions must be attached to specific locations. In order to examine the spatial relationships between parental restrictions and children’s playgrounds, we used

maps to identify parental restrictions in spatial terms. The parents were asked to indicate a maximum of three places where they allowed children to play and a maximum of three places where they prohibited children from playing by placing stickers on the maps. The same maps used in the children's questionnaire were used in that of the parents.

2.4 Statistical analysis

2.4.1 Relationship between parental restrictions and children's outdoor activities

Two kinds of analysis were conducted to identify the relationship between parental restrictions and children's outdoor activities. SPSS19.0 and ArcGIS10.0 were used for each analysis. The first analysis focused on the relationships between parental restrictions and children's activities from a cognitive perspective, while the second analysis focused on the spatial aspect. These separate analyses were conducted in order to comprehensively understand the interplay between parental restrictions and children's outdoor activities.

2.4.1.1 Cognitive aspect

The first analysis was composed of two subsets of analyses. A series of regression models were utilized to uncover the effects of parental restrictions on children's activities. Firstly, logistic regression models examined the effects of parental restrictions on children's outdoor activities using each type of outdoor activity, playmate, and playground as dependent variables and parental restriction scores as independent variables. The children's gender, age, and residential area were also used as control variables in this analysis. All independent variables were standardized in order to examine the relative importance of each effect on children's outdoor activities. We also used odds ratios for substantive interpretations. Secondly, a multiple regression analysis was adopted to find a relationship between parental restrictions and the diversity of children's outdoor activities using a sum of the types of outdoor activities, playmates, and playgrounds as dependent variables (for the types of outdoor activities, a squared sum was used because the frequency distribution of the sum of the types of outdoor activities was severely skewed). Independent variables were the same as those in the logistic regression analysis. The statistical significances of the standardized coefficients of parental restriction scores were examined in each analysis, so that the relative strength of each independent variable could be evaluated.

2.4.1.2 Spatial aspect

The second analysis was also divided into two analyses, which were conducted to discuss the relationship between parental restrictions and children's outdoor activities from a spatial point of view using GIS. Firstly, the two nearest neighborhood spatial association measures (Lee, 1979) were calculated and compared in order to examine the spatial relationships between parental restrictions and children's outdoor activities. The first measure assessed the spatial interactions of places in which children are allowed to play by their parents and places in which children actually play. The second measure assessed the spatial interactions of places in which children were prohibited from playing by their parents and places in which children actually played. The nearest-neighbor spatial-association measure R' is calculated by the following expression (1). This statistic approaches zero when two point patterns are clustered, becomes one when two point patterns are randomly distributed, and becomes greater than one when two point patterns are dispersed and regularly distributed.

$$R' = \left\{ \left(\sum_i^{N_A} d_{AB_i} + \sum_j^{N_B} d_{BA_j} \right) / N \right\} / \left(n_A / 2\sqrt{N_B/A} + n_B / 2\sqrt{N_A/A} \right) \quad (1)$$

where d_{AB_i} is the rectilinear distance from point i in series A to the nearest point in series B; d_{BA_j} is the rectilinear distance from point j in series B to the nearest point in series A; N_a and N_b are the number of points of series A and B; n_A and n_B are the ratios of A and B to the total number of points; and A is the size of the area in which all points are distributed.

Secondly, the characteristics of the places in which children were allowed to play or prohibited from playing were examined by overlaying both types of places on a land-use map of the school district and comparing them. Additionally, the places where many parents allowed their children to play or prohibited their children from playing were qualitatively examined based on field observations and overlaying aerial photographs.

2.4.2 Examining factors that influence parental restriction

Structural equation modeling (SEM) was adopted to examine the factors that influence parental restriction. Parental restriction scores and the other variables mentioned above were included in the model. The following model building strategy was used.

The initial model included paths from crime danger perception, traffic danger perception, neighborhood network size, sense of community, residential environment,

and children's age/gender to parental restrictions. The paths that were statistically not significant were deleted, while the paths that were statistically significant were added to the model. The final model, which had statistically significant paths and was in accord with theoretical explanations, was interpreted as the optimum model for this study. Amos 19.0 was used in this analysis.

3. Results

3.1 The relationship between parental restrictions and children's outdoor activities

3.1.1 Cognitive aspect

The percentage of parents who responded that they "always" or "often" allowed their children to come home from school without adult accompaniment was 82.8%. This percentage was 78.0% for going to friends' houses and 74.9% for going to neighborhood parks.

Table 3 summarizes the results of the logistic regression analyses to identify the relationship between parental restrictions and children's outdoor activities. In terms of the direction of associations, the analysis indicates that parental restrictions decreased the likelihood of six of the nine types of activities, although the associations were not statistically significant (Table 3). This trend was similar to the analyses of playmates. Parental restrictions negatively affected four of the six kinds of playmates. Additionally, parental restrictions negatively affected the usage of six of the ten kinds of playgrounds, while some types of activities, playmates, and playgrounds were positively related to parental restrictions. In other words, strict parental restrictions increased the likelihood that children would play with their grandparents, with equipment, and in children's recreational facilities.

Table 3. Results of logistic regression analysis

Variable	Types of activities experienced by children								
	Playing tag or hide-and-seek	Playing ball games	Playing with playground equipment	Playing with sand box	Gathering natural plants or climbing trees	Catching insects	Playing with handheld game machine (outdoors)	Exploring unknown places	Playing with trading cards (outdoors)
	Odds Ratio								
Parental restriction	0.94	1.18	1.39*	1.25	0.77	0.90	0.89	0.83	0.69*
School year	0.92	1.20	0.91	0.82	0.55**	0.85	2.33**	1.33*	1.37*
Gender (girl)	1.03	0.51**	1.02	1.07	1.66**	0.57**	0.61**	0.68**	0.24**
Residential environment (newly developed area)	1.57*	1.26	0.91	1.64**	1.49**	1.25	1.07	1.34*	2.01**

Variable	Playmates					
	Friends of the same age	Brothers and sisters	Friends in lower classes	Friends in upper classes	Parents	Grandparents
	Odds Ratio					
Parental restriction	0.68*	0.68**	0.81	0.90	1.01	1.86**
School year	0.80	0.66**	1.00	0.43**	0.74*	1.07
Gender (girl)	1.06	0.93	0.96	0.93	0.90	0.95
Residential environment (newly developed area)	1.88**	0.82	0.93	0.98	0.75*	0.48**

* Denotes $p < 0.05$

** Denotes $p < 0.01$

Table 3. Results of logistic regression analysis (Cnt.)

Variable	Playgrounds									
	Their houses	Friends' houses	Parks	Roads	Vacant lots	Children's recreational facilities	Schoolyard	Stores	Coppices	Shrines and temples
	Odds Ratio									
Parental restriction	1.08	0.82	0.53**	0.81	0.77	1.32*	1.18	1.04	0.67	0.70
School year	0.98	1.35	0.73	0.72**	0.87	0.66**	0.81	2.13**	1.16	1.32
Gender (girl)	1.15	1.08	0.93	1.11	0.71**	1.10	1.30	0.90	0.47**	1.84
Residential environment (newly developed area)	0.730	0.88	1.61**	2.04**	1.34*	1.47*	0.62**	1.31	1.05	0.24**

* Denotes $p < 0.05$

** Denotes $p < 0.01$

Table 4 shows the results of a multiple regression analysis using the total number of types of play that were experienced by the children, the total number of the kinds of playmates with whom children often play, and the total number of kinds of

places where they often play as dependent variables. Parental restrictions have weak but statistically significant negative effects on the total numbers of kinds of playmates and playgrounds. The diversity of playmates and playgrounds seems to be reduced by strict parental restriction.

Table 4. Results of multiple regression analysis

Variable	Types of activities (squared)	Kinds of playmates	Kinds of playgrounds
standardized partial regression coefficient			
Parental restriction	-0.08	-0.11*	-0.12*
School year	0.08	-0.27**	-0.08
Gender (girl)	-0.30**	-0.05	-0.03
Residential environment (newly developed area)	0.22*	-0.08	-0.17**

3.1.2 Spatial aspect

Fig. 2 shows the distribution of the locations indicated by the parents as places where they allow children to play or prohibit them from playing, and those that children indicated as places where they actually play. The nearest-neighbor spatial-association measure between prohibited places indicated by parents and actual playgrounds indicated by children was 0.76, while that between allowed places indicated by parents and actual playgrounds indicated by children was 0.41. Locations in which children could physically play were not distributed randomly within the school district, so it was not surprising that both measures indicated statistical clustering of locations where children actually played, locations where parents allowed their children to play, and locations where parents prohibited their children from playing. The significance of our analysis, however, was that the locations where children actually played were more closely situated to the locations where parents allowed their children to play than the locations where parents prohibited their children from playing, as indicated by the smaller value of the nearest-neighbor spatial association measure for the former relationship. In other words, children tend to select playgrounds where parents allow them to play rather than those where parents prohibit them from playing.

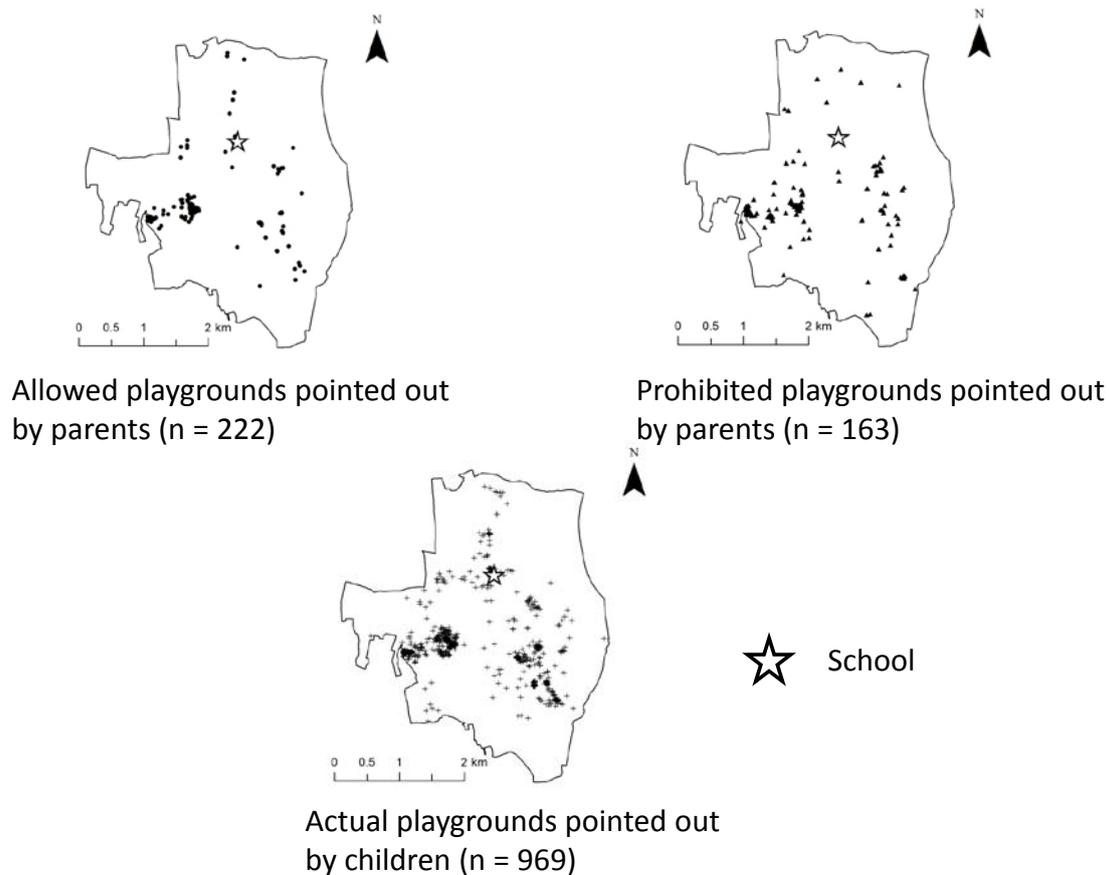


Figure 2. Point distribution maps pointed out by children and parents

Fig. 3 shows the results of the comparison between land use of allowed and prohibited places. Parents tended to indicate wooded, commercial, and other public areas as prohibited places and parks as allowed places ($p < .01$). This result can be confirmed by looking at the allowed/prohibited places in detail. The aerial photographs presented in Fig. 4 are some of the examples of allowed and prohibited places as indicated by the number of parents who chose them.

Picture A is a neighborhood park located in a newly developed area. Open areas along roads or near houses tended to be indicated as allowed places by parents, while wooded and watery areas located in the remote parts of parks were indicated as prohibited areas. Pocket parks that were installed as part of the development of housing estates tended to be indicated as allowed places, as shown in Picture B. Picture C presents a pair of block parks located in a newly developed area. These block parks tended to be indicated as allowed places because of the ease of supervision by parents.

A forest park shown in picture D provides an interesting example, as the park contains a mixture of allowed and prohibited locations. This park has a lot of athletic

equipment, is professionally managed, and is a popular spot for outdoor recreational activities on weekends. Its dense forest, containing many hideouts, may have stimulated parental fear and caused parents to identify it as a prohibited place.

Picture E is a schoolyard. The elementary school where this study was conducted allowed children to play in the schoolyard after school. Schoolyards tended to be indicated as allowed places by parents.

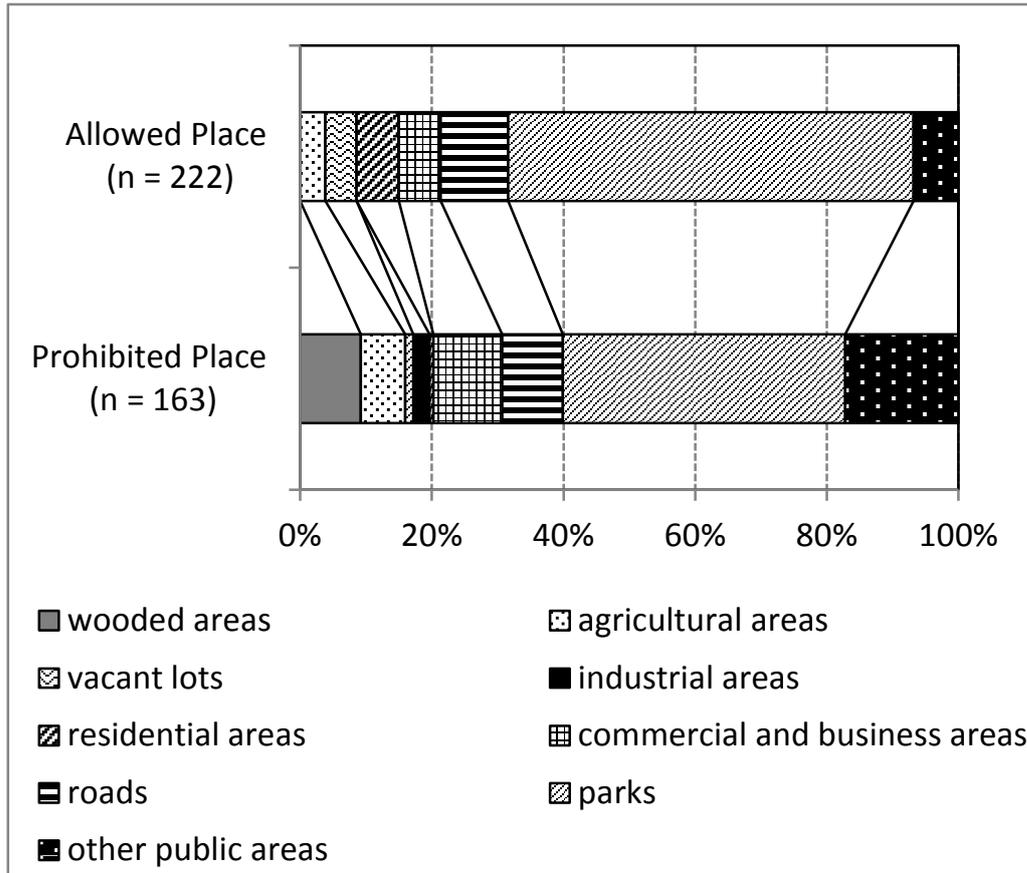


Figure 3. Relationships between allowed/prohibited place and land use

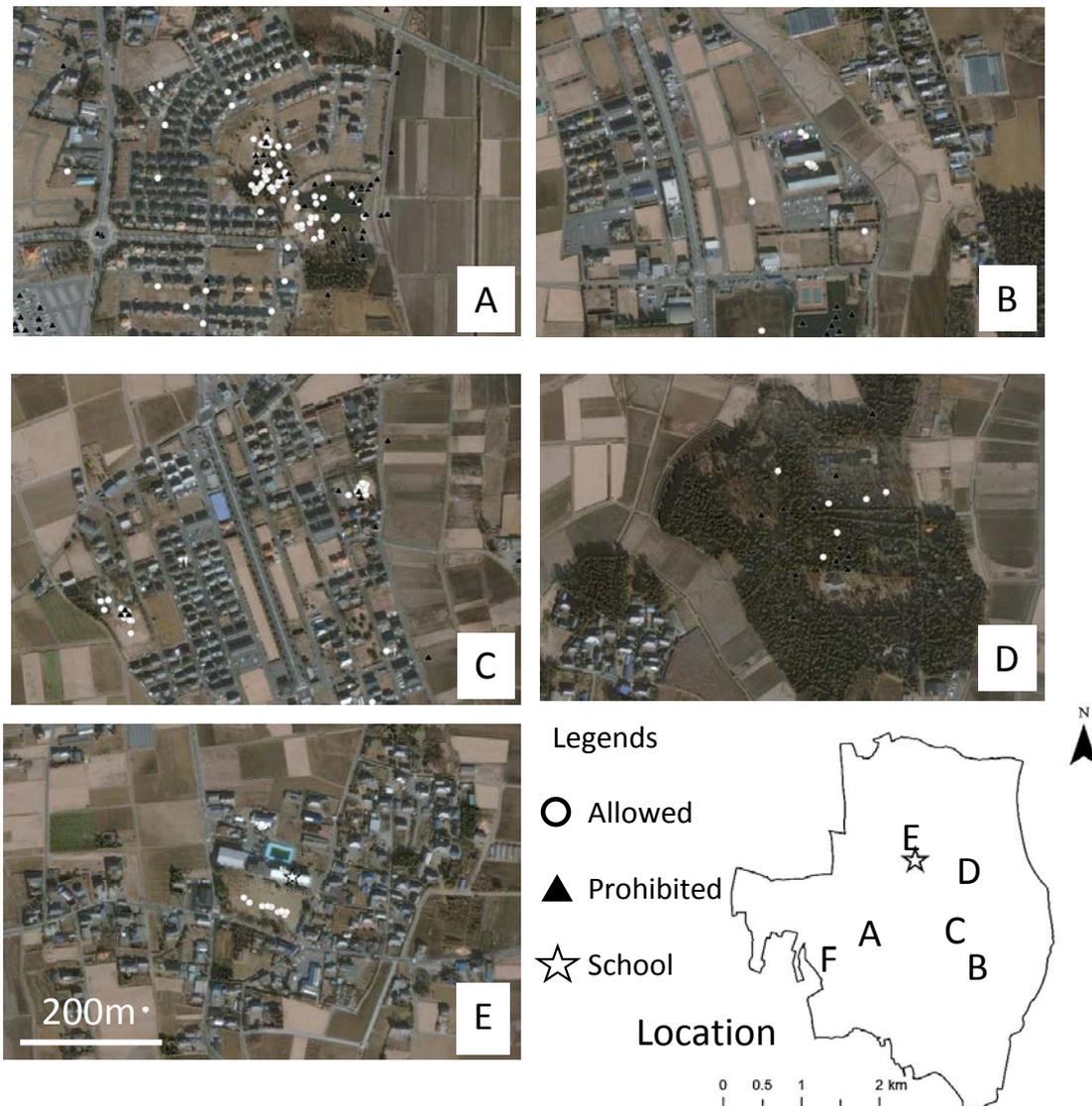


Figure 4. Examples of allowed/prohibited places

3.2 Factors influencing parental restrictions

Fig. 5 shows the results of SEM, which explain the structure of the influences on parental restriction. Our final model excluded non-significant paths as a part of the above-mentioned model building strategy; estimates are not shown in Fig. 5 in order to simplify the presentation of the results. The fitness indices of the model were acceptable (AGFI = 0.969, GFI = 0.986, CFI = 0.986, RMSEA = 0.025).

The model suggests first that parental restriction is affected by children's school year and gender: young and female children tend to be restricted more strictly. Second, children living in the two newly developed areas were restricted less strictly than children living in surrounding rural areas were. Third, parental restriction tightens

when parents perceive danger. However, only the perception of crime danger affected parental restriction. Fourth, traffic and crime danger perception were negatively affected by “sense of community.” Lastly, neighborhood network size and “sense of community” both negatively affected parental restrictions.

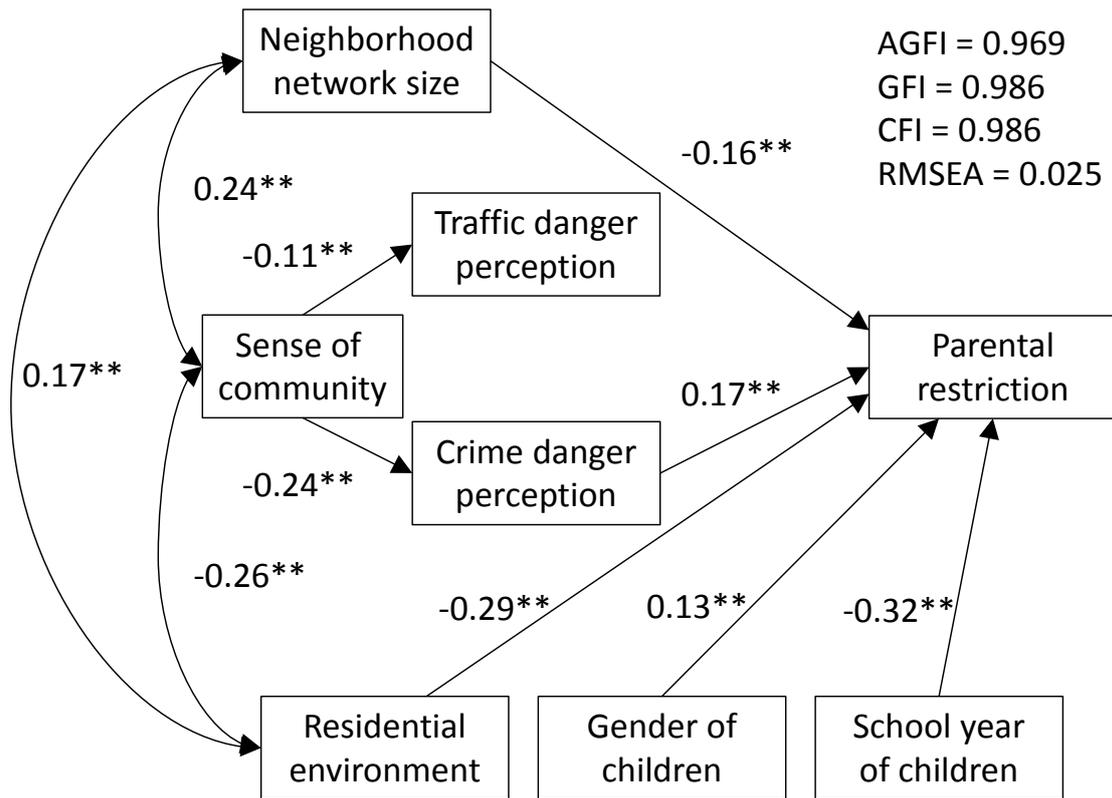


Figure 5. Result of SEM

4. Discussion

Two main findings were revealed by this study. First, parental restrictions can negatively affect children’s outdoor activities in Japan, as shown in other countries. Of the parents surveyed, 70 to 80% allowed their children to perform routine activities, such as coming home from school, without the accompaniment of adults. Although children’s age and measurements of parental restriction are different, this percentage is higher than that of Italy and the United Kingdom (O’Brien *et al.*, 2000; Prezza *et al.*, 2001). Thus, parental restrictions seem to be laxer and children freer in Japan compared to other countries.

Yet, in spite of their low level, parental restrictions do negatively affect children's outdoor activities in Japan. The results of a logistic regression analysis indicate that strict parental restrictions change children's outdoor activities from playing with other children to playing with the accompaniment of adults and change their location from public open spaces to private territorial spaces, although such restrictions do not reduce children's overall experience of each outdoor activity. In sum, parental restrictions change children's outdoor activities into easy-to-supervise activities. This point quantitatively confirms the results of one previous qualitative study (Valentine and McKendrick, 1997). Moreover, the results of our multiple regression analysis show that parental restriction also reduces the diversity of children's playmates and playgrounds.

The result that parental restriction negatively affects children's outdoor activities was also confirmed by our spatial analysis. Children tended to avoid playing in parent-prohibited areas and tended to select playgrounds where their parents allowed them to play when their parents' restrictions were strict. In particular, natural settings, including coppices, water areas, and agricultural areas, tended to be indicated as prohibited places by parents. It is possible that the parental fear of crime evoked by features such as numerous concealed places, low visibility, and difficulty escaping caused these natural settings to be places where children were prohibited from playing (Jorgensen *et al.*, 2002; Nasar *et al.*, 1993).

Previous studies have suggested that unstructured, unsupervised outdoor activities, playing with other children, and playing in green spaces play an important role in the development of children's social skills and autonomy (Fjortoft and Sageie, 2000; Hart, 1979; Moore, 1986). Yet, the results of this study imply the possibility that parental restrictions have a negative effect on children's development in Japan, although this study did not survey children's development directly.

Few previous studies have empirically examined the negative effects of parental restriction on children's outdoor activities (Wen *et al.*, 2009). The strength of this study is its empirical identification of the relationship between parental restrictions and children's outdoor activities based on questionnaire surveys approached from both cognitive and spatial aspects.

The second finding of this study is that children's demographic characteristics and parental perception of environments affected parental restrictions. As expected, it was found that female and younger children tended to be restricted more strictly than male and older children were, as shown by a SEM analysis based on questionnaire survey data. This result is consistent with previous studies (Carver *et al.*, 2008; Prezza,

2007). However, children living in newly developed areas tended to be restricted less strictly than those living in surrounding rural areas, a finding that contrasts with previous works that have found children in urban areas to be more restricted (Kytta, 2004). This result can be interpreted via the physical characteristics of the newly developed areas. These areas have more parks and playgrounds than the surrounding rural areas. The existence of playgrounds near the home can reduce parental restrictions because parents can easily let their children play outside under their supervision (O'Brien *et al.*, 2000; Prezza *et al.*, 2001). The results of this study thereby seem to reflect the physical characteristics of newly developed areas, which have many easy-to-supervise playgrounds.

Parents who perceived danger in their neighborhoods tended to restrict their children more strictly. However, the perception of danger with regard to traffic was not related to parental restrictions, while perceived crime danger was significantly related to parental restrictions. The effect of perceived crime danger on parental restrictions is consistent with previous studies (Carver *et al.*, 2008; Prezza, 2007). The inability to identify the relationship between perceived traffic danger and parental restrictions is difficult to interpret because there is a busy road in the school district in question and parental perception of traffic danger is high, as shown in Table 2. Dangerous places in terms of traffic safety tend to be related to specific locations. Thus, parents find it easier to implement strategies to reduce the likelihood of traffic accidents without restricting children's outdoor activities (e.g., adding traffic lights, creating sidewalks, etc.). Perceived danger in terms of crime victimization, on the other hand, may be more ambiguous and may not necessarily be related to specific locations. That is, perceived danger in terms of crime tends to be more general and impose stricter control over children's outdoor activities because many factors create criminal opportunities and these factors tend to be beyond parents' control. Few studies have empirically examined the relationship between perceived traffic/crime danger and parental restriction. This argument awaits further investigation.

Parents who had close ties to neighborhood residents tended to lessen their restrictions on their children. This result may be caused by parents' trust that neighborhood residents will help their children in case of danger. In fact, in an interview that was conducted prior to this study, several parents told us: "I think residents living in this neighborhood will help my child when he faces danger because my child and I fit well in this neighborhood," and, "I know most of the residents living in this neighborhood. I think there are no 'strange' or 'dangerous' people here, so I can let my child play in this neighborhood at ease." These comments seem to support the

interpretation described above. Similar to perception of danger, the relationship between parent-neighborhood relations and restrictions on children has been seldom studied. Future studies should examine the generalizability of these results.

The results of this study show that reducing parental perception of danger at playgrounds, as well as increasing parental perception of strong neighborhood social ties, is necessary for the relaxation of parental restrictions. The fundamental concept that parental restrictions are constructed by parental perception and children's demographic characteristics has been demonstrated in Italian studies (Prezza *et al.*, 2001, 2005). The ability to identify commonalities among different countries suggests the possibility that this fundamental concept can be generalized. We therefore hope that this concept will be confirmed in other countries in the future.

5. Conclusion

An increase in children's outdoor activities, such as playing outside, serves an important purpose in child development. However, parental restrictions can inhibit these activities. This study examined the relationship between parental restrictions and children's outdoor activities and identified the factors that influence parental restrictions based on questionnaire surveys administered to both parents and children. The results show that parental restrictions can make children's outdoor activities more structured and supervised. Additionally, parental restrictions were shown to be constructed by parental perception of crime danger, ties to the neighborhood, and children's demographic characteristics.

This study proposes two approaches to urban planning that can improve children's outdoor activities. The first is the improvement of playgrounds. A reduction in the perceived risk of crime at playgrounds, accomplished by making supervision by parents easy through changing playground design, can appropriately lead to the improvement of children's outdoor activities. However, there are limitations to this approach. Not only is it difficult to eliminate all blind spots in playgrounds, but also diverse playgrounds, including refuges, sometimes play an important role in children's healthy development. Thus, this study proposes a different approach for urban planners. If parental perception of crime danger decreases and social ties to neighborhood residents become stronger through the urban planning process, children's outdoor play can be encouraged even without special spatial renewal of children's playgrounds. For example, an urban planning concept that aims to relieve fear of crime and enhance neighborhood social cohesion, called the "safer cities approach," "2nd Generation CPTED," or "safe growth," has recently been advocated by urban planners (Saville,

2009; Saville and Cleveland, 2008; Wekerle and Whitzman, 1994). There are similar examples in Japan. Several cities, including Tsukuba City, have begun to create safer and freer environments for children by referring to playgrounds from a safety-from-crime point of view and conducting workshops involving parents and children (Hino, 2011). These efforts can improve children's outdoor activities by changing parental perception of neighborhood environments as well as directly changing playground features. Urban planners can not only built attractive playgrounds for children, but also change residential perception of both playgrounds and relationships among residents by involving residents in the process of improving playgrounds in order to encourage children's outdoor activities.

This study measured children's outdoor activities using children's self-reports. However, these activities can also be measured objectively using a Global Positioning System logger. This study could not directly measure children's mental and physical development, so it will be necessary to measure the indices that relate to children's development, such as body mass index in future studies. A longitudinal study of children's development is also needed in order to explicitly identify the relationship between parental restrictions and children's development.

It is necessary to accumulate similar studies in order to generalize the results. However, the outlook of this challenge appears bright, as similar studies are being conducted in many countries. Comparing the results from multiple countries will be an interesting theme in future studies.

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