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**Parental Altruistic Fear: Environmental Cues and Association with
Children's Outdoor Play**

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Mamoru AMEMIYA *Corresponding Author
1-1-1, Tennodai, Tsukuba, Ibaraki, 305-8573, Japan
Faculty of Engineering, Information and Systems, University of Tsukuba
amemiya@sk.tsukuba.ac.jp

Tomoko Doi HATA
〒356-8533
1196 Kamekubo, Fujimino, Saitama, 356-8533 Japan
The Faculty of Human Studies, Bunkyo Gakuin University
thata@bgu.ac.jp

George KIKUCHI
2576 E San Ramon, MS/ST104, Fresno CA 93740-8029
Department of Criminology, California State University, Fresno
gkikuchi@csufresno.edu

Abstract

This study aimed to identify environmental cues that give rise to parental altruistic fear of children's crime victimization and the relationship between such fear and children's actual outdoor play area choices. Questionnaire surveys with maps to 410 children and 234 parents residing in one school district in Tsukuba City, Japan, were analyzed using a geographical information system. The results indicated parental altruistic fear was evoked by environmental cues similar to cues giving rise to fear of crime in general, including opportunities for concealment and a low level of residents' activity. Furthermore, the locations of children's outdoor play area choices seemed to be influenced by parental altruistic fear, which was spatially concentrated in certain areas of the school district. The implication of parental altruistic fear for children's development and possible measures for reducing parental altruistic fear are discussed.

Keywords: Altruistic fear, Fear of crime, Children, Outdoor play, Spatial analysis

1. Introduction

Japan, where the present study was conducted, has a reputation as a safe country (OECD, 2011). However, despite the low national crime level, a number of surveys conducted recently have indicated that fear of crime among the general Japanese public has been increasing (The Nikkoso Foundation for Safe Society, 2011). In particular, a notable trend is that parental “altruistic fear” (Snedker, 2006; Warr & Ellison, 2000) of their children’s victimization is rising considerably. While fear of crime in general is defined as “an emotional response of dread or anxiety to crime or symbols that a person associates with crime” (Ferraro, 1995, p. 4), altruistic fear is people’s fear that their significant others may become the target of crime (Snedker, 2006). Studies have shown that altruistic fear level tends to be higher than fear of personal victimization (Snedker, 2006; Tulloch, 2004; Warr & Ellison, 2000). This trend is also the case in Japan. According to a recent national public opinion survey, 37.7% of Japanese adults “often” or “sometimes” feel fear of personal victimization, while 50.7% of Japanese parents “often” or “sometimes” worry that their children would be crime victims (The Nikkoso Foundation for Safe Society, 2011; Cabinet Office, Government of Japan, 2013). Parental altruistic fear is particularly elevated in suburban areas in Japan, according to several recent surveys (National Research Institute of Police Science, 2008; 2011; Amemiya, 2012).

In contrast to other developed countries, many suburban areas in Japan developed rapidly without effective urban planning. Therefore, one unique characteristic of Japanese suburban areas is a land use mixture of residential, agricultural, and wooded areas (Yokohari, Takeuchi, Watanabe, & Yokota, 2000). This land use mixture can provide diverse opportunities for children’s outdoor activities. Indeed, children living in Japanese suburban areas often play in not only public parks but also other green open spaces, including agricultural and wooded areas, vacant lots, and grounds of shrines (Senda, 1998). On the other hand, for parents, the existence of diverse green open spaces in residential areas means that their children’s play areas are difficult to supervise. Thus, one of the reasons for elevated parental altruistic fear in Japanese suburban areas is children’s outdoor play in diverse natural settings and parents’ limited awareness of their children’s play areas.

Parental altruistic fear of crime can be considered a subset of general fear of crime. Since the 1960s, fear of crime has been an important theme in various social sciences (Hale, 1996). Studies on fear of crime in environmental psychology can be divided into two categories. The first category is studies that regard fear of crime as consequences. These studies focus on people’s environmental evaluations that precede fear of crime.

Previous studies of this category have shown that places evoking fear of crime are concentrated in certain areas with particular environmental characteristics (Doran & Burgess, 2012; Nasar & Fisher, 1993). In natural settings, the environmental physical characteristics that affect people's fear of crime include physical and social incivilities (e.g., litter, graffiti, loitering teenagers, etc.), isolation, lack of surveillance, low visibility, darkness, and difficulty of escape (Burgess, 1995; Doran & Burgess, 2012; Fisher & Nasar, 1992, 1995; Herzog & Miller, 1998; Jorgensen & Anthopoulou, 2007; Jorgensen, Hitchmough, & Calvert, 2002; Jorgensen, Hitchmough, & Dunnett, 2007; Jorgensen, Ellis, & Ruddell, 2013; Kuo, Bacaicoa, & Sullivan, 1998; Nasar & Fisher, 1993; Nasar, Fisher, & Grannis, 1993; Nasar & Jones, 1997; Parsons, 1995; Robinson, Lawton, Taylor, & Perkins, 2003; Yokohari, Amemiya, & Amati, 2006). Since these environmental cues increase the perceived risk of crime victimization and lower the possibility of help from others, fear of crime at such places is raised. While these studies discussed fear of one's own victimization, it is hypothesized that parental fear of their children's victimization, or altruistic fear, would also be evoked by certain environmental characteristics. However, environmental cues that evoke parental altruistic fear have not been explored in previous studies. If parental altruistic fear relates to certain environmental cues as does fear of crime in general, the places that evoke parental altruistic fear may concentrate in small areas too. Thus, this study examined the geographical concentration of fearful places and environmental cues that evoke parental altruistic fear of their children's victimization.

The second category of studies on fear of crime in environmental psychology focuses on the consequence of the fear. In other words, these studies aim to identify people's behavior that is affected by fear of crime. In particular, the influence of parental altruistic fear on children's behavior has been a key research theme. Previous studies have shown that parental altruistic fear is an important contributor to restrictions of their children's behavior (Alparone & Pacilli, 2012; Blakely, 1994; Carver, Timperio, & Crawford, 2008; Carver, Timperio, Hesketh, & Crawford, 2010; Prezza, Alparone, Cristallo, & Luigi, 2005; Prezza & Pacilli, 2007; Prezza et al., 2001; Valentine & McKendrick, 1997; Veitch, Bagley, Ball, & Salmon, 2006). Moreover, a number of studies have indicated that parental restrictions caused by parental altruistic fear can severely limit their children's outdoor play (Gill, 2007; Hillman, 2006; Hillman, Adams, & Whitelegg, 1990; Malone, 2007; O'Brien, Jones, Sloan, & Rustin, 2000; Valentine & McKendrick, 1997). Outdoor play is important not only for children's physical development but also for their mental development (Biddle, Gorely, & Stensel, 2004; Boreham & Riddoch, 2001; Ekelund et al., 2004; Page et al., 2005). Therefore,

parental altruistic fear can be a key concept in discussing children's physical and mental development. However, while the previous studies discussed above have identified the relationships between parental altruistic fear and the frequency, contents, and number of playmates participating in children's outdoor play, few studies attempted to determine the spatial relationships between places for children's outdoor play and parental altruistic fear, with the exception of a unique study conducted by Veitch and her colleagues (2008). Since parents can prohibit their children from playing in places that evoke parental altruistic fear, such places would be underrepresented in the geographical distribution of their children's outdoor play areas. Thus, this study examined whether parental altruistic fear of specific places severely limits their children's outdoor play area choices.

Therefore, the objectives of this study were to identify the geographical concentration of the places that evoke parental altruistic fear, to uncover the environmental characteristics of fearful places, and to examine the relationship between parental altruistic fear and their children's outdoor play from a spatial perspective.

2. Methods

2.1 Study area

The study was conducted at an elementary school 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 (Yokohari et al., 2006). Tsukuba City finished constructing a new railway system connecting the city and the center of Tokyo directly in 2005 and has been rapidly urbanizing. Because of its increasing population and changes from traditional community relationships, the social and physical environments of children have changed drastically and parental altruistic fear has been assumed to be increasing. Thus, Tsukuba City is an ideal study site to research the effects of environment on people's attitudes and behaviors, including parental altruistic fear.

The school district examined in this study (Figure 1) included several agricultural and wooded areas. Additionally, four small city parks and two neighborhood parks were located in the district. Many children in the elementary school play in not only public parks but also other open spaces including agricultural, wooded areas, vacant lots, shrines, and roads. However, it was difficult for adults to supervise their children in many places because about 60.8% of the land in the school district consists of agricultural and wooded areas. These physical characteristics contributed to

parental altruistic fear even though serious crimes against children had not actually occurred in the area.

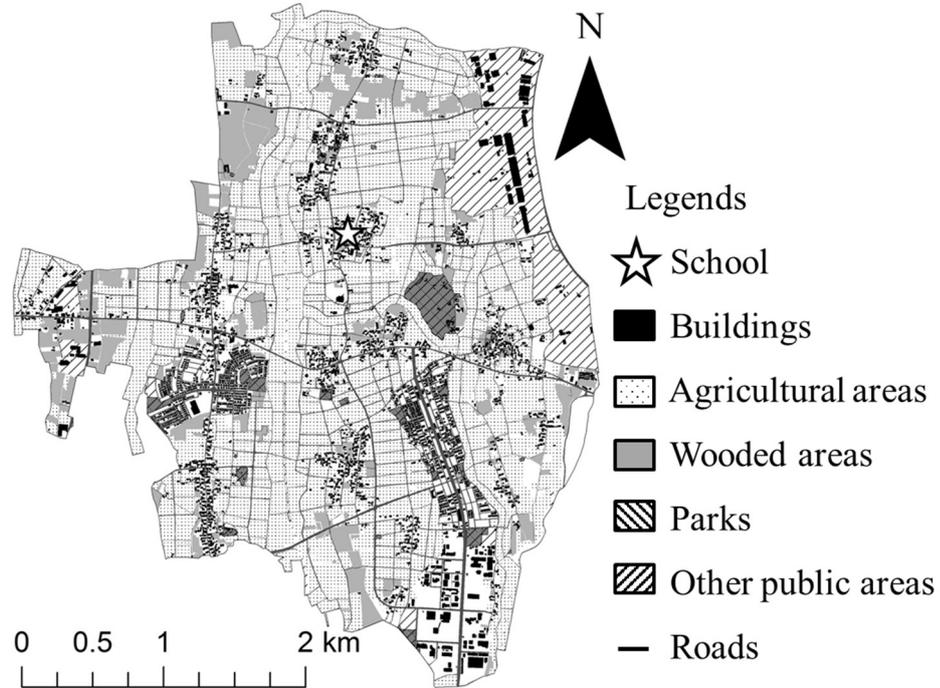


Figure 1: Map of the school district in Tsukuba City in which data were collected

2.2 Procedure

A questionnaire survey using maps 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 the parents of children in the school. The participants of the study were all of the children in the school ($n = 540$) and their parents ($n = 400$). Children's age ranged from 6 (first graders) to 12 (sixth graders) years old.

Of the 540 questionnaires distributed to the children and the 400 questionnaires distributed to the parents, 410 and 234 completed questionnaires, were returned and used in the analysis, respectively. The response rates were 75.9% for the children and 58.5% for the parents. A detailed demographic profile of the respondents is shown in Table 1.

Table 1: Demographic Profile of the Respondents

Children (N = 410)		
Gender		
Boy		210 (51.2%)
Girl		199 (48.5%)
School Year (Age [years])		
1st (6–7)		59 (14.4%)
2nd (7–8)		73 (17.8%)
3rd (8–9)		88 (21.5%)
4th (9–10)		73 (17.8%)
5th (10–11)		64 (15.6%)
6th (11–12)		53 (12.9%)
Parents (N = 234)		
Gender		
Male		22 (9.4%)
Female		209 (89.3%)
Average age		37.88 (SD = 4.06)
Average length of residence (yrs)		8.89 (SD = 10.33)
Household income per year (million yen)		
<3		13 (5.6%)
3–6		59 (25.2%)
6–9		77 (32.9%)
>9		43 (18.4%)
Car ownership		226 (96.6%)
House type		
Privately owned single family		204 (87.2%)
Rented single family house		7 (3.0%)
Rented apartment house		18 (7.7%)

Note. Missing values in each category.

2.3 Data collection

As a part of the questionnaire, we collected data by use of mapping methodology, similar to some previous studies on general fear of crime (Doran & Burgess, 2012; Nasar et al., 1993; Veitch et al., 2008). Each child respondent received a stapled booklet containing eight maps covering the entire school district. The children were asked to indicate a maximum of three outdoor places where they often played by placing stickers on the maps. In order to accommodate children's possibly limited understanding of maps, we asked the children to seek their parents' help, if necessary. The stickers were 5 mm in radius and each map was printed in color on 297 mm × 420 mm white paper (A3, approximately tabloid size). The maps were created by the authors using existing geographical information system (GIS) data with a scale of 1:5,000.

The parents were asked to indicate with stickers a maximum of three places that induced fear when they thought of their children playing there. The reasons for selecting each place were further elicited through open-ended questions. Additionally, the parents were asked to indicate a maximum of three places where they were able to allow their children to play without altruistic fear and a maximum of three places where they prohibited their children from playing because of altruistic fear.

The collected data of selected play areas, fear-inducing places, and permitted/restricted places were entered into the GIS as point features with XY coordinate pairs. The GIS software used in this study was ESRI ArcGIS 10.1 (ESRI, Redlands, CA).

2.4 Data Analysis

2.4.1 Geographical concentration of fearful places

We first examined the geographical concentration of the places that elicited parental altruistic fear by calculating nearest neighbor distances between locations of parental altruistic fear. The nearest neighbor measure R is a measure of spatial clustering of point patterns. R is calculated as shown in Equation 1, in which i is each point; r is the nearest neighbor rectilinear distance between points; n is the total number of points; and A is the size of the area in which all points are distributed (Clark & Evans, 1954).

$$R = \left(\sum r_i/n \right) / \left(0.5/\sqrt{n/A} \right) \quad (1)$$

R becomes 0 when a point pattern is concentrated completely on one point and 1 when a point pattern is randomly distributed. R is greater than 1 when a point pattern is dispersed and regularly distributed. R in this study means the degree to which the places that evoke parental altruistic fear concentrate spatially. In other words, the distribution of places that evoke parental altruistic fear concentrates in small areas when R nears a value of 0.

2.4.2 Characteristics of fearful places

In order to identify the characteristics of the places that evoke parental altruistic fear, two analyses were conducted. First, the physical characteristics were examined by overlaying the coordinates of the fearful places on a land-use map of the school district. Second, the responses to the open-ended questions about parents' reasons for describing certain places as fearful were examined through text mining. We tagged nouns, verbs, and adjectives after parsing sentences, since nouns, verbs, and adjectives would be most likely to express the reasons for place selection. We counted the frequency of each parse and visualized the relationships between the tagged parses by calculating Jaccard indices. The Jaccard index J is calculated as shown in Equation 2, in which x and y represent parses included in descriptions of places eliciting parental altruistic fear. J indicates the degree of co-appearance of words. In this study, the description consisting of words with large J will be interpreted as the description expressing environmental characteristics of the places that evoke parental altruistic fears.

$$J(x, y) = |x \cap y| / |x \cup y| \quad (2)$$

We clustered the parses by using the method proposed by Newman and Girvan (2004); the parses that have strong links with each other are divided into some clusters based on the "modularity index" (Newman & Girvan, 2004). All parses were analyzed as Japanese words, using the Japanese text mining software KH Coder (Higuchi, 2013).

2.4.3 Spatial relationships between parental altruistic fear, permission, restriction, and children's outdoor play

Finally, the nearest neighbor spatial association measures were calculated and compared in order to examine the relationships between the places eliciting parental altruistic fear, places of parental permission/restriction, and children's actual outdoor play locations. The nearest neighbor spatial association measure R' is calculated as shown in Equation 3 (Lee, 1979), where d_{ABi} is the rectilinear distance from point i in Series A to the nearest point in Series B; d_{BAj} 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.

$$R' = \left\{ \left(\sum_i^{N_A} d_{AB_i} + \sum_j^{N_B} d_{BA_j} \right) / N \right\} / \left(n_A / 2\sqrt{N_B/A} + n_B / 2\sqrt{N_A/A} \right) \quad (3)$$

This statistic approaches 0 when two point patterns (e.g., the distributions of fearful places and play areas) are matched completely and becomes 1 when two point patterns are randomly distributed. R' becomes greater than 1 when two point patterns are dispersed and regularly distributed. We compared R' values between the distributions of four location types: places that elicited parental altruistic fear, places where parents permitted their children to play, places where parents restricted their children from play, and places where their children chose as their play areas.

3. Results

3.1 Geographical Concentration of Fearful Places

More than half (148) of 234 parents indicated at least one fearful place. Of 148 in total, 83, 44, and 21 parents indicated one, two, and three fearful place(s) respectively. Therefore, the total number of fearful places indicated by the parents was 234. Figure 2 shows the distribution of the locations indicated by the parents as eliciting fear for their children's safety. As shown in Figure 2, certain places were marked as fearful by many parents. The nearest neighbor measure R was 0.43 ($Z = -16.7$, $p < .001$; Null hypothesis is $R = 1$), which indicates a significant concentration of the places evoking parental altruistic fear. In other words, this result implies that there are "hot spots" of parental altruistic fear of crime in this school district.

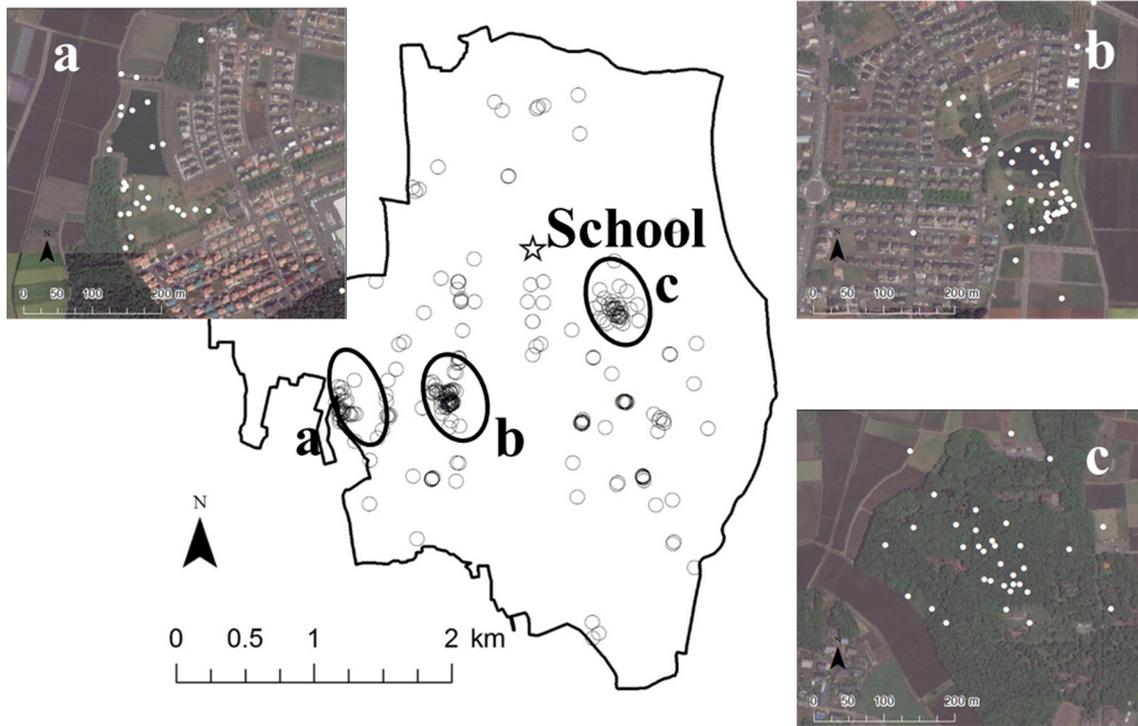


Figure 2: Point distribution map of children's play locations evoking parental altruistic fear (n = 234). Source of Aerial Photo: ESRI World Imagery (Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community)

3.2 Characteristics of Fearful Places

Figure 3 represents the relationship between the places eliciting parental altruistic fear and land use. The parents tended to indicate parks, roads, wooded areas, agricultural areas, and water areas as fearful places and residential areas as safe places. The land use category is therefore assumed to be one of the factors associated with parental altruistic fear.

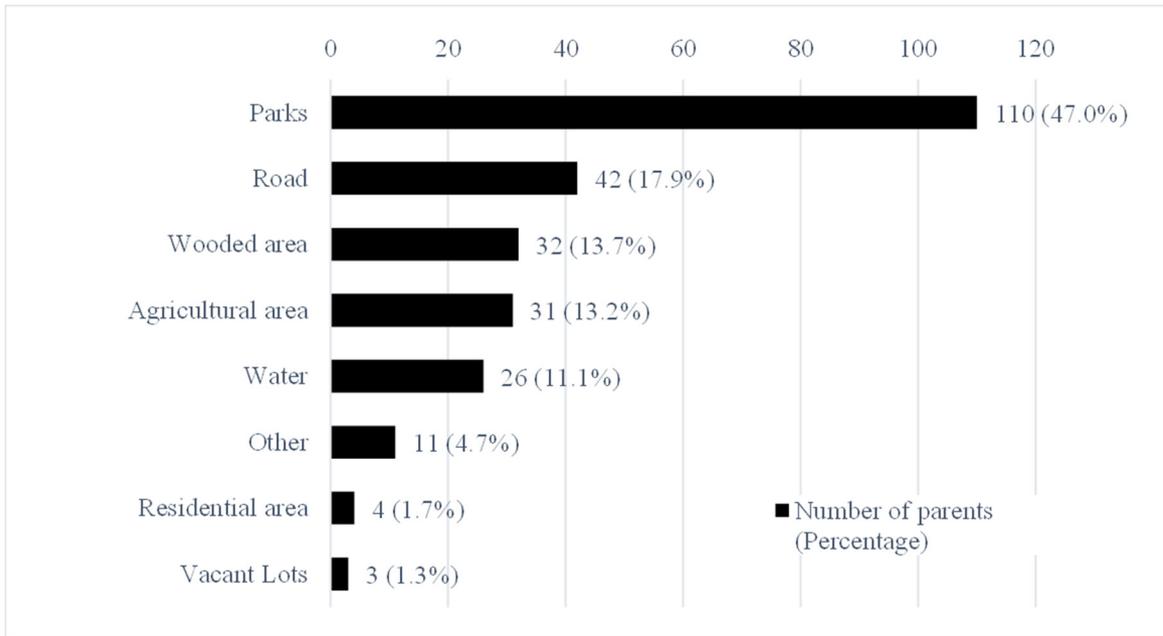


Figure 3: Land use of children’s play locations evoking parental altruistic fear (n = 234).

However, it is difficult to glean more detailed environmental cues of parental altruistic fear from land use categories. This is why we examined parents’ evaluations of fearful places in order to identify additional environmental cues for fear using text mining and Jaccard index. Figure 4 shows the results of the text mining that analyzed open-ended descriptions of reasons for parental altruistic fear. Each of the words in Figure 4 was translated from Japanese into English after analysis. The size of the circles represents the frequency of occurrence of each parse. Bigger circles mean parses are frequently used to explain the environmental characteristics of parental fearful places. The line widths represent Jaccard indices, which indicate co-appearance of parses. The colors indicate clusters of closely connected parses. We can understand environmental characteristics of parental fearful places structurally using the clusters. Figure 4 was drawn after simplifying the text mining results by limiting the frequency of each parse (≥ 5) and the Jaccard index ranks (≥ 1).

3.3 Spatial Relationships between Parental Altruistic Fear, Permission, Restriction, and Children's Outdoor Play

About 70% (n=156) of 234 parents indicated at least one place where they permitted their children to play. Of 156 in total, 105, 36, and 15 parents indicated one, two, three of them, respectively. About 30% (n=76) of 234 parents indicated at least one place where they restricted their children from play. Of 76 in total, 46, 22, and 8 parents indicated one, two, three of them, respectively. All of the children (n=410) indicated at least one play area. Of 410 in total, 72, 120, and 219 children indicated one, two, and three play area(s), respectively. Therefore, a total of 222, 114, and 969 places were indicated as the places where parents permitted their children to play, the places where parents restricted their children to play, and the places where children indicated as their play areas, respectively.

Figure 5 shows the distributions of the places where parents permitted their children to play or restricted them from playing and the places that children indicated as play areas. Table 2 shows the R' nearest neighbor spatial association measures for each combination of the spatial distributions of parental altruistic fear, permission, restriction, and children's actual outdoor play. The R' value between the places of parental altruistic fear and prohibited places was 0.32 ($Z = -21.06$, $p < .001$; Null hypothesis is $R' = 1$), and the R' value between the places of parental altruistic fear and permitted places was 0.84 ($Z = -11.08$, $p < .001$). These results indicate that parents tended to restrict their children from playing in places that elicited parental altruistic fear. The R' value between restricted places and children's actual play areas was 0.68 ($Z = -18.03$, $p < .001$), while the R' value between permitted places and children's actual play areas was 0.41 ($Z = -35.00$, $p < .001$). These results indicate that parental restrictions on their children's outdoor play were spatially correlated with children's actual outdoor play area choices.

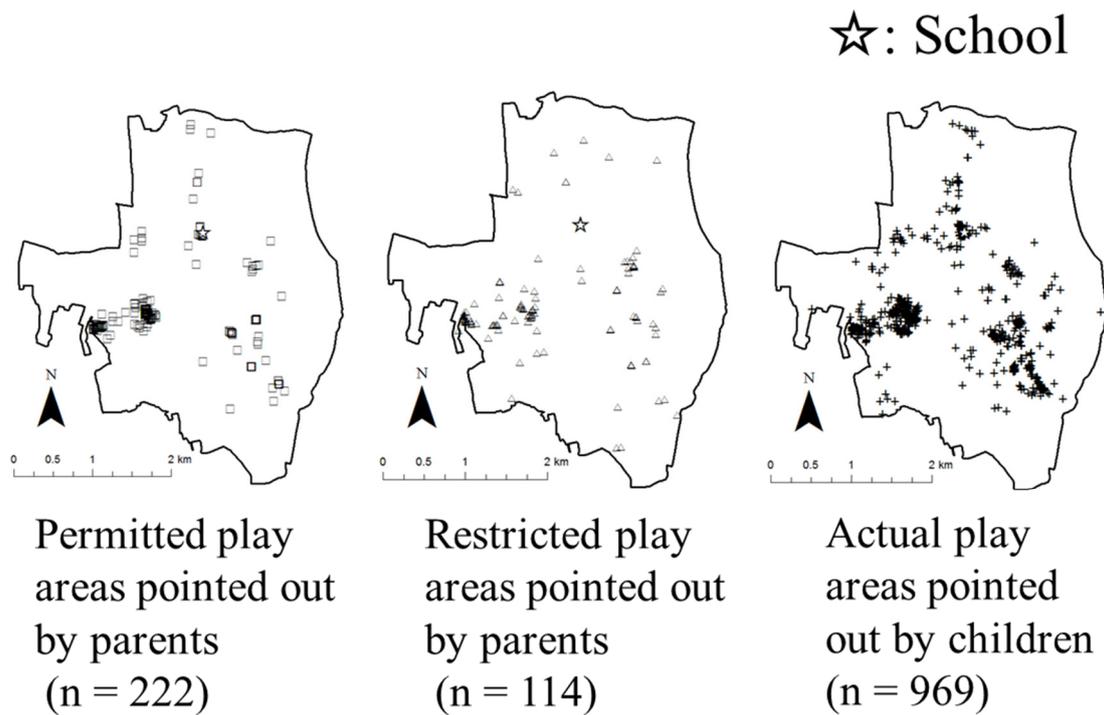


Figure 5: Point distribution maps of permitted and restricted play areas indicated by parents and actual play areas indicated by children.

Table 2: Nearest Neighbor Spatial Association Measures among Point Distributions

R'	Parental altruistic fear places	Permitted places	Restricted places	Actual play areas
Parental altruistic fear places	-	-	-	-
Permitted places	0.84**	-	-	-
Restricted places	0.32**	0.71**	-	-
Actual play areas	0.73**	0.41**	0.68**	-

Note. * $p < 0.05$, ** $p < 0.01$

4. Discussion

Previous studies have found a geographical concentration of places evoking fear of crime (Doran & Burgess, 2012; Nasar & Fisher, 1993). However, these studies have focused on fear for respondents' own safety rather than altruistic fear. Focusing on parental altruistic fear of their children's victimization, this study examined the geographical concentration of altruistic fear by using nearest neighbor measurement. We found that places evoking parental altruistic fear within a school district were concentrated in certain small areas. This result is consistent with findings about fear of crime in general (Doran & Burgess, 2012; Nasar & Fisher, 1993).

Additionally, this study identified land use categories and the physical characteristics of places that evoke fear among parents. The map overlaying analysis and text mining revealed that natural settings in particular, including parks, woodlands, agricultural areas, and water areas, tended to be indicated as fearful places by parents. Conversely, play areas in residential areas tended to be indicated as safe places. The results of text mining showed a relationship between parental altruistic fear of a place and environmental characteristics such as lack of surveillance, lack of activities of local residents, poor visibility, darkness during day and night, incivilities, and easy access by strangers. These findings are consistent with previous studies examining general fear of crime in natural settings (Jorgensen et al., 2013); environmental features such as numerous concealed places, low visibility, difficulty of escape, and few observers correlate with fear in general. Thus, it is likely that theories that explain general fear of crime in natural settings can also apply to altruistic fear of crime. In other words, reducing parents' fear of personal victimization through appropriate environmental design in natural settings may also reduce parental altruistic fear for their children.

We also examined spatial correlations among places indicated as fearful by parents, permitted/restricted play areas, and children's actual outdoor play areas by using nearest neighbor spatial association measures. A noteworthy result of our analyses was that the locations of parent-restricted places were correlated with locations evoking parental altruistic fear of crime. Therefore, it is possible that parents restrict their children from playing in these fearful places. Additionally, locations where children actually played were more closely correlated with parent-permitted locations than with parent-restricted locations. In other words, children tended to select play areas where parents approved of rather than those areas where parents disapproved of for safety reasons. Thus, parental altruistic fear may reduce the probability of some places chosen as play areas by children.

Previous studies (Doran & Burgess, 2012; Fisher & Nasar, 1992) have shown that people tend to avoid places where they fear becoming a victim of crime, while this study found that an individual's avoidance behavior can also be caused by altruistic fear for others. Specifically, parental altruistic fear of their children's victimization can cause children's avoidance behavior through parental restrictions. However, since children's behaviors in their neighborhoods depend on a system of child-parent-environment negotiations (Perez & Hart, 1980), children's avoidance behavior may be caused by other factors such as close relationship between parents and children, children's individual characteristics, and children's own fear in their play areas. Closer examination of the relationship between parental altruistic fear and children's avoidance behavior remains for future studies.

Based on the results of this study, children's avoidance behavior induced by parental altruistic fear seems to have arisen especially in natural settings. Surely, such avoidance behavior may lower the actual crime victimization risk of children, especially in high crime areas. However, avoidance behavior may also have negative effects. Previous studies (Burgess, Harrison & Limb, 1988; Fjortoft & Sageie, 2000; Hart, 1979; Kytta, 2004; Moore, 1986) have suggested that unstructured and unsupervised outdoor activities, especially play in natural settings, are important for the development of children's social skills and autonomy. Natural settings in Japan, which include woods and agricultural areas, are considered valuable play areas where children can engage in activities such as gathering insects, climbing trees, and observing plants (Senda, 1998). The results of this study suggest that opportunities for this sort of play may be significantly reduced because of rising parental altruistic fear of victimization of their children.

In addition to these substantive findings, a methodological aspect of this study should be highlighted. This study examined the relationship between people's behavior and physical environment using GIS and spatial statistics. Using GIS and spatial statistics, we could discuss parental altruistic fear and children's play area choice geographically. Similar to this study, many studies focus on the geographical relationship between people and environment in environmental psychology. GIS and spatial statistics can be used to encourage methodological progress in environmental psychology.

5. Policy Implication

Finally, we discuss practical implications of this study. Recently, in order to tackle heightened parental altruistic fear, some Japanese city officials, including

Tsukuba City where this study took place, have begun to create safer natural environments for children by modifying play areas via a safety-from-crime perspective based on CPTED (Crime Prevention Through Environmental Design) theory (Amemiya & Yokohari, 2004). However, the usual implementation of this approach is to simply enhance visibility by cutting woods (Amemiya & Yokohari, 2004; Yokohari et al., 2006). Based on the results of this study, this effort may reduce parental altruistic fear indeed, but there are limitations to this approach. Not only is it difficult to eliminate all blind spots in all play areas of children, but it may also reduce play in natural settings, including in nature refuges which can have an important role in children's healthy development. Changing physical environments only from a crime prevention perspective does not always mean creating desirable play areas for children.

The results of this study suggest a different approach to promoting children's outdoor play in natural settings as well as reducing parental altruistic fear. This study identified the geographical concentration of the places that evoke parental altruistic fear. The results imply the importance of focusing on certain areas when implementing countermeasures. Additionally, in this study, physical concealment was identified as an environmental cue that evokes parental altruistic fear, but so was lack of people's activity. Therefore, encouraging activities of local residents in natural settings might reduce parental altruistic fear even without eliminating blind spots. Some recent efforts in Japan have eschewed typical crime prevention activities such as neighborhood foot patrols by residents in favor of everyday activities like gardening at children's play areas. Such measures would increase natural surveillance without placing an unnecessary burden on local residents. It is possible to reduce parental altruistic fear without damaging the attractiveness of children's play areas in natural settings through enhancing "natural" activities of local residents (e.g., setting garden beds or facilities that enhance natural surveillance of local residents in fearful places).

Despite the above strengths, there were some limitations to this study. Since this study examined a pattern in one school district only, the results may not be generalizable to other school districts or other cities. With regard to the fearful places, it is necessary to identify environmental cues more closely based on experimental approaches used in previous studies (Jorgensen & Anthopoulos, 2007; Jorgensen et al., 2002). The effect of parental altruistic fear on their children's development should be studied in more detail using longitudinal data in the future. Moreover, the effects of demographic factors such as children's age, parents' age, sex, personality, social class, and the relationship between parents and their children on parental altruistic fear and children's outdoor play are further challenges for future research.

References

- Alparone, F. R., & Pacilli, M. G. (2012). On children's independent mobility: The interplay of demographic, environmental, and psychosocial factors. *Children's Geographies*, 10(1), 109–122.
- Amemiya, M., & Yokohari, M. (2004). Identifying the problems associated with crime prevention in parks and measures for their solution in Japan. International Federation of Park & Recreation Administration, The 20th world congress in HAMAMATSU, CD-ROM.
- Amemiya, M. (2012). The area difference of the relationship between children's independent mobility measured by parental license and children's outdoor play. *Landscape Research Japan*, 75(5), 477–452. (in Japanese)
- Biddle, S. J., Gorely, T., & Stensel, D. J. (2004). Health-enhancing physical activity and sedentary behavior in children and adolescents. *Journal of Sports Sciences*, 22, 679–701.
- Blakely, K. S. (1994). Parents' conceptions of social dangers to children in the urban environment. *Children's Environments*, 11, 16–25.
- Boreham, C., & Riddoch, C. (2001). The physical activity, fitness and health of children. *Journal of Sports Sciences*, 19, 915–929.
- Burgess, J. (1995). *Growing in confidence: Understanding people's perceptions of urban fringe woodlands*. Cheltenham, England: Countryside Commission.
- Burgess, J., Harrison, C. M., & Limb, M. (1988). People, parks and the urban green: A study of popular meanings and values for open spaces in the city. *Urban Studies*, 25(5), 455–473.
- Cabinet Office, Government of Japan. (2013). Public opinion survey on safety of children. Retrieved from <http://www8.cao.go.jp/survey/h25/h25-kodomo/index.html>. (In Japanese)

- Carver, A., Timperio, A., & Crawford, D. (2008). Playing it safe: The influence of neighborhood safety on children's physical activity—A review. *Health & Place*, 14, 217–227.
- Carver, A., Timperio, A., Hesketh, K., & Crawford, D. (2010). Are children and adolescents less active if parents restrict their physical activity and active transport due to perceived risk? *Social Science & Medicine*, 70, 1799–1805.
- Clark, P. J., & Evans, F. C. (1954). Distance to nearest neighbor as a measure of spatial relationships in populations. *Ecology*, 35, 445–453.
- Doran, B. J., & Burgess, M. B. (2012). *Putting fear of crime on the map: Investigating perceptions of crime using geographic information systems*. New York, NY: Springer.
- Ekelund, U., Sardinha, L. B., Anderssen, S. A., Harro, M., Franks, P. W., Brage, S., Frogerg, K. (2004). Associations between objectively assessed physical activity and indicators of body fatness in 9- to 10-y-old European children: A population-based study from 4 distinct regions in Europe (the European Youth Heart Study). *American Journal of Clinical Nutrition*, 80, 584–590.
- Ferraro, K. F. (1995). *Fear of crime: Interpreting victimization risk*. Albany, NY: State University of New York press.
- Fisher, B. S., & Nasar, J. L. (1992). Fear of crime in relation to three exterior site features: Prospect, refuge, and escape. *Environment and Behavior*, 24, 35–65.
- Fisher, B. S., & Nasar, J. L. (1995). Fear spots in relation to microlevel physical cues: Exploring the overlooked. *Journal of Research in Crime & Delinquency*, 32, 214–239.
- Fjortoft, I., & Sageie, J. (2000). The natural environment as a playground for children: Landscape description and analyses of a natural playscape. *Landscape and Urban Planning*, 48, 83–97.
- Gill, T. (2007). *No fear: Growing up in a risk averse society*. London, England: Calouste Gulbenkian Foundation.
- Hale, C. (1996). Fear of crime: A review of the literature. *International Review of Victimology*, 4, 79–150.

Hart, R. A. (1979). *Children's experience of place: A developmental study*. New York, NY: Irvington.

Herzog, T. R., & Miller, E. J. (1998). The role of mystery in perceived danger and environmental preference. *Environment and Behavior*, 32, 301–322.

Higuchi, K. (2013). KH Coder. <http://khc.sourceforge.net/en/>

Hillman, M. (2006). Children's rights and adults' wrongs. *Children's Geographies*, 4, 61–67.

Hillman, M., Adams, J., & Whitelegg, J. (1990). *One false move . . . A study of children's independent mobility*. London, England: PSI Publishing.

Jorgensen, A., & Anthopoulou, A. (2007). Enjoyment and fear in urban woodlands—does age make a difference? *Urban Forestry & Urban Greening*, 6, 267–278. Jorgensen, A., Hitchmough, J., & Calvert, T. (2002). Woodland spaces and edges: Their impact on perception of safety and preference. *Landscape and Urban Planning*, 60, 135–150.

Jorgensen, A., Hitchmough, J., & Dunnett, N. (2007). Woodland as a setting for housing-appreciation and fear and the contribution to residential satisfaction and place identity in Warrington New Town, UK. *Landscape and Urban Planning*, 79, 273–287.

Jorgensen, L. J., Ellis, G. D., & Ruddell, E. (2013). Fear perceptions in public parks: Interactions of environmental concealment, the presence of people recreating, and gender. *Environment and Behavior*, 45(7), 803–820.

Kuo, F. E., Bacaicoa, M., & Sullivan, W. C. (1998). Transforming inner-city landscapes: Trees, sense of safety, and preference. *Environment and Behavior*, 30(1), 28–59.

Kytta, M. (2004). The extent of children's independent mobility and the number of actualized affordances as criteria for child-friendly environments. *Journal of Environmental Psychology*, 24, 179–198.

Lee, Y. (1979). A nearest-neighbor spatial-association measure for the analysis of firm interdependence. *Environment and Planning A*, 11, 169–176.

- Malone, K. (2007). The bubble-wrap generation: Children growing up in walled gardens. *Environmental Education Research*, 13, 513–527.
- Moore, R. C. (1986). *Childhood's domain*. London, England: Croom Helm.
- Nasar, J. L., & Fisher, B. (1993). "Hot spots" of fear and crime: A multi-method investigation. *Journal of Environmental Psychology*, 13, 187–206.
- Nasar, J. L., Fisher, B., & Grannis, M. (1993). Proximate physical cues to fear of crime. *Landscape and Urban Planning*, 26, 161–178.
- Nasar, J. L., & Jones, K. M. (1997). Landscapes of fear and stress. *Environment and Behavior*, 29, 291–323.
- National Research Institute of Police Science (2008). A report on daily activities and crime victimizations of elementary children. National Research Institute of Police Science, Japan.
- National Research Institute of Police Science (2011). A report on life and safety of elementary children. National Research Institute of Police Science, Japan.
- Newman, M., & Girvan, M. (2004). Finding and evaluating community structure in networks. *Physical Review E*, 69, 026113.
- O'Brien, M., Jones, D., Sloan, D., & Rustin, M. (2000). Children's independent spatial mobility in the urban public realm. *Childhood: A Global Journal of Child Research*, 7, 257-277.
- OECD. (2011). Personal security. In *How's life? Measuring well-being*. OECD Publishing. doi:10.1787/9789264121164-13-en
- Page, A., Cooper, A. R., Stamatakis, E., Foster, L. J., Crowne, E. C., Sabin, M., & Shield, J. P. H. (2005). Physical activity patterns in nonobese and obese children assessed using minute-by-minute accelerometry. *Journal of Investigative Dermatology*, 29, 1070.
- Parsons, R. (1995). Conflict between ecological sustainability and environmental aesthetics: Conundrum, canard or curiosity. *Landscape and Urban Planning*, 32, 227–244.

Perez, C., & Hart, R. (1980). Beyond playgrounds: Planning for children's access to the environment. In P.F. Wilkinson (Ed.), *Innovation in play environments* (p. 252–271). New York: St. Martin's Press.

Prezza, M., Alparone, F. R., Cristallo, C., & Luigi, S. (2005). Parental perception of social risk and of positive potentiality of outdoor autonomy for children: The development of two instruments. *Journal of Environmental Psychology*, 25, 437–453.

Prezza, M., & Pacilli, M. G. (2007). Current fear of crime, sense of community, and loneliness in Italian adolescents: The role of autonomous mobility and play during childhood. *Journal of Community Psychology*, 35, 151–170.

Prezza, M., Pilloni, S., Morabito, C., Sersante, C., Alparone, F. R., & Giuliani, M. V. (2001). The influence of psychosocial and environmental factors on children's independent mobility and relationship to peer frequentation. *Journal of Community & Applied Social Psychology*, 11, 435–450.

Robinson, J. B., Lawton, B. A., Taylor, R. B., & Perkins, D. D. (2003). Multilevel longitudinal impacts of incivilities: Fear of crime, expected safety, and block satisfaction. *Journal of Quantitative Criminology*, 19, 237–274.

Senda, M. (1998). *Play space for children*. Tokyo, Japan: Ichigaya Syuppan.

Snedker, K. A. (2006). Altruistic and vicarious fear of crime: Fear for others and gendered social roles. *Sociological Forum*, 21, 163–195.

The Nikkoso Foundation for Safe Society. (2011). *Research Report on Fear of Crime*. Retrieved from http://www.syaanken.or.jp/wp-content/uploads/2012/05/23031bouhan23_03.pdf. (In Japanese)

Tulloch, M. I. (2004). Parental fear of crime: A discursive analysis. *Journal of Sociology*, 40(4), 362–377.

Valentine, G., & McKendrick, J. (1997). Children's outdoor play: Exploring parental concerns about children's safety and the changing nature of childhood. *Geoforum*, 28, 219–235.

Veitch, J., Bagley, S., Ball, K., & Salmon, J. (2006). Where do children usually play? A qualitative study of parents' perceptions of influences on children's active free-play. *Health & Place*, 12, 383–393.

Veitch, J., Salmon, J., & Ball, K. (2008). Children's active free play in local neighborhoods: A behavioral mapping study. *Health Education Research*, 23(5), 870–879.

Warr, M., & Ellison, C. G. (2000). Rethinking social reactions to crime: Personal and altruistic fear in family households. *American Journal of Sociology*, 106, 551–578.

Yokohari, M., Amemiya, M., & Amati, M. (2006). The history and future directions of greenways in Japanese new towns. *Landscape and Urban Planning*, 76, 210–222.

Yokohari, M., Takeuchi, K., Watanabe, T., & Yokota, S. (2000). Beyond greenbelts and zoning: A new planning concept for the environment of Asian mega-cities. *Landscape and Urban Planning*, 47, 159–171.