博士論文

論文題目：The crime prevention mechanisms of neighborhood social capital and social reactions to crime: A social psychological approach with multilevel and spatial analytic techniques

（地域の社会関係資本による犯罪予防メカニズムおよび犯罪への社会的反応：マルチレベル・空間分析手法による社会心理学的アプローチ）

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Chapter 1 THEORETICAL BACKGROUND

Introduction

This dissertation explores the relationship between neighborhood social capital and crime through multiple empirical data analyses. In this dissertation, the links between social capital and crime are investigated using several approaches to the modifiable areal unit problem (MAUP) that extend beyond the traditional multilevel model that has been used in recent neighborhood studies. In addition, the issue of reverse causality is examined through an analysis of the effects of neighborhood crime and the crime prevention community design (*bouhan machizukuri* in Japanese) on residents' social capital, including social ties, social participation, social cohesion, and social trust. Through these explorations, this dissertation provides new insights into an increasingly comprehensive understanding of the association between social capital and crime/crime prevention in Japan.

Two main research approaches have been used in the field of criminal research. The first approach is the "etiology of crime," which has been widely studied since the 1970s. This approach focuses on criminals' internal factors, such as biology, mental illness, personality and posttraumatic states, as possible answers to the question of why people become criminals, and it seeks to prevent crime by addressing these factors (Blackburn, 1968; Conrad & Dinitz, 1977;

Eysenck, 1964; Lombroso-Ferrero, 1972; Moyer, 1971). Efforts to reduce crime based on the etiology of crime have been unsuccessful, however, because of the difficulty of identifying the causes of crime and developing rehabilitation programs that can counter or neutralize the influences of these causes on criminals or delinquent juveniles.

The second approach, which has become increasingly accepted since the 1980s, is the "occasionalism of crime." This approach assumes that there is little difference between criminals and non-criminals, as people with a low affinity for crime will commit crimes if they have the opportunity to do so, and people with a high affinity for crime will not necessarily commit a crime if they do not have the opportunity. This approach seeks to prevent crime by designing physical and social environments that make crime less feasible. This dissertation views crime from the occasionalism perspective and investigates the relationships between neighborhood community environments – especially neighborhood social capital – and crime.

Background and Measurements of Social Capital

Over the last decade, researchers have explored the effect of social capital as a community-level factor in crime prevention. According to Putnam (1995), social capital consists of "features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" (1995: 67). Close network ties within a group

generate higher levels of trust and give rise to norms of reciprocity. Trust and reciprocity, in turn, encourage cooperative behaviors – manifested as collective efficacy and informal social control – that have been hypothesized to yield many positive benefits (Healy & Cote, 2001; Putnam, 2000). In "*Making Democracy Work*," Putnam (1993) explained differences between subnational government performances in northern and southern Italy using the concepts of social capital. From his two-decade-long investigations of 20 Italian provincial governments' performances, Putnam found that the northern provinces achieved a higher level of government performance compared with the southern provinces. He measured the rates of voting in national elections, the subscription rates for newspapers, the number of social organizations and other factors at the province level and concluded that the values of these indices were associated with the differences in province-level government performances. In southern Italy, where vertical social networks (i.e., social ties characterized by disparity in members' power) were dominant, people's social trust was low; regulations, a sense of helplessness, and alienation prevailed; political institutions were inefficient; and corruption flourished. However, in northern Italy, where horizontal social networks (i.e., social ties characterized by members' homogenous social backgrounds) dominated, people's social trust was high; values of solidarity and integration took root; people actively participated in organizations; and effective political institutions existed. Additionally, Putnam argued that affluent social capital causes people to voluntarily cooperate and trust each other.

Consequently, social capital may be a solution to the dilemma of collective actions and a key to making democracy work. Because Putnam devoted one-quarter of the book to describing the historical development of Italian culture, many readers thought that his theories could only be applied to Italy (Inaba, 2013). However, when Putnam (2000) applied the same theories to the U.S. context, researchers understood that he had explicated more universal theories. For example, Putnam found that the state-level integrated social capital index (which was composed of people's participation in community volunteer activities, informal sociability, and social trust) and the state-level homicide rate had a near-perfect correlation (r = .80). However, even after Putnam's application of social capital theory to the U.S. succeeded, some researchers were concerned that strong American characteristics such as racial/ethnic diversity would skew the results of his analyses (Inaba, 2013).

Putnam's "communitarian" definition is widely used as a categorization of social groups and citizen participation – i.e., bonding and bridging social capital. Bonding social capital indicates a homogenous relationship among community members and is a generator of trust, cooperation, and cohesiveness within the relationship (e.g., within family, ethnic, or racial groups). By contrast, bridging social capital connects heterogeneous people who belong to different groups/organizations (e.g., through relationships between different ethnic groups or heterogeneous social ties, such as with friends of friends). Bridging social capital conceptually

overlaps with Granovetter's (1973) weak ties, and bonding social capital overlaps with strong ties. Putnam viewed social capital from the communitarian perspective and emphasized the importance of citizens' participation in bridging groups/organizations. These views are contrasted with Bourdieu's view that benefits are generated within individuals' social ties and that these social ties are the outcomes of individuals' personal backgrounds.

The major reason that social capital exerts favorable effects on society is that it promotes cooperative behaviors. Additionally, social capital contributes to health, education, and the economy through various mechanisms, such as providing specific supports that reduce psychological stress (Kawachi, & Berkman, 2000), expanding children's opportunities for learning experiences by expanding and diversifying their social connections (Croll, 2004; Pribesh & Downey, 1999), and enhancing market effectiveness by reducing the transaction cost through social trust (Miyagawa & Omori, 2004). Furthermore, Putnam claimed that social capital can even benefit people who do not contribute to creating and maintaining this capital in their neighborhood.

In contrast to Putnam, Bourdieu (1986) defined social capital as "the aggregate for the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition" (1986: 248). Additionally, Coleman, a famous sociologist in the U.S., stated that social capital "consists of some aspect of a social structure, and it facilitates certain actions of individuals who are within the structure"

(1994: 302). Coleman posited that engaging in successful cooperative behaviors with others generates social trust and that these interactions encourage subsequent cooperative behaviors and can be a source of various benefits. Of particular note is that Putnam viewed social capital as a public good that contributes to collective gains among people who are embedded in local communities or groups, whereas Bourdieu and Coleman viewed social capital as a private good that contributes to private gains.

The current dissertation defines social capital as a public good that influences neighborhood residents' crime victimization because the problems of the social dilemma and the modifiable areal unit, which stem from crime prevention through neighborhood social capital, are intimately related to the collective goods features of social capital. In addition, Bourdieu argued that differences in social capital can be attributed to individual-level differences in socioeconomic backgrounds, whereas Putnam demonstrated that differences in social capital depend on the geographic place level. Although both perspectives are helpful in explaining the amount of social capital and its social consequences for each analytic unit (i.e., the individual and neighborhood levels), this dissertation notes that Putnam's framework, which targets the neighborhood community, has an advantage for town development and policy recommendations. That is, for the purpose of shaping evidence-based political interventions in the field of crime prevention, the detection of vulnerable neighborhoods in terms of social capital is more efficient than the

detection of vulnerable individuals. Thus, this dissertation views social capital as a neighborhood feature that consists of networks, trust and norm reciprocity, according to Putnam's definition.

How, then, has social capital been operationally defined? In other words, how has it been measured? Because research on social capital from the aspect of private goods, represented by Bourdieu's definition, has been developed from social network studies, many researchers have measured social capital from the structural perspective. Based on the assumption that social capital comprises resources that individuals can access through their social ties, researchers have measured people's social networks mainly through the position generator and the name generator. The position generator aims to measure individuals' capacity to access other people who hold valuable social positions. Participants are presented with a list of diverse occupations and asked whether they have acquaintances with the listed occupation (Lin, 2001). Individuals who have acquaintances with high occupational statuses, such as lawyers, doctors, and politicians, are regarded as having "high social capital." Using the name generator method, participants are asked to list others with whom they conduct social exchanges (e.g., counseling and support) and to provide information about the listed people (e.g., their demographic characteristics, psychosocial characteristics and relationship with the participant) (van der Gaag & Webber, 2008). This two-step measurement method captures the participants' network structures and the characteristics of their relationships. The position generator and name generator techniques measure individual

social capital, and the measured network indices have been used mainly as explanatory variables to predict individuals' success in business. Thus, to measure neighborhood-level social capital, other methods should be used. Operational definitions of social capital that are based on methods that are derived from social network analysis have been met with the criticism that such definitions are identical to the concept of individual-level social support (Moore, Salsberg, & Leroux, 2013).

How, then, has neighborhood-level social capital been operationally defined for measurement purposes? For the social network components, the number and closeness (e.g., frequency of interaction) of social ties, such as family, friends and coworkers living in the neighborhood, are measured as structural aspects of neighborhood social capital (Harpham, 2008). In addition, the residents' participation in various community organizations (e.g., political, educational, business, religious, sport, and hobby groups) is also often measured. Participation in community organizations can function as a brokerage that generates connections with others (social ties) and connections with other organizations (organizational ties). Furthermore, it can yield opportunities/norms for cooperative activities and access to various information and services. In the context of neighborhood research, network measurements aim to detect the effect of individuals' embeddedness in organizations (Small, 2008). Trusting relationships enable the truster to benefit from the trustee's resources by promoting cooperation and interactions between

the two parties. This prediction is based on theories that have arisen from the prisoner's dilemma game, the N-person prisoners' dilemma game, and the social dilemma (Anderson & Mellor, 2008). To tap into generalized trust in strangers, the following question in the General Social Survey, the European Social Survey and the World Values Survey has been often used: "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" Recently, in place of trust in generalized others, trust in particularized others has become the predominant measure of trust. For example, the Social Capital Assessment Tool (Harpham, Grant, & Thomas, 2002) measures trust in neighbors by asking respondents whether they agree that "people in this neighborhood can be trusted." Nevertheless, in the present dissertation, a subset of Yamagishi and Yamagishi's (1994) generalized trust scale is used as the measure of trust. The norm of reciprocity refers to a willingness to help others with an expectation that others will reciprocate as needed. If general others, rather than the particular others whom an individual has directly helped, are assumed to be the reciprocator, the norm is referred to as generalized reciprocity. By contrast, if one expects direct reciprocation from the particular others whom one has helped in the past, the norm is referred to as particularized reciprocity. Generalized reciprocity is the measure of reciprocity that is used in this dissertation. The Adapted Social Cohesion and Trust Scale measures the norm of reciprocity by asking respondents whether "in general, people around here are willing to help each other out." The scale also includes an item that focuses on a

behavioral aspect, as follows: “In the past six months, how often have you helped neighbors?” This dissertation uses the respondents’ own norms of generalized reciprocity (e.g., “If someone helps you, you would also help any other person”) and their aggregation at the neighborhood level. Table 1-1 indicates the social capital indices of the structural and cognitive aspects at each measurement level, i.e., the individual and collective (neighborhood) levels. Additionally, Table 1-2 shows the question items that are related to neighborhood-level social capital indices.

Table 1-1. Social capital indices of structural and cognitive aspects at each measurement level

Measurement level	Structural aspect	Cognitive aspect
Individual level	Name generator Position generator	
Collective (neighborhood) level	The number of and closeness of social ties The number and frequency of social participation	Trust in others Norms of reciprocity

Table 1-2. Tangible question items about neighborhood-level social capital indices

	Question items	Representative survey
Network	The number of social ties (kin [or family], friends, coworkers, etc.)	
	The number of neighborhood groups/organizations the respondent participates in and the frequency of participation	
Trust	"Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?"	General Social Survey, European Social Survey, the World Value Survey
	"People in this neighborhood can be trusted"	Social Capital Assessment Tool
	"Most people can be trusted"	Yamagishi & Yamagishi (1994)
Norms of reciprocity	"In general, people around here are willing to help each other out"	Adapted Social Cohesion and Trust Scale
	"In the past six months, how often have you helped neighbors?"	Adapted Social Cohesion and Trust Scale
	"If someone helps you, you would also help any other person"	

Social Capital and Crime

Within the field of criminal sociology, as Putnam discussed, social capital has been treated as a collective force that serves to prevent the occurrence of delinquency and crime in communities. For example, in Jacobs's (1961) "*The Death and Life of Great American Cities*," social capital was characterized as interpersonal relationships within neighborhoods that develop over long periods of time and serve to reduce the community's rates of crime and delinquency via constant surveillance by residents (or what has been termed "eyes on the street"). More recently, Sampson, Raudenbush, and Earls (1997) empirically examined the influence of collective efficacy (a summary measure of social cohesion, trust and informal social control) on crime in Chicago

using data from the Project on Human Development in Chicago Neighborhoods. They classified Chicago neighborhoods into 343 neighborhood clusters and found that a neighborhood cluster's collective efficacy (i.e., an aggregated variable at the neighborhood level) was negatively associated with the respondents' reported perceptions of neighborhood violence, the respondents' rates of violent victimization and the neighborhoods' homicide rates. In other research, Kennedy, Kawachi, Prothrow-Stith, Lochner, and Gupta (1998) reported that aggregated generalized trust and civic participation were associated with lower gun violence at the U.S. state level. Rosenfeld, Baumer, and Messner (2001) found a negative association between an index of social capital (a summary measure of trust, fairness, helpfulness and civic engagement among neighbors) and the homicide rate at the U.S. county level. Even in country-level comparisons, the crime reduction effect of social capital has been found. Lederman, Loayza, and Menendez (2002) used data from 39 countries and showed that the homicide rate was lower in countries where people's social trust was high.

Additionally, some researchers have investigated the causal association between social capital and crime – that is, they have examined which causes the other. Rosenfeld et al. (2001) estimated a non-recursive model in which possible reciprocal effects between social capital and the homicide rate were examined using structural equation models. Lederman et al. (2002) examined the causal association using instrumental variables that were correlated with the

explanatory variable (i.e., the social capital indicators) but were not correlated with the regression residuals. Lederman et al. used regional dummy variables to group countries according to their geographical location or stage of development and the numbers of telephones per capita and radios per capita in the country as instrumental variables. The results of both studies showed that the direction of the effect in which "social capital reduces crime" was robust. Thus, a number of studies have consistently found that social capital has a preventive effect on crime, and the idea that neighborhoods that are affluent in social capital have lower crime rates than those with less social capital is shared by many researchers.

The Logics of the Crime Reduction Effect of Social Capital

Why, then, is neighborhood social capital linked to crime rates? This section discusses the question from several theoretical criminological perspectives.

A recent theoretical extension of traditional social control theory, the systemic model of crime proposed by Bursik and Grasmick (1993), focuses on informal social controls administered by neighborhood residents and formal social controls administered by public institutions as social factors that contribute to crime prevention (Figure 1-1). Formal social controls are public goods and services allotted by public institutions that are located within or outside the neighborhood. In general, the public institution that is most relevant to crime prevention is the police. The systemic

model of crime assumes that communities' abilities to access resources from public institutions is ensured by residents' social ties, including social participation and trust. In other words, this theory suggests that neighborhoods that are affluent in social capital are able to gain access to public social controls (Rosenfeld et al., 2001). For instance, in local communities with abundant social capital, residents can utilize "resources" such as alerting the police to neighborhood problems and cooperating with the police in crime prevention.

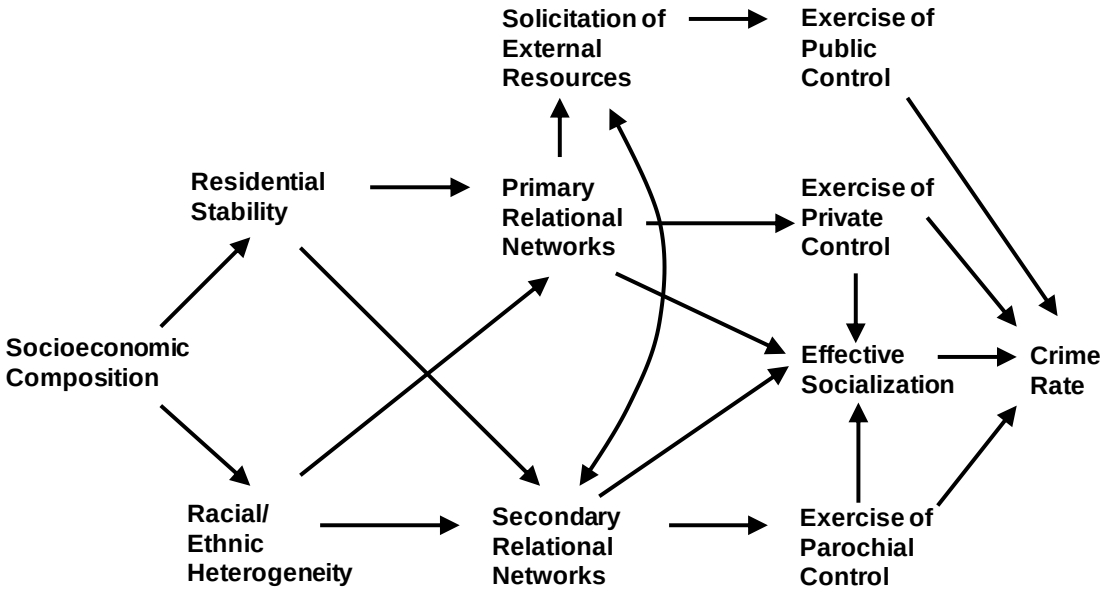

Figure 1-1. The basic systemic model of crime (adapted from Bursik & Grasmick, 1993)

As an additional form of informal social control, Sampson et al. (1997) advocated for the concept of collective efficacy. Collective efficacy is a sense of community that is associated with residents' willingness to intervene on behalf of the public. This idea has two subordinate

concepts. The first concept is “informal social control,” which is the perception of neighborhood residents’ willingness to intervene in the communities’ problems. The second concept is “social cohesion and trust.” In neighborhoods where residents’ trust is high, the sense that residents work cooperatively together is strong; this sense is associated with a low crime rate. The above two subordinate conceptions fit well with social capital theory, especially because social cohesion and trust are nearly synonymous with the network and social trust concepts in social capital theory.

In summary, trust, social participation and social networks facilitate informal social controls, collective efficacy among neighbors and access to formal social control administered by public institutions and contribute to reducing crime in neighborhoods.

In a second criminological theory that is related to social capital, Rosenfeld et al. (2001) discussed the negative link between social capital and crime from the perspective of anomie theory. Anomie theory defines a situation in which a harmonious relationship between a socially defined goal and people’s means to achieve the goal is fallen apart as “anomie” (Merton, 1938, 1968). Although in many societies, many people share the goal of economic success, the opportunities to achieve such success are limited for some. Such people will lose sight of social norms and emotional sympathy for other people and then think only about the means of achieving their goals. Merton called this situation “innovation.” This situation weakens the social norms that control deviant behaviors. Therefore, in anomic environments where people lack a strong

sense of order, people behave egoistically and are willing to exploit others. Furthermore, social trust declines as crime and violence simultaneously intensify (Rosenfeld et al., 2001). Thus, anomie theory describes a covariant relationship among social capital, anomie and crime rather than a one-way effect of social capital on crime.

Third, social capital stimulates neighborhood management activities, such as cleanup activities, and other cooperative behaviors that subsequently reduce neighbors' crime victimization (Takagi, Tsuji, & Ikeda, 2010). Community management activities, such as cleanup activities (e.g., mowing lawns and filling trash cans), represent "signs of occupancy" (Cirel, Evans, McGillis, & Witcomb, 1977). Signs of occupancy express a sense that neighborhood residents pay attention to their community. This sense, in turn, has crime-reducing effects. This process is also related to the broken window theory (Wilson & Kelling, 1982), which states that criminal behavior is prevented in neighborhoods where residents attend to their community. In the context of social capital theory, it is thought that neighborhoods with abundant social capital engage in abundant management activities, which lead to a lower crime rate.

Incidentally, the studies that are included in this dissertation measured the respondents' neighborhood social capital and examined the crime prevention effects of social capital aggregated at the neighborhood level. In this context, there is no ground for believing that the social capital surrounding a respondent's house affects the respondent's likelihood of being a

crime victim in areas that are geographically distant from his/her house or neighborhood. For example, an individual's neighborhood social capital may have no effect on his/her likelihood of being victimized by purse-snatching in front of a train station. Therefore, this dissertation explores the crime prevention effects of social capital by targeting burglary victimization as the main outcome, because we can determine the sites where burglaries occur.

The Scope of Social Capital

Social capital theory researchers have discussed the scope of social capital. As previously mentioned, there is agreement that social capital includes social networks (social participation), trust, and the norm of reciprocity when it is defined at ecological levels (Kawachi, Subramanian, Kim, 2008). Meanwhile, a sense of belonging, the comfort of the local community, and the quality/attractiveness of a neighborhood (e.g., as related to noise, graffiti, litter, and green space) are theoretically located in the intermediate point between social capital and outcomes; thus, they are viewed as separate from social capital. Although some previous studies have treated such intervening variables as social capital, these variables should be discriminated from social capital (Harpham, 2008). Similarly, although it is unclear whether the collective/cooperative behaviors that are addressed in this dissertation are a subset of social capital, they should be treated as outcomes of social capital because, on most occasions, collective/cooperative behaviors

can be exercised only when an adequate amount of social capital exists (Grootaert & Bastelaer, 2002). Thus, the present dissertation views social networks, trust, and reciprocity as proxy indices of the neighborhood forces that facilitate collective actions. That is, the concept that is represented by the term "social capital theory" does not include neighborhood management activities and informal social controls, but it does represent the neighborhood mechanisms that facilitate residents' cooperative behaviors.

Some researchers take the critical view that introducing social capital to traditional criminological models to boost the above-mentioned informal/formal social controls and neighborhood management activities is a just translation of traditional theories. However, the application of social capital theory to the criminological models is useful because researchers can introduce a number of features to the models. The first such feature is the concept of people's (intentional and unintentional) investments in neighborhood social capital. Forming social networks and trusting others are "investments" in the local community and involve some costs, regardless of the investor's intent. That is, maintaining neighborhood social capital requires some effort (thus, social capital can be accumulated via people's efforts). The second feature is the externality (the spillover effect) of social capital. Namely, neighborhood social capital exerts favorable effects, even on residents who do not invest in it (this aspect of social capital is partially examined in Studies 1 and 2). Third, social capital can be diverted to serve other purposes. For

example, a sporting club that is organized to promote participants' health can be helpful when neighborhood safety worsens or when an earthquake occurs. Fourth, social capital theory incorporates the downsides of social ties and trust. Although the downside feature of social capital is not addressed in the current dissertation, a previous study demonstrated that newcomers' mental health degenerates in neighborhoods where the longer-term residents exhibit high levels of trust in each other (Takagi et al., 2013).

Research on Social Capital and Crime in Japan

When studying the relationship between social capital and crime in Japan, the following five points can be particularized. First and most simply, there are few empirical studies on this topic using Japanese data. It is clear, however, that people have attempted to reduce crime by utilizing neighborhood social factors. For example, the word *kizuna* (bond), which has been a trendy expression since the Great East Japan Earthquake in 2011, indicates that in their daily lives, Japanese people have embraced the idea that community social ties are important for society. However, when we rigorously measure indices of social trust/networks and crime victimization and investigate their association in Japan, it is difficult to find the obvious linkage. Thus, cumulative empirical research on the relationship between social capital and crime is required to practically incorporate social capital into crime prevention in the Japanese context.

Second, the importance of social capital increases as a bulwark against increasing vulnerability to the social problems (such as crime and health problems) related to the aging of society and other social disparities in Japan (Nishida, 2010). Unlike Japanese society, American society is characterized by marked heterogeneity in social economic status and race/ethnicity. In the U.S., individuals and groups are spatially allocated according to race, income, and occupations, and this "segregation" based on various social characteristics is an important factor that contributes to increases in crime (Logan & Messner, 1987). In a society that is composed of people with different social backgrounds, social capital has been significantly important for connecting people who are socially different (i.e., it serves as "bridging social capital," Bellair, 2000). In Japan, compared with the U.S. and the U.K., there have been fewer findings regarding the effects of residents' heterogeneity on crime based on their social characteristics and the modifying effect of social capital. Because social diversity, such as economic disparities, is continuing to increase in Japanese society (Otake, 2005), research on the effect of social capital on crime is important for future crime prevention in Japan.

Third, the reason that social capital receives substantial attention from researchers is related to the demerits and the limitations of the "crime prevention community design" (*bouhan machizukuri* in Japanese) that has become increasingly popular in town development in recent years. For example, there have been attempts to change communities' physical environments to

enhance crime deterrence. The academic theories that are the bases for current environmental criminology and town development include theories that concern environmental design, such as situational crime prevention (Clarke, 1995), defensible space (Newman, 1972), and Crime Prevention through Environmental Design (CPTED) (Crowe, 1991). Most of the "environments" that these theories address refer to the physical features of neighborhoods, residences, and the urban structure. These theories explain the importance of the "hardware" aspect of neighborhoods' physical environments and pay relatively little attention to the "software" aspect, such as social relationships among residents. Town development that is excessively focused on deterring crime is unrealistic, however, because of the finite nature of municipalities' budgets. In addition, town development that enforces the physical environment's abilities to deter crime increase the closed nature and exclusiveness of communities and ultimately cause their "fortification" (Blakely & Snyder, 1999; Low, 2003). By contrast, crime prevention through social capital arises as a by-product of social capital. People do not form their social networks for the purpose of crime prevention; however, if the by-products of people's social networks can prevent crime, they are highly beneficial. This is one motivation to empirically study the crime prevention effects of social capital.

Fourth, ongoing changes in Japanese society are also associated with the need for research on the crime prevention effects of social capital in the Japanese context. In Japanese

traditional rural society, social mobility and social uncertainty were lower than in the U.S. and the U.K., and bonding social capital was created by the residents' "closed" social networks. In such societies, because mutual surveillance among residents worked and outsiders were easily identified, crime was prevented with relative ease. However, recent changes in local communities have required the development of urban-type crime prevention models. In urban social settings, bridging social capital is likely to be constructed based on social ties, social participation and (generalized) trust that are not derived from the traditional territorial connections. In such societies, where people's mobility and diversity of social characteristics are high, there is a need to construct social capital as a lubricant to unite people who have different social backgrounds (Takagi & Kawachi, 2014). In Japan, social characteristics are expected to become increasingly diverse in the future. Therefore, the current dissertation's findings about the relationship between social capital and crime will be important.

Finally, if the crime prevention effects of neighborhood social capital are robust, we can expect a synergistic effect that allows surplus police forces to be reallocated to risky neighborhoods where neighborhood social capital is poor. Understanding the relationship between neighborhood social capital and crime can provide some useful tips for identifying vulnerable neighborhoods from the perspective of social capital and for creating interventions and policy recommendations for such neighborhoods.

The remainder of this dissertation consists of three chapters. Each chapter includes two empirical studies. Chapter 2 addresses crime prevention through collective neighborhood behaviors (Studies 1 and 2). Study 1 investigates the effect of social capital and neighborhood management activities on crime victimization. The key purpose of Study 1 is to examine whether the crime prevention effect of social capital can be applied to the Japanese context. In this study, neighborhood management activities (e.g., cleanup activities) that led to improved neighborhood environments were used as a proxy of "signs of occupancy." Study 2 discusses the idea that the crime prevention effects of social capital and the cooperative behaviors suggested in Study 1 include features of the social dilemma. Study 2 asks, "How is social capital associated with the social dilemma and the continuation of collective cooperative behaviors?"

Studies 3 and 4 in Chapter 3 examine how crime prevention effects vary according to the geographic range of neighborhoods. These studies approached the modifiable areal unit problem noted in the field of multilevel neighborhood research by applying geographical information systems and spatial analytical techniques. Focusing on "space" rather than a "place," these studies aim to provide theoretically and practically beneficial findings by detecting the "precise" neighborhood effects of social capital.

Chapter 4 discusses the impacts of crime on society through two empirical studies. Study 5 investigates the associations between crime and social relationships from the perspective

of the “reaction to crime,” which is a key component of criminal research. Study 5 demonstrates that crime has an adverse effect on individuals’ social relationships and social participation. Study 6 examines the effect of the “surveillance society,” one type of reaction to crime, on neighborhood social capital. This study demonstrated that enhanced social surveillance, which arose from the deterioration of public safety, had both positive and negative aspects. By shedding light on the impacts of surveillance on social capital, Study 6 reveals the merits and demerits of community designs that are based on crime prevention.

Chapter 2 CRIME PREVENTION THROUGH COLLECTIVE NEIGHBORHOOD ACTIONS

Study 1: The Effects of Social Capital and Neighborhood Management Activities on Crime Victimization

Introduction

Study 1 used empirical data and multilevel models to investigate whether the preventive effect of social capital on crime that has been observed in the Western countries also applies to the Japanese context. Although there are few empirical studies on the relationship between social capital and crime in Japan, there have been some previous studies in the field. For example, Yamamura (2009) found that social capital indices, including the number of fire companies and ceremonial occasions at the prefecture level, were inversely associated with the crime rate. A 2003 report from the Cabinet Office captured volunteer activities as a social capital index and showed that the crime rate was low in prefectures with a high rate of volunteers (Cabinet Office, 2003).

Although some research, such as the above studies, has shown significant associations between social capital and crime using Japanese data, overall, empirical research in this field is lacking in Japan. In particular, there is little research that directly measures neighborhood

residents' trust, reciprocity and networks and analyzes the effect of these indices on crime using the multilevel model, an analytical method that is commonly used in the fields of criminology, public health and social epidemiology.

In recent empirical studies on neighborhood social capital, researchers have mainly used the multilevel model. The multilevel model is a statistical method that uses independent variables at multiple levels and estimates their effects on an individual-level outcome variable. More specifically, this method estimates how features of social contexts, such as counties, states and countries, affect the crime victimization of the people embedded in these contexts by controlling individual-level covariates. For example, we may estimate the effects of neighborhood-level social capital on crime by viewing aspects of social capital as factors that predict individual-level burglary victimization, along with the effects of individual-level independent variables such as sex, age, household income, and type of housing. In criminal research that focuses on both individual- and neighborhood-level independent variables as important explanatory factors for crime victimization, the multilevel model is a useful analytical tool.

It is especially necessary to use a multilevel model to examine the spillover effect (Putnam, 2000) of social capital. Although a certain portion of individuals' investments in collective social capital returns directly to those who made the investment, a portion of that investment also benefits those who do not invest in the collective social capital. For instance, in

neighborhoods where the crime rate is reduced through the efforts of a subset of residents, people who do not cooperate with or do not even acknowledge other neighbors can also enjoy the benefits of a "safe neighborhood." Although such situations can create free-rider problems, we consider such outcomes to be positive manifestations of social capital because the people living in these neighborhoods can gain positive spillover effects from abundant stocks of social capital.

A schematic representation of the analysis in Study 1 is shown in Figure 2-1. Study 1 tested a path model in which neighborhood-level social capital stimulated community management activities, such as cleanup activities, and in which those management activities, in turn, reduced neighbors' crime victimization. Community management activities, such as cleanup activities (e.g., mowing lawns and filling trash cans) and community gatherings, represent "signs of occupancy" (Cirel et al., 1977). Signs of occupancy express a sense that neighborhood residents are careful about their community, and this sense has crime-reducing effects. These effects are also related to the broken window theory (Wilson & Kelling, 1982), which states that criminal behavior is prevented in neighborhoods where residents attend to their community. In the context of social capital theory, it is assumed that neighborhoods that are affluent in social capital offer abundant community management activities. Therefore, we can predict that the crime rate is reduced in such neighborhoods.

Given these effects, what is the most appropriate geographical scale on which to

examine the interactions among neighbors living in relatively “micro” neighborhoods? Because the number of neighborhood management activities near residents’ homes may vary among geographic areas that are smaller than municipalities or towns, analyses based on geographically small neighborhoods are desirable to detect the crime prevention effects of such activities. Thus, the present study used street blocks as the unit of analysis in multilevel models. The issues that are related to the areal unit are discussed in greater detail in Chapter 3.

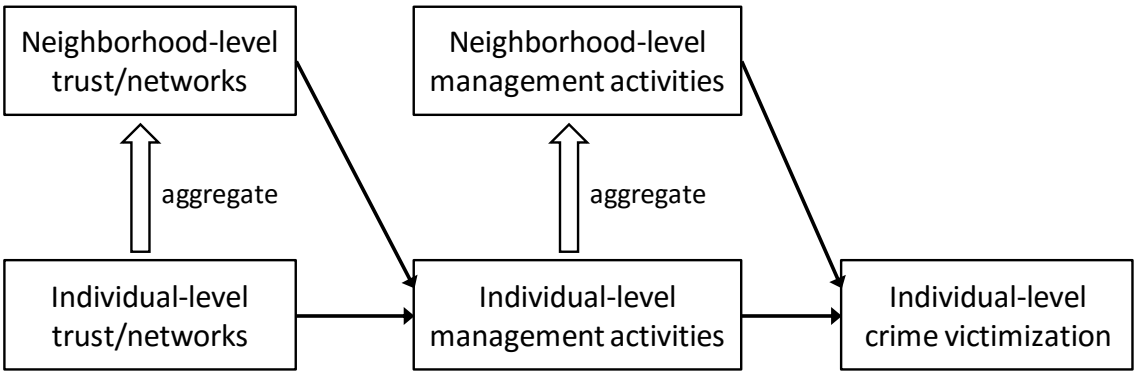

Figure 2-1. Summary of the path analysis in Study 1

Methods

Data

In 2006, study group investigators mailed a questionnaire survey to 1,000 residents of Itabashi Ward in Tokyo, Japan. The subjects were chosen form eligible voter rolls using two-stage random sampling. The response rate was 44.1%.

Itabashi Ward is one of the 23 wards of Tokyo. It had a population of 523,083 at the time of the 2005 population census. Itabashi Ward is a typical urban area, and the population density is 16,243/km^2. This ward ranks 9th in population density among the 23 wards of Tokyo. This study sampled from both old town areas with high residential stability and new residential areas with high residential mobility. Consequently, these data accounted for variations in neighborhood characteristics.

If the number of crimes in Itabashi Ward is excessively high, it should affect the patterns of residents' cooperative behaviors. The crime rate for this ward is 5.0 per 1,000 people, and the ward ranks 10th in crime among Tokyo's 23 wards. Thus, this ward is average in terms of public safety. Based on the above-mentioned characteristics of the study region, the results of this study can be regarded as a crime prevention model for typical urban areas and can be generalized to other urban areas to a certain degree.

Measurements

This study measured the following two types of crime victimization in the past five years as dependent variables: "burglary," consisting of household burglary and car break-ins, and "vehicle theft," consisting of car, motorbike and bicycle theft. In the analysis, the sums of the respondents' experiences of each type of crime victimization were used.

The main independent variables were social capital and management activities. The social capital variables included two types of social network indices (supportive social ties and personal network size) and generalized trust. Supportive social ties in the neighborhood were measured by the participants' responses to the following two items: "Number of acquaintances who cooperate with you" and "Number of acquaintances who go to neighborhood events or meetings with you." In the analysis, the average of these two items was used. The size of the residents' personal networks was measured using their responses to the following two items: "Number of acquaintances whom you greet upon meeting them on the street" and "Number of acquaintances with whom you talk casually." In the analysis, the average of these two items was used. The supportive network and the personal network size were scale-free items. Because the distributions of this type of scale are power-low or lognormal (Barabási, 2002; Watts, 2003), these network items were translated into natural logarithms.

Generalized trust was assessed using the following items derived from Yamagishi and Yamagishi's (1994) generalized trust items: "Most people can be trusted," "Most people are basically good and kind," and "I basically trust other people." The participants responded using a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree). In the analysis, the average of these three items was used.

Neighborhood management activity was measured by asking the respondents how often

they participated in the following activities: “Participation in neighborhood meetings and talking about neighborhood problems” and “Participation in cleanup activities in the neighborhood.” The participants responded using a 4-point Likert scale (1 = Never participate, 2 = Rarely participate, 3 = Sometimes participate, 4 = Frequently participate). In the analysis, the average of these two items was used.

The respondents’ sex, duration of residency, annual household income and educational background were included as sociodemographic covariates.

Statistical analysis

As previously mentioned, the outcome variable of the first model, management activities, was measured using a 4-point Likert scale; the outcome variable of the final model, experiences of crime victimization, was count data that summed each respondent’s crime victimization experience. Therefore, this study used a multilevel linear regression model to analyze the management activities and a multilevel Poisson regression model to analyze the crime victimization. The neighborhood-level unit was the street block (n = 58). The average number of respondents embedded in each street block was 6.2 (in the analyses of crime victimization, however, the number of respondents in each block was reduced to 3.8 because of missing values). The software used was HLM6. A two-level random-intercept and fixed-slope model was applied.

Results

Table 2-1 contains the descriptive statistics for this study.

Table 2-1. Descriptive statistics of Study 1

Items	Mean	SD	Items	%
Social networks[a]			**Sex**	
Size of personal network	6.82	9.09	Male	42.1
Supportive social ties	3.33	10.55	Female	57.9
Generalized trust (4-point scale) (α=.663)			**Annual household income**	
"Most people can be trusted"	2.47	0.73	Unwaged	1.8
"Most people are basically good and kind"	2.83	0.75	Less than 1 million yen	1.6
"I basically trust in other people"	3.03	0.74	1-2 million yen	7.3
Mean	2.77	0.57	2-3 million yen	12.0
			3-4 million yen	14.6
Management activities (4-point scale) (r = .472)			4-6 million yen	18.1
"Participation in cleanup activities in neighborhood"	2.24	1.02	6-8 million yen	13.4
			8-10 million yen	7.9
"Participation in neighborhood meetings and talking about neibhorhood's problems"	2.55	1.01	10-15 million yen	8.1
			15-20 million yen	4.3
Mean	2.40	0.83	More than 20 million yen	1.2
			NA/DK	9.7
Duration of residency	28.91	15.98		
			Educational attainment	
			Junior high school	8.5
			High school	36.5
			Technical school	14.2
			Tow-year college/higher professional school	9.7
			University	23.5
			Graduate school	0.8
			Other	1.6
			NA/DK	5.1
			Burglary victimization	
			Household burglary	5.8
			Car break-in	9.8
			Vehicle theft victimization	
			Car/bike theft	7.6
			Bicycle theft	27.0

[a] The values of the social network indices shown in this table were not translated into the natural logarithm.

There were approximately 15% more women than men among the respondents. The

most common income category was “4-6 million yen.” Concerning educational background, high school education was the most common, accounting for approximately 4 out of 10 participants. The percentages of respondents who experienced crime victimization were 5.8% for household burglary, 9.8% for car break-in, 7.6% for car/bike theft, and 27.0% for bicycle theft.

Table 2-2 shows the effects of neighborhood- and individual-level social capital on individual-level management activities.

Table 2-2. Multilevel linear model estimates for management activities

Dependent Variable:	Management activity
Independent Variables	Coefficient
Individual-Level Variables	
Intercept	0.02
Sex (male=1)	-0.12
Duration of residency	0.01 *
Household income	0.04 **
Educational background	-0.05
Personal network size	0.03
Supportive networks	0.38 ***
Generalized trust	0.19 *
Neighborhood-Level Variables	
Personal network size	0.33 ***
Supportive network size	0.16
Generalized trust	0.31 †
Random Effect	Variance Component
Intercept	0.00
Level-1 *n*	359
Level-2 *n*	58

Note: ***p<.001, **p<.01, *p<.05, †p<.10

As shown in Table 2-2, individual-level support networks and generalized trust were positively associated with management activities. Similarly, neighborhood-level personal network size was positively related to management activities.

Next, the variable "management activities" was included as an independent variable, and the coefficients for each type of crime victimization were estimated (Table 2-3).

Table 2-3. Multilevel Poisson model estimates for crime victimization

Dependent Variable:	Burglary	Vehicle theft
Independent Variables	Coefficient	Coefficient
Individual-Level Variables		
Intercept	-5.88 ***	-1.73
Sex (male=1)	0.34	0.14
Duration of residency	0.02 *	0.01
Household income	0.16 †	-0.01
Educational background	-0.12	0.10
Personal network size	0.64 ***	0.00
Supportive networks	0.10	0.04
Generalized trust	0.50	0.13
Management activity	-0.50	0.20
Neighborhood-Level Variables		
Management activity	-2.42 ***	-0.41
Random Effect	Variance Component	Variance Component
Intercept	0.03	0.15
Level-1 *n*	221	221
Level-2 *n*	58	58

Note: ***p<.001, **p<.01, *p<.05, †p<.10

Table 2-3 shows that neighborhood-level management activity was inversely linked

with burglary victimization but was not associated with vehicle theft. However, individual-level management activity was not significant for either type of victimization. Furthermore, individual-level personal network size showed a significant positive association with burglary victimization.

Discussion

This study first analyzed the association between social capital indices and neighborhood management activities using a multilevel linear model (Table 2-2). The results suggested that a larger individual-level supportive network was associated with frequent participation in management activities. This result demonstrates that having many supportive acquaintances provides opportunities and support for participating in neighborhood activities, which stimulates cooperative behavior. At the neighborhood level, however, the significant effect of supportive networks was not found. Because supportive networks tend to be formed within relatively close and friendly relationships, the extent of their influence may be limited, and their effect on those who lack these types of networks may be small.

Network size was positively associated with management activities at the neighborhood level. Thus, in neighborhoods where neighbors have large social networks, respondents can easily interact with other people even if their own networks are small. This finding suggests that this type of network exerts a spillover effect on neighbors and may be an important factor that allows

individuals who lack social ties to participate in their communities. By contrast, the size of individual-level networks was not associated with management activities, suggesting that networks of mere acquaintances can exercise influence only when the people within such networks are grouped at the contextual level. To uncover the reason why the differences between individual- and contextual-level effects arose, further investigation is required.

Both individual- and neighborhood-level generalized trust was associated with the exercise of management activities (but the significance level of neighborhood trust was 10%). This suggests that the expectation that others will behave cooperatively is important for individuals who engage in cooperative behaviors with others. Wrightsman's (1992) focus on trust as a factor in resolving the prisoner's dilemma and the social dilemma provides one perspective through which to understand these results. Specifically, people do not choose a cooperative behavior when there is a possibility of being exploited by others; however, they willingly choose a cooperative behavior when there is trust or an expectation that they can make exchanges with others on a reciprocal basis.

Next, in terms of the relationships between neighborhood management activities and crime victimization, Table 2-3 shows that the effects of individual-level management activities on crime victimization were not significant for either burglary or vehicle theft. By contrast, neighborhood-level management activities were associated with burglary victimization but were

not related to vehicle theft victimization. The reason that management activities were not associated with vehicle theft victimization can be inferred as follows: whereas household burglary and car break-ins, which are included in the burglary category, are likely to take place at or near victims' homes, vehicle theft is not tied to the residence and can also take place in public places, such as stations and streets. Thus, victimizations that occurred far from victims' homes cannot be prevented by management activities that are aggregated at the victim's block level. Because of the inconsistency between the definition of "neighborhood" in this study (i.e., a block) and the geographic range of victimization measured, this study cannot detect a significant preventive effect of management activities on vehicle theft victimization. These results suggest that management activities that are conducted in residential areas enhance crime prevention in the area but are not efficacious for crime that occurs outside of the neighborhood. Future studies should examine the locations where the victimizations occurred versus defining the appropriate geographical range of the "neighborhood."

An additional point to note is that individual-level management activities were not associated with crime victimization. The crime prevention effect was only exerted when the management activities were aggregated at the neighborhood level. These results are consistent with one of the conditions of the social dilemma, i.e., the smallness of individual influence causes people to withhold cooperative behaviors (Umino, 2006). This situation is a potential invitation

to free-ride. The social dilemma characteristics that are inherent in neighborhood cooperative behaviors are explored in greater detail in Study 2.

Regarding the positive relationship between individual-level personal network size and burglary victimization, it is possible that a large number of weakly interacting acquaintances, such as those whom respondents only greet when they meet them on the street, may increase the social diversity of people's social networks. People whose social ties are numerous and diverse are more likely to become a crime victim because of an increased number of opportunities to be involved in unsafe situations and social uncertainty (Kennedy & Silverman, 1985; Krannich et al., 1989). However, it has been shown that large neighborhood-level personal network size promotes management activities and indirectly contributes to burglary prevention. These results suggest that this type of network index may have both crime-stimulatory and crime-prevention effects depending on its level.

As a limitation of this study, a problematic aspect of multilevel models should be noted. For the neighborhood-level variables, this study used the averages of responses from participants living on the same street block. According to this method, two respondents who are next-door neighbors may be assigned to different "neighborhoods," and their reciprocal influences might be ignored in the multilevel analyses. Thus, simply clustering residents according to street blocks or other administrative boundaries makes it difficult for studies to detect rigorous neighborhood

effects. The issues concerning areal units are discussed in detail in Chapter 3. Finally, the generalizability of the present study's findings should be discussed. This study surveyed residents in Itabashi Ward, Tokyo. Thus, the models that were examined in this study should be interpreted as an urban crime prevention model. The 2006 crime rate in Itabashi Ward reported by Tokyo Metropolitan Police Department (5.0 per 1,000 people) was ranked 10th among Tokyo's 23 wards (mean 7.9, range 4.0-35.5); therefore, Itabashi Ward's crime rate is average compared with Tokyo's other 22 wards. Thus, the results of the present study are representative of areas with an average crime rate rather than those with an anomalously high crime rate. From that standpoint, this study's results can be viewed as a crime prevention model for average Japanese urban areas.

Study 2: The Effect of Social Capital on the Social Dilemma Inherent in Collective Anticrime Activities

Introduction

In Study 1, the effects of street block-level management activities on crime victimization were examined through multilevel models. The significant crime reduction effect of neighborhood-level management activities that was found in Study 1 indicates that social capital has a spillover effect on the people who are embedded in its contexts. This result can be viewed as an example of the public good aspect of social capital; however, this feature of social capital can be an incentive for non-cooperation because people's own individual cooperative behaviors do not have a crime reduction effect, as Study 1 showed. Thus, we can consider that the features of the social dilemma exist in the context of crime prevention through neighborhood cooperative behaviors. Study 2 explores a mechanism that promotes cooperative neighborhood crime prevention behaviors through social capital from the perspective of the social dilemma.

The present study focuses on anticrime activities as cooperative neighborhood behaviors. Anticrime activities (*jishu bouhan katsudou* in Japanese) have been promoted by the policies of the National Police Agency and local governments. In 2007, the number of groups conducting anticrime activities, such as neighborhood watches and volunteer patrols, was 15 times higher

than the number in 2003 (Sugata, Kato, & Koide, 2008).

The factors that promote anticrime activities among neighborhood residents have been examined within the framework of social control theory. The systemic model of crime (Bursik & Grasmick, 1993) in particular focuses on both the informal social control exerted by neighborhood residents and the formal social control administered by public institutions as factors that prevent crime. The systemic model assumes that people's social ties and trust facilitate effective socialization and the availability of public resources and that informal and formal social control are, therefore, exercised in the neighborhood. Sampson et al. (1997) showed that residential stability enhances neighborhoods' collective efficacy, which is the concept involving informal social control. The anticrime activity that is addressed in this study is one form of informal social control.

In Japan, however, "crime prevention fatigue" has been noted as a recent problematic phenomenon in collective anticrime activities (Shimada, 2008, 2009). When this fatigue occurs, even after residents begin conducting neighborhood anticrime activities, some people or groups drop out because of the burden of excessive effort. Residents' surveys have shown that groups that abandoned their activities refer to decreased motivation, getting into a rut, and deficiency in neighbors' cooperation as reasons for discontinuing their crime prevention activities (Harada, 2009).

Although empirical studies on informal social control and collective efficacy have been accumulating in the field, the appearance of features of the social dilemma in collective anticrime activities has thus far been largely ignored. As mentioned above, in social capital theory, although the spillover effect (in which some residents' cooperative behaviors contribute to the safety of those who do not cooperate) can be considered a positive effect of social capital, it can also be a source of the free-rider problem (Putnam, Leonardi, & Nanetti, 1993). The pathway by which trust/networks increase collective efficacy, which drives informal social controls, may not adequately explain the continuity of collective anticrime activities. Thus, the present study investigated the effect of social capital on anticrime activities from the viewpoint of the social dilemma.

Dawes (1980) pointed to the following two definitions as conditions of the social dilemma.

(1) $D(m) > C(m+1) \qquad m = 0,1,2,\ldots,N-1$

(2) $D(0) < C(N)$

where $D(m)$ represents the utility of individuals who choose "deception" when m people in society choose "cooperation," and $C(m+1)$ represents the utility of individuals who choose "cooperation" when $m+1$ people in the society choose "cooperation." Thus, equation 1 indicates that deception is more desirable for individual actors than is cooperation (in other words,

actors gain lower utility when they choose cooperation than when they choose deception). One reason for the lower utility is the cost (i.e., time and energy) of cooperative behaviors. Equation 2 shows that the situation in which all members of the society choose cooperative behavior is more desirable than the situation in which all members of the society choose deception, as the latter situation is the most socially inefficient. Thus, although deception is desirable for individuals, utility decreases considerably if all members of the society choose deception. Hence, a situation in which non-cooperation by all members of society decreases their utility but the cost of cooperation is high represents a social dilemma because people cannot choose either cooperative or non-cooperative behaviors.

However, a situation that consists of only the two abovementioned conditions cannot be clearly distinguished from the prisoner's dilemma game, in which only two actors exist. Because there are only two "players" in the prisoner's dilemma game, one player's choice directly and strongly affects the other player. However, for cooperative behaviors in local communities, the smallness of one's behavioral impact given the presence of many other people can also be an important factor that inhibits cooperative behaviors. Thus, in addition to the above two definitions, Umino (2006) indicated that Dawes's definitions cannot capture the "sense of inefficacy," that is, the idea that the impact of any one individual is small in society as a whole. In the social dilemma situation, the impacts of individual's choices are much smaller than in the prisoner's dilemma.

The behavioral choice strategies that can be observed in the prisoner's dilemma do not exist in the social dilemma situation because individuals' choices have little influence on the situation. Therefore, the sense of inefficacy that results because the influence of individuals is quite small should be included in Dawes's definition when the social dilemma is conceptualized in contrast to the prisoner's dilemma.

Drawing from the above three definitions, the social dilemma has the following three features: cooperative behaviors burden actors (sense of cost); if all members of society choose deception, the results are undesirable for society (sense of crisis); and the impact of individuals' actions is quite small (sense of inefficacy). That is, the social dilemma situation suggests that one knows that society suffers in the absence of people's cooperative behaviors, but one cannot choose either cooperation or non-cooperation because the cost and the small impact of individual behaviors serve as incentives for non-cooperation. The present study aimed to capture this situation using the three abovementioned indices. Incidentally, if an individual estimates that cost and inefficacy are high and the sense of crisis is low, he/she cannot regard the situation as a dilemma, and he/she can willingly choose non-cooperation because there is only incentive for non-cooperation.

Given the above formulation of the social dilemma, this study examined the hypothesis that trust, reciprocity and social participation among actors (i.e., neighborhood residents) reduce

the cost of cooperation, allow the actors to share the same interests (an increase in the sense of crisis), and reduce the sense of inefficacy. This study used variables aggregated at the neighborhood level as social capital indices and analyzed the path model shown in Figure 2-2 using multilevel models. The neighborhood-level unit is described in the Methods section.

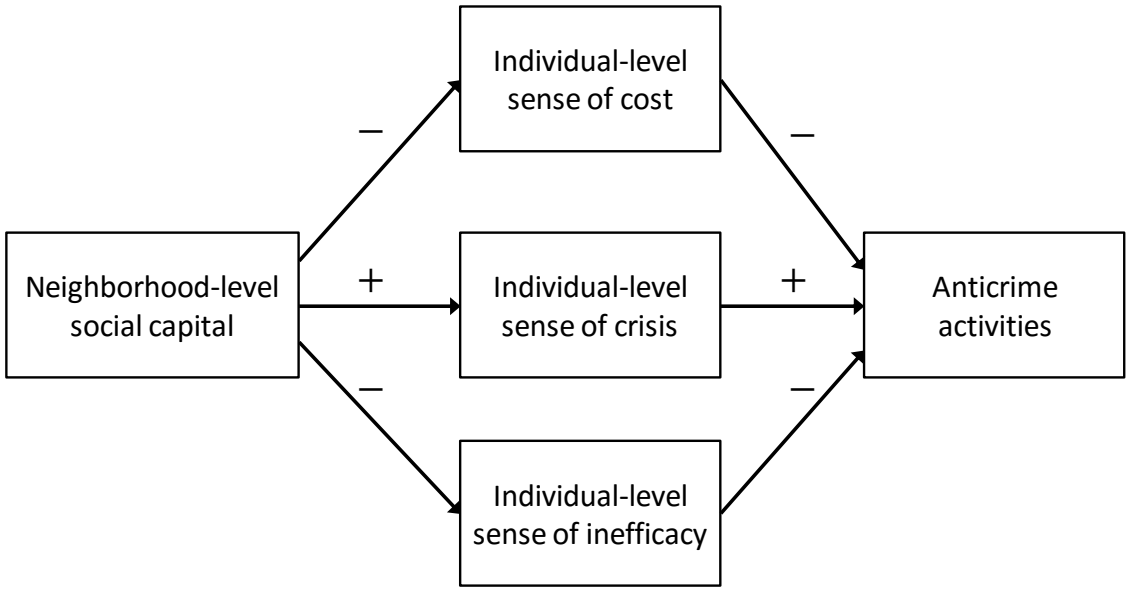

Figure 2-2. Schematic of the path analysis in Study 2

Methods

Data

In 2009, study investigators mailed a questionnaire survey to 635 residents of Makuhari Bay Town in Chiba Prefecture, Japan. The response rate was 75.1%. Makuhari Bay Town is a large housing area that consists of 32 apartment buildings that are built on 84 hectares of land.

Residents began to move to the area in 1995, and as of March 2009, 22,900 people lived there in 7,950 households. This survey is the third wave of a panel study (people who responded to both the first and the second wave of the surveys conducted in 2006 and 2007 were surveyed).

This study considered apartment buildings rather than commonly used *choumoku* as the "neighborhood community." The apartment buildings were treated as the neighborhood because they are more explicit autonomous boundaries than *choumoku* in large housing complexes such as Makuhari Bay Town, since autonomy is established for each apartment building. For example, bulletin board systems (BBS) and mailing lists exist at each apartment building, and the apartment buildings serve as "neighborhoods" for each resident. Since the beginnings of Makuhari Bay Town, its residents' concern for town development has been high, and ambitious efforts have been exerted (the abovementioned community BBS and mailing lists are examples). Thus, by focusing on this area, neighborhood anticrime activities and the crime prevention fatigue and free-riding derived from them can be readily captured in the framework of multilevel models.

Measurements

The survey items that assessed social capital included items concerning generalized trust, norms of reciprocity, and social participation. Generalized trust was assessed with the following three items: "Most people can be trusted," "Most people are basically good and kind" and "I

basically trust other people." The responses were arranged on a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree). The average of these three items was used. The norms of reciprocity were measured using the following three items: "In society, people follow the rule that they should help each other in a pinch," "If someone helps you, you would also help any other person" and "If you are dealt with kindly by other people, you also feel that you would help someone in need." These responses were also presented on a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree). In the analyses, the average of these three items was used. For social participation, the sum of the respondents' participation in the following 14 neighborhood groups/activities was determined: residents' associations, condominium management associations, parent-teacher associations, organizations for local children, disaster prevention activities, activities relevant to the neighborhood environment, support groups for the elderly and disabled, child-rearing support groups, Meals on Wheels, neighborhood events and festival planning groups, neighborhood newsletter groups, free market/joint purchase groups, sports clubs, and hobby groups. In the analyses, the first principal component score for generalized trust, norms of reciprocity and social participation was used as the social capital index.

Sense of crisis, sense of inefficacy, and sense of cost variables were measured as cognitive components of the social dilemma situation according to Umino (2006). Umino (2006)

addressed the social dilemma situation relevant to trash separation in neighborhoods. Trash separation is also one of the collective cooperative behaviors that are conducted in neighborhood communities, and Umino's methods can be applied to collective anticrime activities in neighborhoods. Each item was arranged on a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree). Sense of crisis was assessed using the following two items: "Community safety will deteriorate if neighborhood residents do not conduct anticrime activities in the neighborhood" and "The deterioration of public safety due to neighborhood disorder will not happen until far into the future (reverse scoring)." Sense of inefficacy was measured using the following two items: "Even if I conduct anticrime activities, my neighborhood will not become safer" and "If I participate in safety patrols and friendly greeting campaigns in my neighborhood, my neighborhood will become safer (reverse scoring)." Sense of cost was measured using the following two items: "Conducting anticrime activities with my neighbors is a troublesome task for me" and "Conducting anticrime activities with my neighbors takes up much of my energy." The averages of each item were used as the cognitive components of each social dilemma indicator. The sociodemographic covariates included the respondents' sex and age. The dependent variables were collective and individual anticrime activities. The index of collective anticrime activities was based on the frequency of the respondents' participation in the following neighborhood activities (1 = Do not participate at all, 2 = Rarely participate, 3 =

Sometimes participate, 4 = Frequently participate): “Neighborhood crime watch,” “Friendly greeting campaigns at school roads” and “Neighborhood meetings on crime prevention.” In the analysis, the first principal component of these three items was used.

For individual anticrime activities, the respondents were asked whether they engaged in the following seven behaviors: “Changing a lock on a door to prevent burglary,” “Installing a secondary window key in addition to a normal key,” “Caring about strange occurrences (suspicious figures and sounds) at neighbors’ houses,” “Avoiding walking alone at night,” “Carrying a portable crime prevention buzzer,” “Keeping a safe distance from passersby on the road at night” and “Being picked up by family or friends at night instead of walking home.” In the analysis, the first principal component score of these seven items was used. The principal component score was calculated using a tetrachoric correlation matrix because these seven items were binary.

In addition to the cross-sectional participation in 2009, a variable that indicated the continuation of participation in neighborhood anticrime activities from the most recent past survey in 2007 to the present survey in 2009 was analyzed. In the analysis of this variable, the participants who responded to both the 2007 survey and the current survey were included. In this analysis, the people who reported that they participated in neighborhood anticrime activities in both 2007 and 2009 were coded as 1; all others were scored as 0.

Statistical analysis

The macro-level unit was the condominium building (n = 32). The average number of respondents who were embedded in each condominium building was 14. Multilevel models were used; the individual level was level 1, and the condominium building level was level 2. The software used was HLM6.

Results

Table 2-4 shows the descriptive statistics of the present study's sample.

Table 2-4. Descriptive statistics of Study 2

Items	Mean	SD	Items	%
Collective anticrime behaviors (4-point scale) (α=.774)			**Sex**	
Neighborhood crime watch	1.34	0.691	Male	40.0
Friendly-greeting campaigns at school roads	1.50	0.863	Female	60.0
Neighborhood meetings about crime-prevention	1.41	0.757	**Age**	
			20-29 years old	2.7
			30-39 years old	22.8
Individual anticrime behaviors (0-7)	1.80	1.299	40-49 years old	39.1
			50-59 years old	18.0
Generalized trust (4-point scale) (α=.761)			60-69 years old	11.4
"Most people can be trusted"	2.50	0.709	70-79 years old	5.9
"Most people are basically good and kind"	2.66	0.615		
"I basically trust other people"	2.93	0.634	**Continuation of neighborhood anticrime activities between 2007-2009**	
Norms of reciprocity (4-point scale) (α=.488)			Continually participated	7.1
"In society, people follow the rules in which people should help each other in a pinch"	2.46	0.636	Dropped out	12.4
"If someone helps you, you would also help any other person"	3.36	0.561		
"If you are dealt with kindly by other people, you also feel that you would help someone in need"	3.54	0.516		
Social participation (0-12)	3.08	2.850		
Sense of crisis (4-point scale) (*r* = .238)				
"Community safety will deteriorate if neighborhood residents do not conduct anticrime activities"	3.03	0.761		
"Deterioration of public safety by neighborhood disorder will not happen until far into the future" (reverse scoring)	2.50	0.875		
Mean	2.76	0.645		
Sense of inefficacy (4-point scale) (*r* = .252)				
"Even if I conduct anticrime activities, my neighborhood will not be safe"	2.56	0.895		
"If I participate in safety patrols and friendly-greeting campaigns in neighborhood, my neighborhood will be safe" (reverse scoring)	2.69	0.755		
Mean	2.62	0.654		
Sense of cost (4-point scale) (*r* = .636)				
"Conducting anticrime behaviors with my neighbors is a troublesome task for me"	2.21	0.707		
"Conducting anticrime behaviors with my neighbors takes up a lot of my energy"	2.20	0.780		
Mean	2.20	0.674		

Table 2-4 shows that the frequency of participation in collective anticrime behavior was relatively low (1.34-1.50 on a 4-point scale). The individual anticrime behaviors variable was also low, on average (1.8 out of 7 behaviors). In terms of the continuity of collective anticrime activities from 2007 to 2009, only 7.1% of the respondents reported that they participated in anticrime activities in both survey years. In comparison, 12.4% of the respondents participated in collective anticrime activities in 2007 but discontinued these activities by 2009.

The associations between the social capital index and the cognitive elements of the social dilemma are shown in Table 2-5.

Table 2-5. The associations between social capital and each cognitive element of the social dilemma

Dependent Variable:	Sense of crisis	Sense of inefficacy	Sense of cost
Independent Variables	Coefficient	Coefficient	Coefficient
Individual-Level Variables			
Intercept	3.14 ***	2.19 ***	2.73 ***
Sex (male=1)	-0.03	-0.13 *	0.04
Age	-0.04	0.07 *	0.02
Social capital index	0.16 ***	-0.18 ***	-0.13 **
Condominium Building-Level Variable			
Social capital index	0.28 **	-0.60 **	-0.37 *
Random Effect	Variance Component	Variance Component	Variance Component
Intercept	0.00	0.02 **	0.00
Social capital index	0.00	0.01	0.00
Level-1 *n*	462	462	462
Level-2 *n*	32	32	32

Note: ***p<.001, **p<.01, *p<.05

Table 2-5 shows that individuals who had high social capital and those who lived in a building that was characterized by high neighborhood social capital were likely to estimate the disadvantage stemming from non-cooperation (i.e., the sense of crisis) to be high. Table 2-5 demonstrates that both individual- and apartment building-level social capital reduced individuals' inefficacy. Similarly, the table shows that individual- and building-level social capital reduced the perception of the cost of engaging in cooperative behavior with neighbors. These results suggested that social capital influences people's cognition about resolving the social dilemma, regardless of the measurement level.

Table 2-6 shows the association between the cognitive elements of the social dilemma and participation in anticrime activities.

Table 2-6. The association between the cognitive elements of the social dilemma and collective/individual anticrime activities

Dependent Variables:	Collective anticrime activities	Individual anticrime activities
Independent Variables	Coefficient	Coefficient
Individual-Level Variables		
Intercept	-0.25 †	0.48 ***
Sex (male=1)	-0.09	-0.33 ***
Age	0.08 *	0.01
Sense of crisis	0.01	0.07 **
Sense of inefficacy	-0.16 **	0.01
Sense of cost	-0.13 *	0.04
Social capital index	0.28 ***	-0.02
Condominium Building-Level Variables		
Sense of crisis	0.07	0.06
Sense of inefficacy	0.07	0.04
Sense of cost	0.10	0.08
Social capital index	0.45 *	-0.10
Random Effect	Variance Component	Variance Component
Intercept	0.00	0.00
Sense of crisis	0.04 *	0.00
Sense of inefficacy	0.07	0.00
Sense of cost	0.03 **	0.01 †
Social capital index	0.03 *	0.00
Level-1 *n*	477	477
Level-2 *n*	32	32

Note: ***$p<.001$, **$p<.01$, *$p<.05$, †$p<.10$

First, both individual- and condominium-level social capital indices were positively associated with participation in collective anticrime activities but did not have significant effects on individual anticrime behaviors. Second, in terms of the social dilemma variables, the results showed that the sense of inefficacy and the sense of cost reduced participation in neighborhood

collective anticrime activities. The sense of crisis was not linked to collective anticrime activities. Furthermore, individual anticrime behaviors were associated only with the sense of crisis. In comparison, no cognitive component of the social dilemma aggregated at the apartment building level was associated with the collective anticrime activities.

Table 2-7 shows the effects of the social capital and social dilemma indices on the continuity of collective anticrime activities from 2007 to 2009. Because the outcome variable was binary, a multilevel logistic regression analysis was applied.

Table 2-7. The effects of the social capital and social dilemma indices on the continuity of collective anticrime activities

Dependent Variable: Continuity of participation		
Independent Variables	Odds Ratio	95%CI
Individual-Level Variables		
Intercept	0.05 ***	(0.01-0.18)
Sex (male=1)	0.44 †	(0.18-1.05)
Age	1.11	(0.80-1.54)
Sense of crisis	1.21	(0.75-1.94)
Sense of inefficacy	0.98	(0.65-1.58)
Sense of cost	0.56 *	(0.34-0.92)
Social capital index	1.87 **	(1.31-2.67)
Condominium Building-Level Variables		
Sense of crisis	0.78	(0.34-1.80)
Sense of inefficacy	0.74	(0.35-1.66)
Sense of cost	0.28	(0.06-1.46)
Social capital index	2.27 **	(1.80-2.78)
Random Effect	Variance Component	
Intercept	0.11	
Sense of crisis	0.30	
Sense of inefficacy	0.19	
Sense of cost	0.35	
Social capital index	0.30	
Level-1 *n*	442	
Level-2 *n*	32	

Note: ***p<.001, **p<.01, *p<.05, †p<.10

In Table 2-7, both individual- and condominium-level social capital showed a significant positive association with the continuity of collective anticrime activities. In terms of the cognitive elements of the social dilemma, only the individual-level sense of cost had a significant association with the continuity of collective anticrime activities.

Discussion

The present study shows that social capital encourages crime prevention activities through the cognitive resolution of the social dilemma. Both individual- and condominium-level social capital indices were positively associated with the sense of crisis (Table 2-5). This result suggests that abundant interactions among residents help to broaden their social views and may dissipate the differences between individual and collective interests. For example, Inamasu et al. (2010) suggested a concept of social perspective as a factor that explains the association between affluent social networks and frequent social participation. Social perspective is the ability to understand the existence of world views that differ from one's own familiar living environment and to feel connections with society. Therefore, people who can take social perspective through abundant social capital are likely to experience not only their own fear of crime but also a critical feeling about the "deterioration of the neighborhood." Additionally, frequent contact with others may help people identify the problems that the neighborhood faces. For example, if people do not have any acquaintances in the neighborhood, they are not likely to know the troubles that their neighbors face, whereas if they are acquainted with their neighbors, they become aware of the neighborhood's current situation. Additionally, affluent social ties increase people's opportunities to gain information about crime in the neighborhood and, consequently, heighten their fear of crime (Arai et al., 2013; Shimada et al., 2004). Furthermore, individuals' sense of "my profits and

losses" changes into a sense of "our profits and losses" as their social ties in the neighborhood increase. De Filippis (2001) argued that for individuals embedded in informal social networks, individual gains and interests are likely to become synonymous with group gains and interests (and then they act as networks). This process can be interpreted from the perspective of the civic virtue model that Boix and Posner (1998) advocated as an explanation of the association between social capital and governance in neighborhood communities. That is, social capital shifts residents' preference from individual interests to collective interests, developing the "I" into the "we." Based on this viewpoint, in neighborhoods with rich social capital, people consider their neighborhood and express concern about the neighborhood's safety (i.e., they develop a sense of crisis).

In the current study, social capital was negatively associated with the sense of inefficacy (Table 2-5). That is, in communities where affluent social capital exists, people can expect that their cooperative behaviors are effective and relevant because they can anticipate others' cooperation.

Based on the negative association between social capital and the sense of cost (Table 2-5), we can infer that social participation and trust among neighbors can reduce the sense of cost by increasing the ease with which people engage in cooperative behaviors. Additionally, the expectation that neighborhood residents are willing to cooperate may convince people who provide their resources to others that their behavior will not be unilaterally exploited.

Table 2-6 demonstrates that an individual-level sense of inefficacy and cost are related to collective anticrime activities, whereas a sense of crisis is not. These results suggest that to encourage collective anticrime activities, it is important to reduce the sense of inefficacy and cost but not to proclaim a social crisis. Conversely, the index of individual anticrime behaviors was only associated with a sense of crisis. Because individual anticrime behaviors do not require cooperation with neighbors, the sense of inefficacy and cost regarding neighborhood collective activities are not involved in people's decision to engage in individual behaviors.

Furthermore, the analysis of the continuity of collective anticrime activities using data from two panel time-points showed that only the sense of cost was significantly correlated with the continuity of participation (Table 2-7). That is, if the sense of cost is high, continuous participation is reduced. Although Table 2-6 shows that the sense of inefficacy can explain "temporary" participation in collective anticrime activities, Table 2-7 suggests that a reduction in costs is more important for continuous participation. Sampson et al. (1997) treated social control and collective efficacy as nearly identical concepts, whereas the present results suggest that efficacy explains the onset of social control but does not predict its continuity. The present results showed that only the sense of cost was linked to continuity, which is consistent with Shimada's (2008, 2009) anecdotal evidence that collective anticrime activities are often interrupted by the "fatigue of crime prevention." A pragmatic recommendation that stems from the present findings

is that to sustain participation in collective neighborhood anticrime activities, it is important to both reduce the sense of inefficacy and improve the environment so that participation costs are reduced.

In summary, this study examined the association between the recognition of the social dilemma and participation in collective anticrime activities under the assumption that crime prevention efforts through neighborhood collective actions are associated with each cognitive component of the social dilemma. As expected, the results showed that each cognitive component of the social dilemma was related to a reduction in the tendency to participate in collective activities. The respondents who underestimated the efficiency of collective actions and overestimated their costs were also unlikely to participate in collective actions. Moreover, the sense of cost was associated with the continuity of collective behaviors. This study suggests that social capital helps to resolve people's social dilemmas and that reducing the sense of cost is especially effective for sustaining neighborhood collective action.

Chapter 3 EXPLORATIONS USING GEOGRAPHICAL INFORMATION SYSTEMS AND SPATIAL ANALYTICAL TECHNIQUES

Study 3: Variation of the Effects of Social Capital on Burglary According to Geographical Scales of the "Neighborhood"[1]

Introduction

Many studies, including those referred to in Chapters 1 and 2, have generated findings on the relationship between social capital and crime using multilevel models. In the research to date, the spatial scale that has been adopted at the macro-level has varied substantially and has included whole countries (Lederman et al., 2002), states (Kennedy et al., 1998), counties (Rosenfeld et al., 2001), town blocks (Takagi et al., 2010), schools (Lindström, 2001), and apartment buildings (Saegert & Winkel, 2004).

Although an association between social capital and crime has consistently emerged across studies regardless of spatial scale, the artificiality of geographical boundaries continues to raise the specter of the MAUP. The MAUP states that the results of multilevel research may be

[1] Study 3 is based on the author's previous study which was published in a book titled "Global perspectives on social capital and health" (Takagi, D. [2013]. Neighborhood social capital and crime. In I. Kawachi, S. Takao, & S. V. Subramanian [Eds.], Global perspectives on social capital and health [pp. 143-166]. New York: Springer).

inconsistent across models that use different areal aggregations (Mobley, Kuo, & Andrews, 2008). Few multilevel studies have addressed this problem empirically in social psychology and criminology. In the fields of epidemiology and public health, it is common practice for researchers to operationally define multiple administrative boundaries and conduct multilevel analyses for each definition of "neighborhood" to test the MAUP. For instance, Mobley et al. (2008) investigated whether different definitions of areal aggregates affected the results of multilevel analyses using the following four areal units in California: the county (n = 57), the medical service study area (n = 519), the primary care service area (n = 333) and the U.S. Census zip code area (n = 1,450). The researchers examined the effects of contextual-level variables for each areal unit on mammography use among elderly women living in California. The results suggested that the effects of area-level variables (such as racial segregation, the proportion of elderly females living alone, and the proportion of elderly people in poverty) differed according to the areal unit of analysis. Tarkiainen, Martikainen, Laaksonen, and Leyland (2010) also examined the relationship between neighborhood characteristics, such as the proportion of manual workers in the area and mortality, using two alternative areal units in Finland (70 districts versus 258 subdistricts in Helsinki, Vantaa, Espoo, and Kauniainen). Although they found that the effects of neighborhood-level characteristics on mortality were slightly stronger when smaller area units were used, they suggested that the choice of area scale did not significantly change the estimates for neighborhood

effects on mortality.

Regardless of the size of the area unit, however, it is questionable whether the geographical ranges that are defined by administrative boundaries are appropriate units for defining "neighborhoods." According to Morenoff, Sampson, and Raudenbush (2001), the problem of assigning boundaries in multilevel models is that "two families living across the street from one another may be arbitrarily assigned to live in different "neighborhoods" even though they share social ties" (2001: 522). For this reason, the use of administrative boundaries to define the contours of "neighborhood social capital" may result in the misclassification and misestimation of the contextual effects of social capital. Specifically, the administrative boundaries that are generally used as the unit of analysis, such as blocks, counties and states, may not be the best distinctions for testing the effects of social capital on crime.

In the current study, aggregate-level spatial scales were defined using physical distances among residents rather than according to administrative boundaries. By defining various geographic sizes of neighborhoods and conducting multiple analyses, this study examined the variability in the effects of social capital on crime according to the spatial scales of the aggregate-level units used in the analyses.

An outline of the method is presented in Figure 3-1. First, the addresses of respondents were converted into coordinates and were plotted on an electronic map as point data using

geographical information systems software (ArcMap). After the conversion, each respondent's social capital indices (measured via mail survey) and the spatial distances among the respondents became available.

To define neighborhood-level units using the distances among respondents, this study manipulated the data as described below (Figure 3-1). For example, when the "neighborhood" was defined as the people living within 100 meters of each other, a circle around central respondent A was drawn, the other respondents in this circle (in this case, B, C and D) were defined as "A's neighbors," and the average of their social capital indices was used as an independent variable to explain A's burglary victimization. The same processes were followed for all of the respondents. When the definition of "neighborhood" was extended to 150 meters, as shown by the outer circle in Figure 3-1, the average of B, C, D, E, F and G's social capital indices was used to represent the neighborhood social capital of the central respondent A. The same processes were followed for all of the respondents, creating circles with radii of 60-500 meters in 10 meter increments. For these manipulations, ArcMap10's Generate Spatial Weight Matrix tool was used.

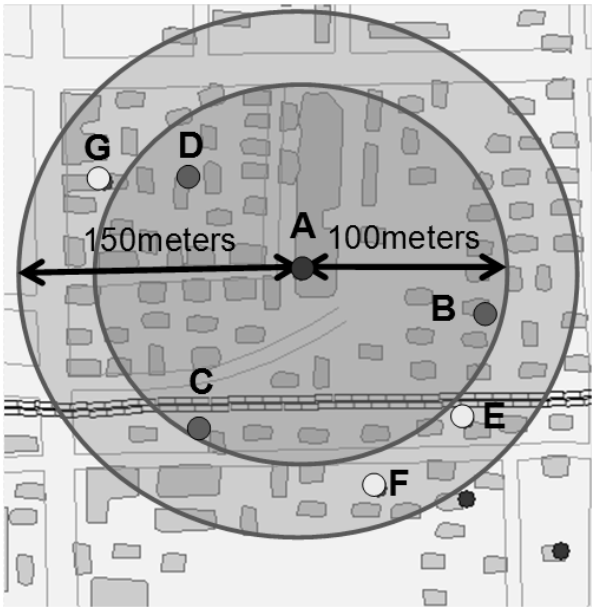

Figure 3-1. Conceptual diagram for defining “neighbors” as people living within 100 and 150 meters of a central respondent

Incidentally, this study did not necessarily argue that using physical distances among neighborhood residents is the best method for examining the link between neighborhood social capital and crime. For example, when researchers view neighborhood watches in each school district as a form of social capital and wish to examine their effect on crime, the school district is clearly the most appropriate area unit of analysis. However, if researchers attempt to resolve the areal unit problem of neighborhood research in which administrative areas are not consistently the appropriate unit of social capital, defining physical distances variably and exploring spatial scales that have a significant effect of social capital are a starting point for an approach to the MAUP.

Methods

Data

In 2009, the investigators of the present study mailed a questionnaire survey to 1,000 residents of Musashino City in Tokyo, Japan. Musashino City is located in central Tokyo and has a population of 135,065. The subjects were selected from among the eligible voters using two-stage random sampling. While Musashino City has the 13th largest population among Tokyo's cities, it has the highest population density (12,990/km^2). The response rate was 34.3%.

In studies that focus on the spatial distance between residents (such as the present study), data from urban areas with high habitation densities are more appropriate than data from rural areas where there are many uninhabitable spaces. The reason is that in rural areas, large expanses of farm land, hills, or mountains likely separate residents. By contrast, in urban areas, accessibility is relatively homogeneous among neighborhoods, and geographic features (e.g., mountains and farm land) other than physical distances are less likely to separate residents. Therefore, in this study, the sampling survey was conducted in the urban area.

Figure 3-2 represents point data that were created from the respondents' coordinates, which were derived from their addresses. The respondents who experienced burglary victimization are shown as black points (because some of the respondents lived in the same condominium building, some points are represented by overlapping dots). Because this study used

a two-stage random sampling method, as previously mentioned, there are places where the density of respondents is sparse.

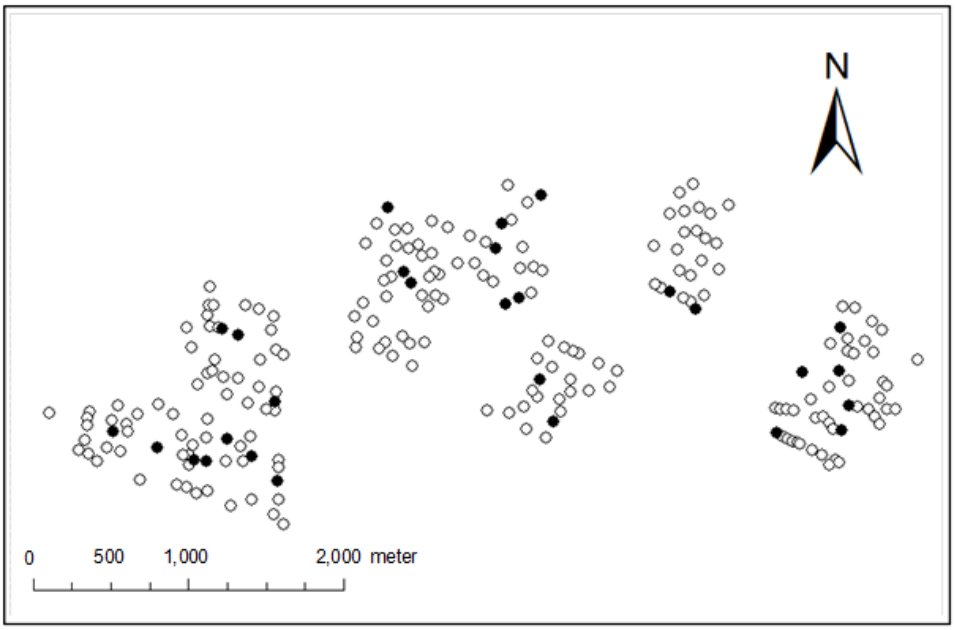

Figure 3-2. Distribution of respondents in Musashino City

Measurements

This study measured the respondents' trust in others, norms of reciprocity and social participation as social capital indices, according to previous studies (e.g., Kennedy et al., 1998; Lederman et al., 2002). Trust was assessed with the following items: "Most people can be trusted," "Most people are basically good and kind" and "I basically trust other people." The participants responded using a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 =

Strongly agree). In the analysis, the average of these three items was used.

Norms of reciprocity were measured with the following two items: “If someone helps you, you would also help any other person” and “If you see people cooperate with each other, you also feel that you would help someone in need.” The responses were also arranged on a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree). In the analysis, the average of these two items was used.

For social participation, the respondents were asked whether they were members of the following 14 groups in their neighborhoods: neighborhood associations, parent-teacher associations, Japan Agricultural Cooperative or other business associations, labor associations, consumer cooperatives or other consumer organizations, volunteer groups, citizens’ organizations, religious organizations, alumni associations, political support groups, professional groups, cultural groups, play groups and child-rearing groups. The sum of participation was used in the analysis.

Additionally, the first principal component score of the above three social capital indices (trust, norms of reciprocity, and social participation) was calculated and used as an index of total social capital.

The study included sex, length of residence, annual household income and type of housing as sociodemographic covariates. For annual household income, the participants were

asked to identify their income level using 12 predetermined categories (1 = less than 2 million yen, 2 = 2-3 million yen, 3 = 3-4 million yen, 4 = 4-5 million yen, 5 = 5-6 million yen, 6 = 6-7 million yen, 7 = 7-8 million yen, 8 = 8-10 million yen, 9 = 10-12 million yen, 10 = 12-14 million yen, 11 = 14-20 million yen, 12 = more than 20 million yen). Annual household income was treated as a continuous variable in the analyses. For type of housing, detached (free-standing) homes were coded as 1, and other types of homes were coded as 0.

The dependent variable in this study, crime victimization, was measured by asking whether the respondents had been victims of a burglary over the past five years. The respondents who had been victimized were coded as 1, and those who had not been victimized were coded as 0.

Statistical analysis

As previously noted, this study changed the geographical range of “neighborhood” from 60 to 500 meters in 10 meter increments and examined the varying effects of neighborhood trust, norms of reciprocity, social participation and the total social capital index on individual burglary victimizations for each “neighborhood” scale. For each analysis, binomial logistic regression was used.

Piecewise regression analyses were conducted to explore the trend of the variation in

the effect of social capital indices as the neighborhood scale changed. The piecewise regression method describes the changes in the data trends by connecting several different regression line segments at "join points." The analysis begins with the minimum number of join points (0, representing a straight line) and tests the model's fit with a maximum number of join points. In the present study's analyses, the maximum number of join points was set as 4. For the piecewise regression analyses, the Joinpoint Regression Program (version 3.4.2), which was developed by the American National Cancer Institute, was used.

Results

Table 3-1 presents the descriptive statistics for Study 3. As Table 3-1 shows, 9.5% of the respondents had been victims of a burglary over the last five years.

Table 3-1. Descriptive statistics for Study 3

	Mean	SD		%
Generalized trust (4-point scale) (α=.774)			**Sex**	
"Most people can be trusted"	2.41	0.686	Male	47.9
"Most people are basically good and kind"	2.62	0.664	Female	52.1
"I basically trust in other people"	2.78	0.678		
			Annual household income	
Norms of reciprocity (4-point scale) (α=.888)			Less than 2 million yen	4.2
"If someone helps you, you would also help any other person"	3.21	0.513	2-3 million yen	7.7
			3-4 million yen	9.5
"If you see people who cooperate each other, you also feel that you would help someone in need"	3.23	0.598	4-5 million yen	7.4
			5-6 million yen	7.1
			6-7 million yen	6.5
			7-8 million yen	6.0
Social participation (0-14)	3.28	2.270	8-10 million yen	9.5
			10-12 million yen	8.6
Years of residency	21.85	16.490	12-14 million yen	5.1
			14-20 million yen	6.5
			More than 20 million yen	5.1
			NA/DK	16.7
			Detached home	55.7
			Burglary victimization	9.5

Next, binomial logistic regression analyses were conducted in which the geographic range of “neighborhood” was changed from 60 to 500 meters in 10-meter increments. For each neighborhood scale, the respondents who did not have two or more “neighbors” were omitted from the analysis for that scale. Therefore, when the neighborhood scale was small, the number of respondents who were included in the analyses was also small. Figure 3-3 shows the number of respondents who were included in the analyses and the average number of “other neighbors” included for each geographical range. The left vertical axis represents the number of respondents who were included in the analyses, and the right vertical axis represents the average number of

"other neighbors." As Figure 3-3 shows, in these analyses, as the geographical range of the "neighborhood" narrowed, fewer respondents and "other neighbors" were included in the analyses. For example, the average number of "other neighbors" was 2.95 in the analysis of the 60-meter neighborhood scale, whereas an average of 35 "other neighbors" was included in the analysis of the 500-meter neighborhood scale. When the neighborhood scale was small, the small number of observations might have caused statistical instability. Additionally, although the influence of outliers was a source of concern in the analyses of small neighborhoods because of the small number of respondents included as "other neighbors," this study determined that the influence of outliers was low because the independent variables (i.e., trust, norms of reciprocity and social participation) were measured on a Likert scale (1-4) or a small range scale (0-14) and extreme outliers were not expected to emerge.

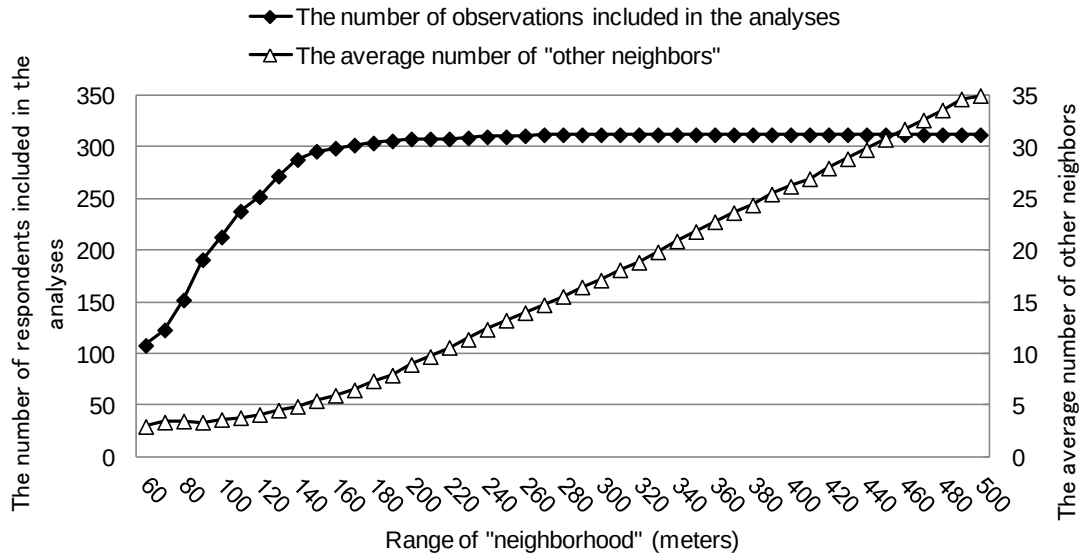

Figure 3-3. The number of respondents included in the analyses and the average number of "other neighbors" in each neighborhood geographical range

Figures 3-4 to 3-7 represent the variation in the effects of trust, norms of reciprocity, social participation and the total social capital index (the first principal component score) on burglary victimization according to the neighborhood spatial scale. The vertical axis represents the regression coefficients of the social capital variable for each neighborhood geographical range, and the horizontal axis represents the range (meters) of the neighborhood.

Additionally, approximate lines that represent the trend of the variation of social capital's effects according to changes in the neighborhood geographical scales and their join points were described using a piecewise regression method. The βs in the figures are the slopes representing the variation of effects of each social capital index.

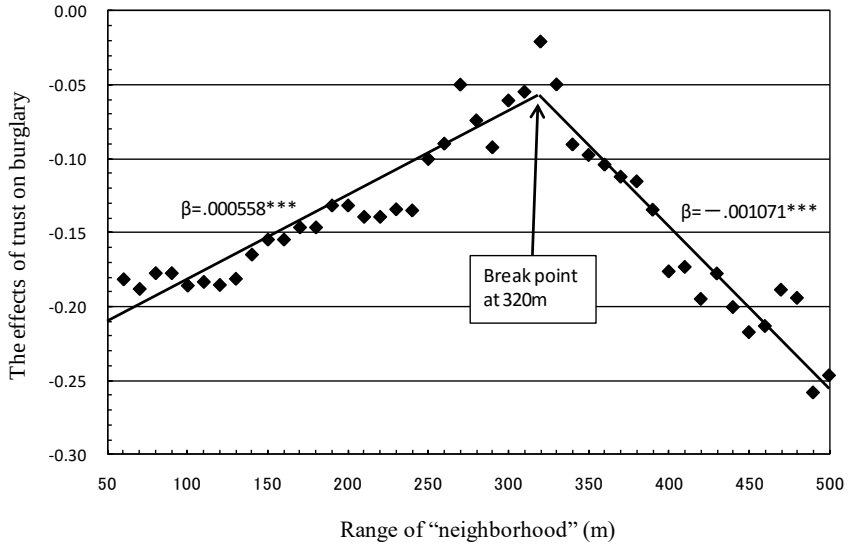

Figure 3-4. The variation of the effects of trust on burglary according to the geographical range of the "neighborhood"

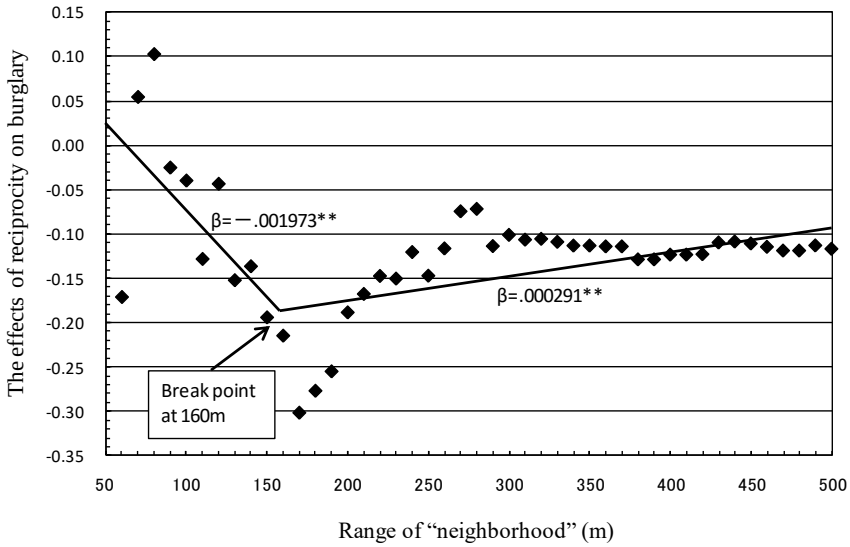

Figure 3-5. The variation of the effects of reciprocity on burglary according to the geographical range of the "neighborhood"

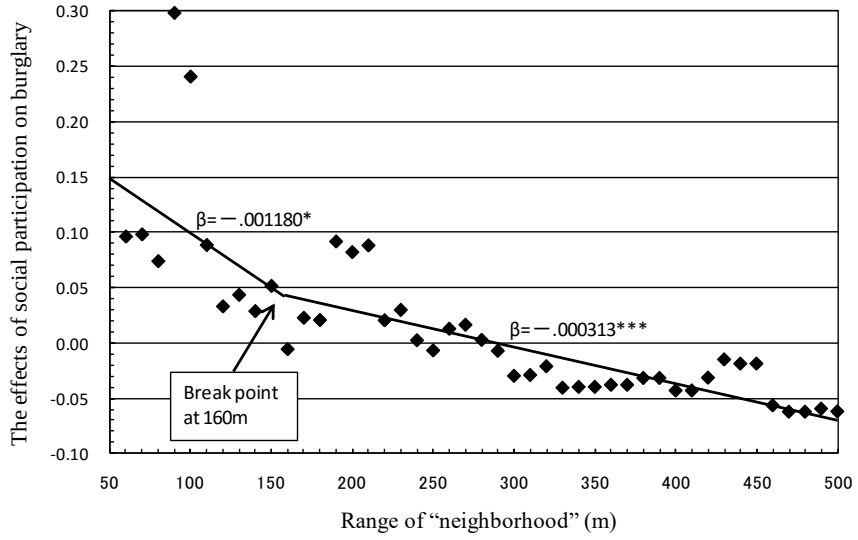

Figure 3-6. The variation of the effects of social participation on burglary according to the geographical range of the "neighborhood"

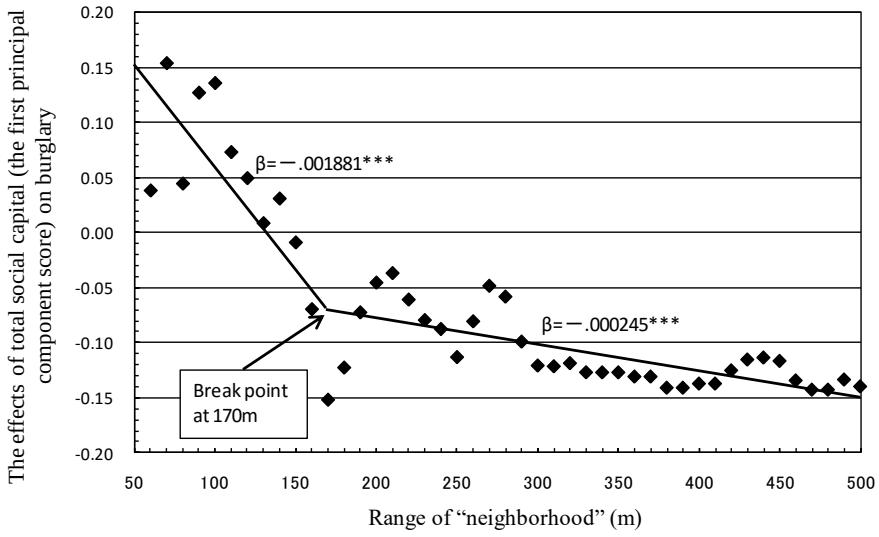

Figure 3-7. The variation of the effects of total social capital (the first principal component score) on burglary according to the geographical range of the "neighborhood"

As Figure 3-4 shows, although trust demonstrated a crime reduction effect at the 60-meter neighborhood range (the coefficient was -0.18), the effects began to shrink as the neighborhood range expanded. At 320 meters, however, the effects of trust began to strengthen again, with the largest coefficient (-0.25) appearing at 500 meters. As shown in Figure 3-5, although the effects of reciprocity grew with the geographical range of neighborhood for the first 100 meters, the effects remained unchanged from the 160- to 500-meter neighborhood range. Although the effects of social participation increased according to the neighborhood spatial scale, as Figure 3-6 shows, the absolute values of the coefficients were quite small, suggesting that the social participation index used in this analysis is not appropriate for crime reduction. Figure 3-7 shows that the total social capital index (the first principal component score) represented greater crime reduction effects as the neighborhood's geographical range increased.

Discussion

First, in terms of the covariate variables (i.e., sex, length of residence, annual household income, type of housing and individual-level social capital), the values did not vary with the geographic range of the neighborhood. Only the type of housing (detached house) was associated with burglary victimization, regardless of the neighborhood geographic range (the results of the covariates are not shown). That is, respondents who lived in detached houses were more likely to

be burglary victims than those who lived in housing complexes. The coefficients of the neighborhood social capital indices discussed below were adjusted for these covariates.

Although the coefficients of trust were negative (i.e., they had a strong preventive effect on crime) when the geographic ranges of neighborhood were small, the preventive effects became weaker as the neighborhood range widened (Figure 3-4). At the 320-meter mark, however, the crime prevention effects of trust began to grow stronger. The strongest preventive effect occurred at approximately the 500-meter neighborhood range, suggesting that the crime reduction effect of neighbors' trust was significant both at the low and high ends of the neighborhood geographical range.

Concerning the effect of reciprocity, although the burglary prevention effect grew stronger as the geographical range of the neighborhood increased from 60 to 160 meters, the regression lines showed that the effects became weaker after the range passed the 160-meter mark (Figure 3-5). However, the points plotted on the figure showed that the preventive effect of reciprocity on crime remained nearly unchanged from 260 meters onwards.

Although Figure 3-6 shows that the effects of social participation become stronger as the neighborhood's geographic range increased, the absolute values of the coefficients are quite small in both the positive and negative directions (Figure 3-6). This result suggests that social participation, at least in this study, may not be an effective factor in preventing burglary.

According to Putnam (2000), social participation can be divided into two types, vertical and horizontal. Vertical social participation refers to participation in organizations or groups that exhibit differences in power, resources and social statuses among members. Horizontal social participation refers to participation in organizations or groups that are composed of families, friends and homogeneous people who are equal in terms of power and resources. Presumably, each type of social participation has different influences on crime victimization. Because the present study mixed the vertical and horizontal groups into a single index of social participation, the significant effects of social participation may not have been detected. A future study should examine the effect of each type of social participation because horizontal groups and vertical groups may have differing effects on crime.

The total social capital index, that was the first principal component score of trust, reciprocity, and social participation, showed stronger effects when the geographical neighborhood ranges were wider (Figure 3-7). Starting at the 300-meter neighborhood range, the variation of coefficients became stable and showed constant crime prevention effects. The trends of the coefficients for reciprocity and total social capital suggest that the effects become stronger as the geographical neighborhood ranges widen and that the effects become stable beginning approximately at the midpoint (250-300 meters).

Trust showed a trend that differed from that of the other indices. Although the trends for

trust, reciprocity and total social capital were similar in that their crime prevention effects became stronger with widening geographic neighborhood ranges, trust showed strong preventive effects at small geographical ranges. In other words, in small neighborhood geographical ranges, a trust-specific prevention process may exist. It is suggested that the crime reduction effect of neighbors' trust is found in areas that are either smaller or larger than those defined by administrative boundaries (the average size of administrative areas (*choumoku*) in Musashino City is 0.2111 km^2; however, the present study's 60-meter "neighborhood" was approximately 0.0113 km^2, and the 500-meter neighborhood was approximately 0.785 km^2). Thus, these results suggest that administrative boundaries may not provide the most appropriate spatial scale for detecting the effect of neighborhood trust on crime.

What is responsible for the bipolarity of the crime-reducing effects of trust? Several theories from criminal sociology and environmental criminology may offer clues. Researchers have accumulated considerable knowledge about neighborhood crime control, and much of this control is closely related to social capital. We can interpret the crime reduction effect in neighborhoods with a wide geographical range from the perspective of the systemic model (Bursik & Grasmick, 1993). The systemic model focuses on both informal social control by neighborhood residents and formal social control by public institutions. This model assumes that trust and social ties among neighborhood residents make resources from public institutions for

crime control accessible; this is the process of formal social control. In this model, the crime reduction effect of neighborhood residents' trust is supplemented by the formal social control of the police. Furthermore, the spatial scale of the neighborhood where the effect of trust becomes significant depends on the geographical range covered by the police. The police cover a wide geographical neighborhood area (e.g., a town or a school district) rather than a small geographical neighborhood area, such as a block. Thus, from the viewpoint of this model, we can predict that the crime reduction effect of trust increases as the spatial scale of the neighborhood used as the unit of analysis increases.

The present study also found that trust had strong crime reduction effects on the narrow-range neighborhoods. We can interpret this result as an effect of "management activities" among immediate neighbors (e.g., cleanup activities). For example, "signs of occupancy" (Cirel et al., 1977) suggest that neighborhood residents care about their community and demonstrate crime reduction effects. Although it is assumed that the systemic model's crime-control process emerges in fairly wide-ranging neighborhoods, it is also assumed that the crime reduction effect of "signs of occupancy" stems from the appearance that residents care for their close neighbors.

Incidentally, some studies have noted that the variable used as an index of generalized trust may not accurately reflect the concept of generalized trust (Grootaert & van Bastelaer, 2002; Tsuji & Harihara, 2002). In many cases, respondents may imagine people whom they know well

when answering the generalized trust questions. Theoretically and ideally, the definition of "others" in the question item on trust should be changed according to the range used to define the neighborhood unit. Future studies must measure respondents' trust in multiple subjects and more precisely examine the effects of trust on neighborhood crime.

In summary, the results of the present study suggest that the effects of trust on crime vary depending on the geographic definition of the neighborhood. These findings indicate that traditional multilevel analyses using one type of administrative boundary may not always accurately detect the effects of social capital. In addition, these results suggest that multiple crime reduction processes may occur in neighborhoods across a range of geographic areas.

Study 4: A Spatial Exploration of Multiple Crime Reduction Mechanisms in Neighborhoods

Introduction

Study 3 explored variation in the effects of trust, reciprocity, social participation and the summary measure of social capital on burglary victimization according to the geographical scale of the "neighborhood" and found multiple geographical scales (including narrow and wide neighborhood spatial scales) for which trust had strong crime reduction effects. This result suggests that multiple distinct crime reduction processes may exist within a geographical scale.

The next question, then, is "What strengthens the crime reduction effects of trust at both wide and narrow neighborhood geographical ranges?" Perhaps the mechanisms that mediate the link between social capital and crime differ according to the size of the neighborhood's geographical range. For example, in the field of public health, Kawachi (1999) stated that the mechanisms of community health advancement through social capital differed depending on the level of aggregation of social capital. This argument is also applicable to criminal research. Williams and McShane (2003) categorized criminological theories into macrotheory, microtheory and bridging theory according to their levels of explanation (i.e., an entire society, a specific hierarchical level within the society or a small group, respectively).

In Bursik and Grasmick's (1993) systemic model, trust in others makes neighbors' informal social control and public institutions' (e.g., police) resources accessible; therefore, the effective unit of analysis may depend on the geographical range that public institutions can cover. In comparison, regarding the mechanism by which community management activities (such as cleanup activities) represent "signs of occupancy" in a neighborhood and, therefore, reduce crime (Cirel et al., 1977), the crime reduction process may be observed over relatively small geographical ranges.

The present study hypothesized that the variation in the effect of social trust on burglary victimization according to the geographical range of neighborhoods varies according to its mediation by the following two mechanisms: (1) the systemic model – neighborhood trust makes available both informal social control by neighborhood residents and police resources (i.e., formal social control); (2) signs of occupancy – neighborhood management activities are facilitated in communities that are affluent in social capital; therefore, criminal behaviors are reduced in such communities.

In the analyses, the aggregate level of "neighborhood" represented in Figures 3-8 and 3-9 was changed from 50 to 1,000 meters in 10-meter increments.

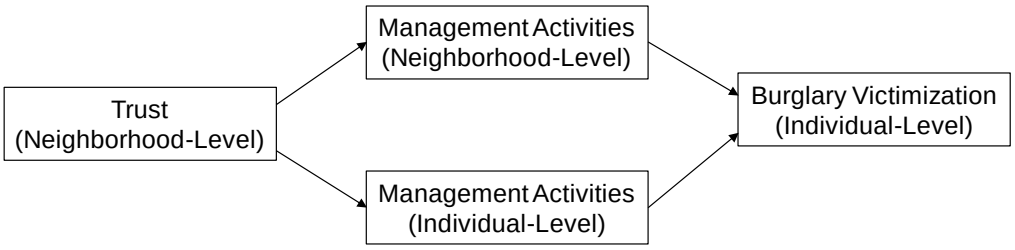

Figure 3-8. Schematic of the signs of occupancy model

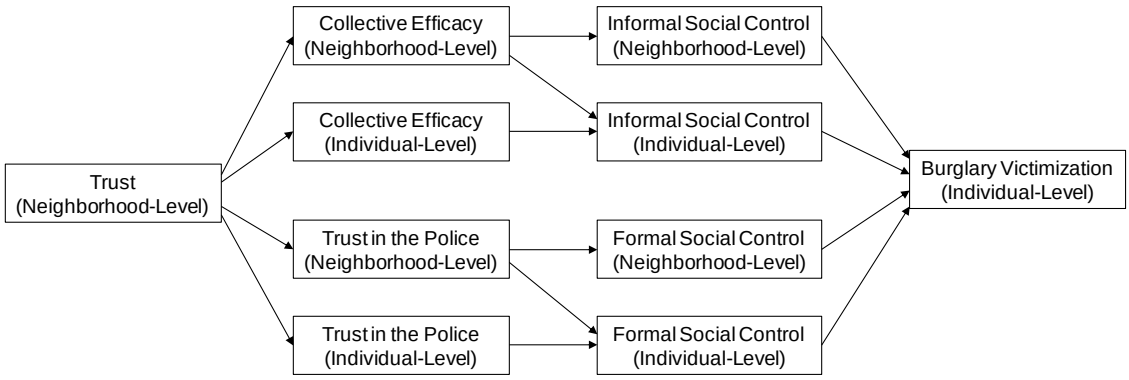

Figure 3-9. Schematic of the systemic model

Methods

Data

In 2009, the investigators of this study mailed a questionnaire survey to 1,000 residents of Arakawa Ward in Tokyo, Japan. The Arakawa Ward has a population of 191,207. The subjects were chosen from among the eligible voters using two-stage random sampling. The response rate was 45.6%.

Table 3-2 shows the population characteristics of Arakawa Ward and the average

population of Tokyo's 23 wards. The descending order rankings of each population characteristic for Arakawa Ward compared with Tokyo's other 22 wards are shown in parentheses. As Table 3-2 shows, a feature of this area is that the population and the number of households are relatively low but the population density is rather high. As with the analytic framework of Study 3, sampling from areas with relatively high residential density was desirable in this study. Thus, to make mail survey data appropriate to the spatial analyses, this study randomly sampled respondents from geographically successive areas. Figure 3-10 represents the point data that were created by translating the respondents' addresses into GPS coordinates.

Table 3-2. Population characteristics of Arakawa Ward

	Arakawa Ward		Average of Tokyo 23 Wards
Population	191,207	(18 / 23)	369,115.3
The number of households	86,229	(20 / 23)	174,995.0
Population density (km^2)	18,745.8	(3 / 23)	594.1
Popuration growth rate	6.0	(9 / 23)	4.4

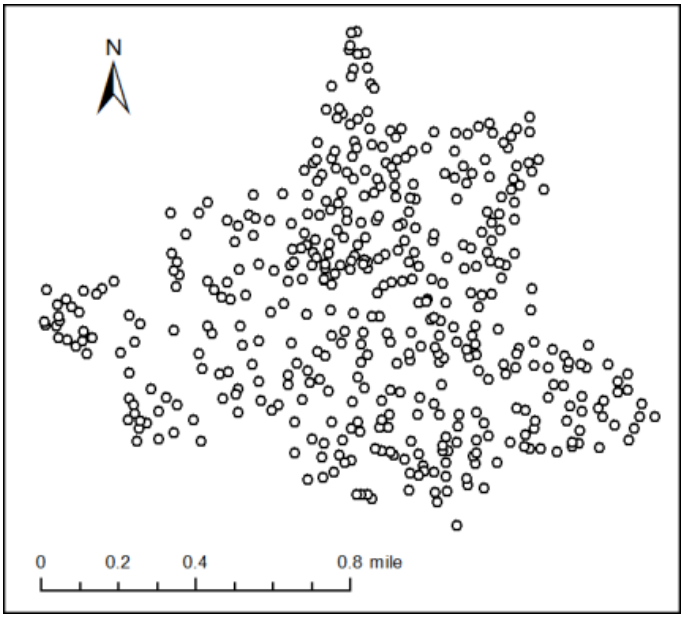

Figure 3-10. Distribution of the respondents in Arakawa Ward

Measurements

As a dependent variable, crime victimization was measured by asking whether the respondents had experienced burglary victimization in the past five years. The respondents who experienced burglary victimization were coded as 1, and other respondents were coded as 0.

The respondents' generalized trust was measured as a social capital index. Generalized trust was assessed using the following items: "Most people can be trusted" and "Most people are basically good and kind." The responses were arranged on a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree). The average of these two items was used in the analyses.

As an index of neighborhood management activities, the respondents' participation in

cleanup activities and neighborhood meetings was measured. Neighborhood management activity was assessed using the following questions: “How often do you participate in cleanup activities in your community’s parks and streets with your neighbors?” and “How often do you participate in neighborhood community association meetings?” The responses were arranged on a 4-point Likert scale (1 = Never participate, 2 = Participate infrequently, 3 = Sometimes participate, 4 = Frequently participate). In the analyses, the average of these two items was used as an indicator of signs of occupancy.

The survey items that constituted the systemic model indices included items related to collective efficacy, trust in the police, informal social control and formal social control (perceived social control by the police). For the collective efficacy variables, the respondents were asked about the likelihood that their neighbors could be counted on to take action if “Children were skipping school and hanging out on a street corner,” “A fight broke out in front of their house” and “Children were spray-painting graffiti on a local building.” The responses were arranged on a 4-point Likert scale (1 = Cannot be counted on at all, 2 = Can scarcely be counted on, 3 = Can be counted on somewhat, 4 = Can be counted on). Trust in the police was assessed using the following items: “The police can be trusted,” “Police officers are honest,” “The police share the spirit of crime prevention with citizens” and “The police are fair.” The responses were arranged on a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree).

Informal social control was assessed using the following questions: “How often do you see your neighbors foot/bicycle patrol in your neighborhood?” and “How often do you see surveillance activities by neighbors on the school roads in your neighborhood?” The responses were arranged on a 4-point Likert scale (1 = Never see, 2 = See infrequently, 3 = Sometimes see, 4 = Frequently see). Formal social control was assessed using the following questions: “How often do you see the police watch and foot/bicycle patrol in your neighborhood?” and “How often do you see patrol cars in your neighborhood?” The responses were arranged on a 4-point Likert scale (1 = Never see, 2 = See infrequently, 3 = Sometimes see, 4 = Frequently see). Although actual local police activity records are the ideal index of formal social controls, the current study used the respondents’ perceptions about the local police activities as a proxy because the official and objective data were not available. In the analysis, the averages of the above items were used as each systemic model’s index.

Sex, length of residence, type of housing, perceived social class and educational attainment were included as control variables. For type of housing, detached (free-standing) homes were coded as 1, and all other types were coded as 0.

Statistical analysis

As previously noted, this study changed the geographical range of the “neighborhood”

from 50 to 1,000 meters in 10-meter increments and examined the variation of the effects of neighborhood trust on individual burglary victimization for each geographical neighborhood scale. The signs of occupancy model (Figure 3-8) and the systemic model (Figure 3-9) were used to link social capital to crime victimization, and the indirect effects of social capital on burglary were extracted.

Piecewise regression analyses were conducted to explore the trends of variation of the indirect effect of social capital according to the changes in the neighborhood range and their breakpoints. The methods and software used for the piecewise regression are identical to those used in Study 3.

Results

Table 3-3 shows the descriptive statistics of Study 4. The percentage of respondents who experienced burglary victimization was 7.7%. Although this figure is lower than that of Study 3 (9.5%), the difference was considered to be slight.

Table 3-3. Descriptive statistics of Study 4

Items	Mean	SD	Items	%
Generalized trust (4-point scale) (*r* =.756)			**Sex**	
"Most people can be trusted"	2.34	0.74	Male	46.5
"Most people are basically good and kind"	2.56	0.77	Female	53.5
Mean	2.55	0.71		
			Perceived social class	
Neighborhood management activities (4-point scale) (*r* = .579)			High	2.2
"Participation in meetings of neighborhood community association"	1.48	0.77	Upper middle	21.1
			Lower middle	37.0
"Participation in cleanup activities"	1.42	0.67	Upper lower	14.9
Mean	1.46	0.65	Lowest	4.9
			DK/NA	19.9
Collective efficacy (4-point scale) (α=.825)				
"If children were skipping school and hanging out on a street corner, my neighbors would call to them"	2.29	0.74	**Educational attainment**	
			Elementary school	0.0
			Junior high school	4.3
"If a fight broke out in front of my house, my neighbors would intervene to prevent it"	2.40	0.73	High school	34.6
			Two year college/higher professional school	23.3
"If children were spray-painting graffiti on a local building, my neighbors would warn them"	2.58	0.75	University	28.4
			Graduate school	3.3
			DK/NA	6.1
Mean	2.42	0.64		
			Detached home	46.6
Trust in the police (4-point scale) (α=.876)				
"The police can be trusted"	2.77	0.80	**Burglary victimization in the past 5 years**	7.7
"Police officers are honest"	3.04	0.74		
"The police share the spirit to crime prevention with citizens"	2.65	0.81		
"The police is fair"	2.60	0.81		
Mean	2.77	0.68		
Informal social control (4-point scale) (*r* = .447)				
Foot/bicycle patrol by neighbors	2.61	0.80		
Surveillance activities on the children's way to and from school	2.95	0.95		
Mean	2.77	0.75		
Formal social control (4-point scale) (*r* = .576)				
Watch and foot/bicycle patrol by police officers	3.16	0.73		
Patrol cars in neighborhood	3.12	0.73		
Mean	3.14	0.65		
Years of residency	27.68	19.40		

As examples of the present study's spatial analyses, Figures 3-11 and 3-12 show the

results of the signs of occupancy model and the systemic model, respectively, when the geographical scale of the neighborhood is set at 50 meters. Although control variables (including sex, length of residence, perceived social class, type of housing, and educational attainment) were included as independent variables for all of the endogenous variables, their coefficients are omitted from the figures. These figures demonstrate that the total indirect effect of trust on burglary was -0.29 in the signs of occupancy model and -0.11 in the systemic model for a neighborhood with a 50-meter range.

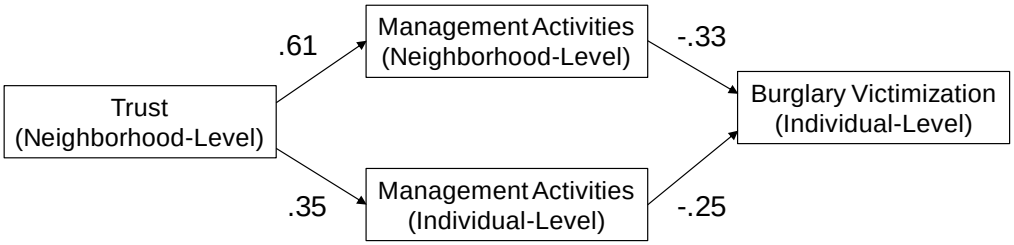

Figure 3-11. The results of path analysis for the signs of occupancy model with a 50-meter neighborhood geographical scale

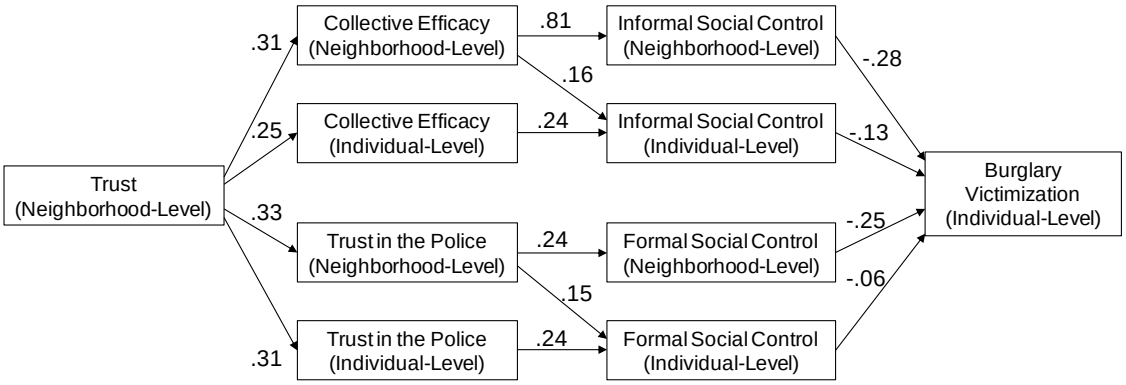

Figure 3-12. The results of path analysis for the systemic model with a 50-meter neighborhood geographical scale

The analyses were conducted, with changing the geographical range of the neighborhood from 50 to 1,000 meters in 10-meter increments. In the analysis of each geographical scale, respondents who did not have two or more "other neighbors" were omitted. Figure 3-13 shows the number of respondents who were included in the analyses and the average number of "other neighbors" for each geographical scale. The left vertical axis represents the number of respondents who were included in the analyses, and the right vertical axis represents the average number of "other neighbors." As Figure 3-13 shows, in the present analyses, as the neighborhood ranges narrowed, the number of respondents included in the analyses and the number of "other neighbors" decreased. For example, the average number of "other neighbors" was 2.84 in the analysis for a 50-meter neighborhood range, whereas it was 290.79 in the analysis for a 1,000-meter neighborhood range. This association suggests that the small number of

observations in the analyses may have resulted in the instability of the neighborhood indices when the neighborhood ranges were small. However, in reality, examining the effects of small neighborhoods' social capital refers to examining the effects of a handful of people in a rather close neighborhood; therefore, this method is appropriate for modeling the real world.

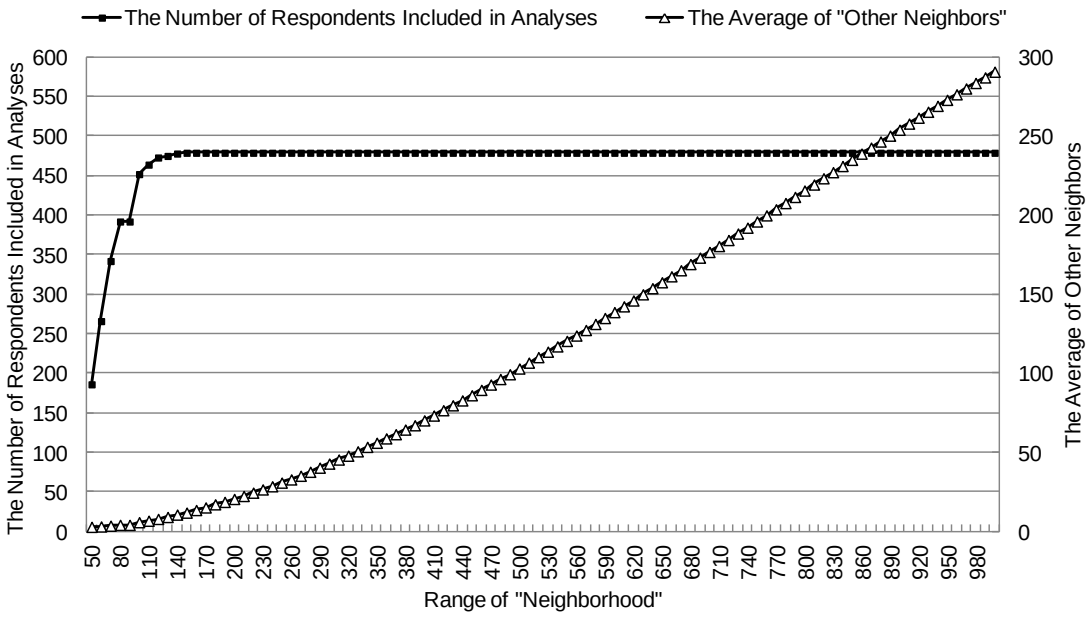

Figure 3-13. The number of respondents included in the analyses and the average number of "other neighbors" in each neighborhood geographical range

Figures 3-14 and 3-15 represent the variation in the indirect effects of trust on burglary victimization in each model according to the neighborhood's spatial scale.

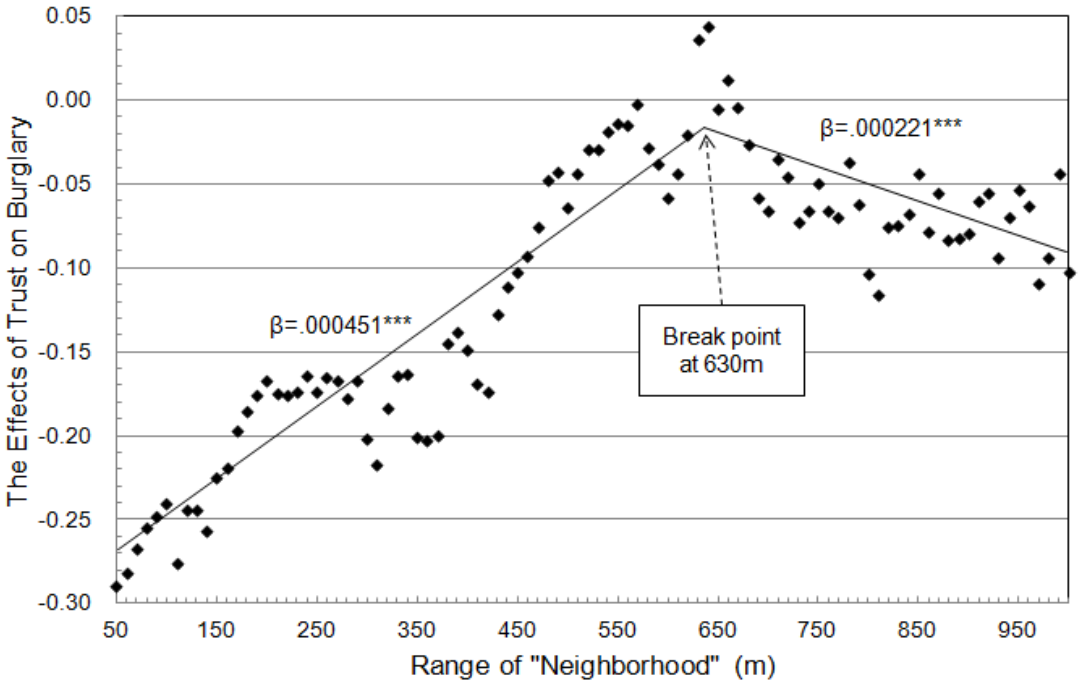

Figure 3-14. Indirect effects of trust on burglary victimization in the signs of occupancy model

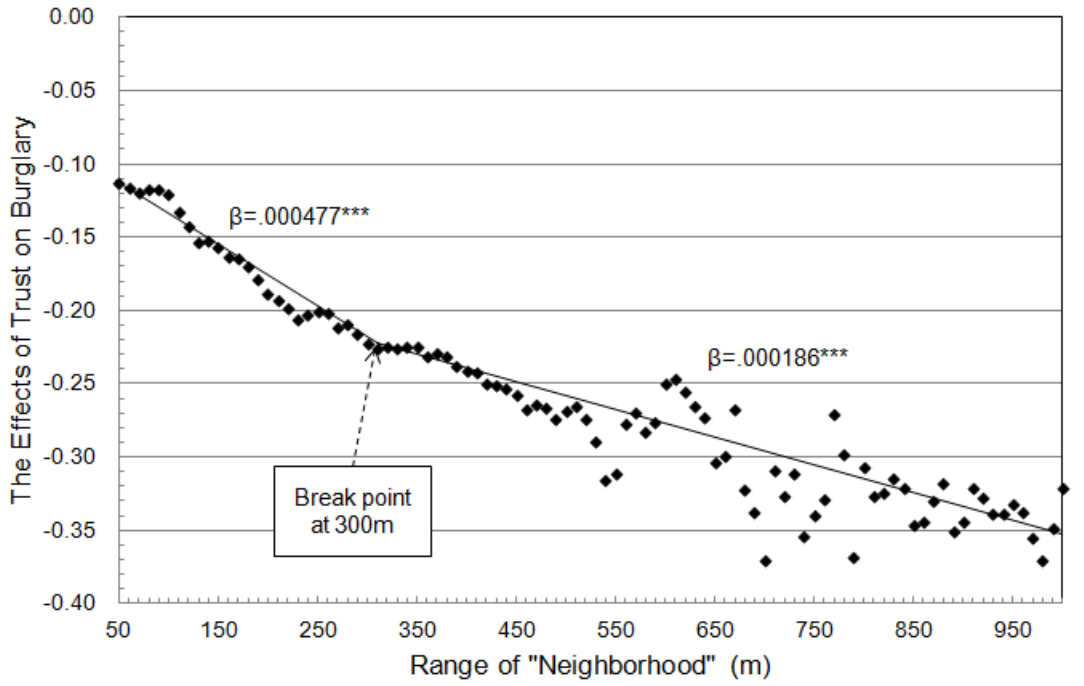

Figure 3-15. Indirect effects of trust on burglary victimization in the systemic model

The vertical axes represent the indirect effects of trust, and the horizontal axes represent the geographical range of the neighborhood. In both figures, it was determined that 1 break point (join point) was the most appropriate number. That is, there are two slopes in each figure. The β values in the figures are the coefficients of each slope of the variation of social capital effects. Figure 3-14 (the signs of occupancy model) shows that the indirect effects of trust resulting from neighborhood management activities were greater for smaller neighborhoods. By contrast, in Figure 3-15 (the systemic model), the indirect effects were greater for larger neighborhoods.

Discussion

First, the results of the signs of occupancy model (Figure 3-14) demonstrated that the preventive effects of social capital on crime were strong when the defined "neighborhoods" were small. The approximate lines described by piecewise regression showed that the preventive effects of social capital gradually weakened in a linear fashion as the neighborhood size approached 630 meters. Although the preventive effects of social capital on burglary strengthened slowly from 630 meters onwards, its slope was relatively gradual.

In comparison, the results of the systemic model (Figure 3-15) showed that when "neighborhoods" were defined using a larger geographical range, the preventive effects of social capital on crime were stronger. Although the approximate lines traced by piecewise regression

indicated a break point at 300 meters, there was no rapid change in slope, and the indirect effects of social capital substantively increased linearly in a negative direction according to the geographical range of the neighborhood. These results suggest that the estimations from the analyses differed depending on the defined geographical neighborhood ranges and that traditional multilevel models that rely on simple administrative boundaries may be unable to detect the significant effect of social capital, depending on the type of boundary used.

Moreover, the results of the present study suggest that different crime prevention processes arise through social capital (social trust) in neighborhoods on both small and large geographical scales. A comparison of the above two models suggests that the most effective geographical range of a neighborhood varies with the models. The crime prevention effect that results from creating "signs of occupancy," that is, an atmosphere that suggests that "community residents take an interest in their neighborhood" and "community residents manage their neighborhood," is expressed in the whisker-close neighborhood around one's home. In the systemic model, in communities where residents participate in the neighborhood watch and neighborhood patrol, both informal social controls by neighborhood residents and formal controls by the police are facilitated (Bennett, 1990; Bennett, Holloway, & Farrington, 2006). Because this model suggests that the crime control effect of neighborhood residents' trust is enhanced by adding formal social control through police interventions, the geographical ranges of

neighborhoods where the crime control effects become strong depend on the geographical scale on which the police can intervene. Typically, the police intervene on the basis of relatively larger geographical scales (e.g., wards, towns, and school districts) rather than small spatial scales, such as blocks. Therefore, the indirect effects of trust in the systemic model increase according to the geographic range of neighborhoods used in the analyses.

As the present study shows, exploring the geographical range at which trust effectively functions can provide practical information for town development. That is, we can use these findings as clues to suggest the type of crime-control mechanism that should be adopted and the neighborhood size that should be targeted. For example, given the idea that interactions among neighborhood residents (e.g., volunteer activities, fund-raising activities and so on) help residents develop trust in each other (Fukuyama, 1995; Putnam et al., 1993), the organization of cleanup activities based on block associations can facilitate both trust among the residents and crime prevention through the creation of signs of occupancy. Similarly, if a local town or multiple neighborhood associations organize such activities on a relatively larger geographical scale and enhance trust among residents, the systemic model should be effective. In this way, the present study also suggests the effective geographical ranges of such activities for crime control.

Two limitations of this study should be noted. First, in the examination of the systemic model, this study used the respondents' perceptions of local police activities as a proxy variable

for the formal controls conducted by the police. However, the residents' perceptions may differ from actual police activities. For example, people who do not trust the police may underestimate the frequency of local police activities. To exclude such biases, official records of police activities should be used in future studies. Second, Arakawa Ward has a relatively high population density among Tokyo's 23 wards. That is, this area can be considered highly urbanized, which may affect the generalizability of the study findings. A future study should examine whether the variation of the effects of social capital according to the neighborhood range is a characteristic of high population density areas only or whether it can be applied to other general urban areas. To advance research on crime prevention through social capital and to apply these findings to the real world, similar studies in areas with characteristics that differ from those of the present study's target area must be conducted to verify the generalizability of the results.

Chapter 4 THE IMPACT OF CRIME ON SOCIETY

Study 5: The Effects of Crime on Social Ties and Social Participation in Neighborhoods

Introduction

Studies 1-4 examined how neighborhood social capital affects crime and crime prevention. Study 5 focuses on the effect of crime on local communities or the people embedded in neighborhoods. Traditionally, the effects of crime on communities have received researchers' attention in the form of "reaction to crime" studies. Researchers have mainly studied people's reactions to crime from the viewpoint of the fear of crime (Skogan & Maxfield, 1981). Recently, studies on the effect of crime on social participation have also accumulated, addressing the question, "Does crime determine the level of neighborhood social ties and participation?"

Examinations of the "reaction to crime" from the perspective of social capital are important. The effects of neighborhood social capital on the residents' outcomes (e.g., crime victimization and health) have aroused researchers' interests, whereas interest in the determinants of social capital have been relatively lacking (Hanibuchi & Nakaya, 2013). Some studies have shown that various individual-level characteristics, such as educational attainment, marital status, age, sex, income, and working status, determine individuals' degree of trust and social

participation (Groot et al., 2007; Huang et al., 2003; Kaasa & Parts, 2008). For example, because high income and education level are associated with affluent individual social capital (Subramanian et al., 2003), we can assume that an area that is inhabited by many residents with high socioeconomic status is likely to be a neighborhood with affluent social capital. Environmental factors such as neighborhood walkability can facilitate residents' interactions with each other and, thus, the development of neighborhood social capital (Hanibuchi et al., 2012; Leyden, 2003). In addition to such neighborhood environmental factors, studies on the effects of neighborhood safety on residents' social ties and participation have increased (Takagi, 2011). Given that many studies have demonstrated the positive effects of social capital on neighborhoods, it is important to clarify the reasons that some neighborhoods have more social capital than others and use this information to improve neighborhood circumstances.

Unfortunately, this area of research on the effects of neighborhood crime on social capital has been characterized by inconsistent findings: The mixed findings range from studies that find no association between rising neighborhood crime rates and levels of neighborhood social ties and trust; to other studies which find the opposite, i.e., crime leads to a strengthening of social ties. Other studies have found that residents tend to withdraw socially in response to high crime rates. For example, Perkins, Brown, and Taylor (1996) conducted individual- and block-level investigations in New York City, Baltimore, and Salt Lake City in the U.S. Longitudinal

data on crime were used to predict the presence of block associations seven years later. The authors concluded that crime and the fear of crime were not associated with residents' social participation. Perkins, Hughey, and Speer (2002) argued that crime alone may not be a sufficient stimulus to boost the level of community organization.

Taylor (1996) examined whether the neighborhood-level crime rate affects community attachment and social involvement (a summary measure of local social ties, neighborhood surveillance, visits to neighbors' house, etc.) using data from 1,622 individuals embedded in 66 neighborhoods in Baltimore. Controlling for residential stability and education, the researchers found that neighborhoods with higher crime rates exhibited higher neighborhood attachment and involvement among residents. In other words, the presence of crime brought the residents together to combat the external threat. Thus, in contrast to the conventional view that crime and related problems fragment the community (Conklin, 1975), Taylor concluded that they may mobilize the community. Similarly, Berkowitz (2000) and Wandersman and Florin (2000) also showed that social problems, including an increase in crime, tend to promote residents' social participation.

In a third set of studies, Logan and Molothc (1987) suggested that high crime rates inhibit residents' attachment to their neighborhoods by increasing their sense of alienation and undermining neighborhood values. Skogan (1990) also provided support for the adverse effect of crime on neighborhood cohesion. His neighborhood-level analysis that was conducted in several

dozen neighborhoods suggested that social and physical disorder had an adverse influence on neighborhood attachment. He found that perceived disorder reduced residents' satisfaction with the neighborhood and increased their intentions to move away. Thus, his findings suggest that an increase in crime constrains cooperation among residents and leads people to withdraw socially. Saegert and Winkel (2004) investigated the association between crime rates and social participation using individual- and dwelling-level data. First, their results suggest that the individual-level perception of crime is linked to low informal socialization, low participation in tenant associations and weak social norms. In addition, they found that past experiences with assaults and homicides were associated with lower social norms at the building level, low informal socialization and low participation in tenant associations. Whereas some crime indices have displayed an encouraging influence on community organizations, Saegert and Winkel concluded that, overall, the depressive effect of crime on social participation outweighed the facilitation effect. They suggested that crime spurs fear and suspicion about neighbors that erode the community's ability to organize and, as a result, weaken residents' motivations to participate in community-based activities.

Some researchers have hypothesized that residential stability is the key factor that determines whether crime facilitates or inhibits social participation. Social disorganization theorists argue that residents react to rising crime by exercising greater informal social control

(e.g., organizing neighborhood patrols); however, the extent of the response may depend on the extent of pre-existing neighborhood social disorganization. In socially disorganized neighborhoods, residents are unable to work together toward achieving common goals and values, i.e., they have low collective efficacy (Bursik, 1988; Kornhauser, 1978).

The present study examined the effect of neighborhood crime on social participation based on generalized trust theory. Trust can be described as the expectation that people will behave with benign intentions and that they will strive to meet their civic commitments and avoid harming others (Barber, 1983). Generalized trust refers to an individual's perception of the trustworthiness of the "average person" – i.e., an individual who is neither a friend nor an acquaintance (Robinson & Jackson, 2001). Yamagishi and Yamagishi (1994) argued that this type of generalized trust reflects "a belief in the benevolence of human nature in general" (1994: 139).

It is known that people's fear of crime is biased (Shimada, 2011). That is, the actual number of crimes differs from the perceived number of crimes. Excessive provisions against crime derived from the unrealistic fear of crime may restrict acquaintanceships and reduce people's social relationships. Conversely, trust in others may affect the reaction in a "good direction." One example of impairments in social capital due to crime is the reduction of social networks and social participation caused by rising crime. However, if cognitive social capital, i.e., trust in others, can buffer the impairment, it may be an effective means of protecting social capital.

In addition, Putnam (1993. 2000) originally stated that the structural aspects (i.e., social ties and social participation) and cognitive aspects (i.e., trust and norms of reciprocity) of social capital influence one other. Namely, affluent social ties create trust and norms, and trust and norms, in turn, facilitate people's interactions and social participations. Even in a potentially difficult situation in which an exogenous factor, such as rising crime, deteriorates the structural social capital in a neighborhood, cognitive social capital, such as trust, may be able to repair it. However, the complementary relationship between factors of social capital has not been examined. If a buffering effect of cognitive social capital (i.e., trust) on other factors of social capital (i.e., social ties and social participation) is found, interventions that enhance social trust can be recommended to prevent a reduction in structural social capital in neighborhoods that face problems such as an increase in crime.

In summary, we must take into account two distinct and opposing mechanisms through which neighborhood crime may affect social ties and social participation. That is, neighborhood crime decrease broad acquaintanceship ties, while it increases intimate social ties to combat with crime. The net impact of crime on social ties is likely to reflect a mix of these two types of effects; moreover, it is likely to be moderated by existing levels of social trust among neighbors.

The present study measured people's friendship ties, acquaintanceship ties and social participation using a mail survey and investigated how these variables were affected by past

neighborhood crime. In addition, the cross-level interaction term between generalized trust and neighborhood-level crime was examined. This study hypothesized that neighborhood crime increases residents' friendship ties while decreasing mere acquaintanceship ties. Furthermore, this study assumed that these effects are moderated by the level of trust in others. As Figure 4-1 shows, this study examined the effects of crime on social participation as mediated by friendship ties and acquaintanceship ties.

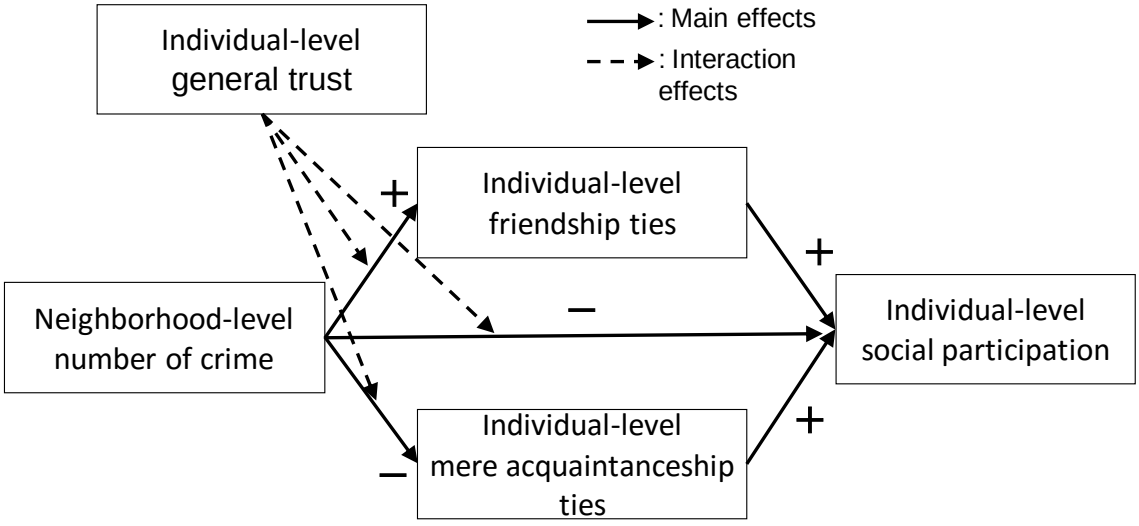

Figure 4-1. A schematic of the analytical model used in Study 5[a]

[a] The directions of all interaction effects are assumed to be positive

Methods

Data

In 2009, the investigators of this study mailed a questionnaire to residents aged 20-69

years in Tokyo's Musashino City (n = 1,000) and Kiyose City (n = 1,000). Musashino City is the 13th largest of Tokyo's 26 cities in terms of population (138,734), and it has the highest population density (12,990/km^2). By contrast, Kiyose City is the 23rd largest of Tokyo's cities in terms of population (74,104) and has the 14th highest population density (7,289/km^2). In each city, the subjects were chosen from among the eligible voters using a two-stage clustered random sampling strategy. In the first stage, the investigators randomly sampled 10 voter registration ledgers from each city. In the second stage, the investigators randomly sampled 100 individuals from each voter registration ledger. The response rates were 33.6% for Musashino City and 30.6% for Kiyose City. Respondents with missing values were omitted from the analyses. As a result, 436 individual-level observations were used in the analyses.

Because of its high mobility and population density, Musashino City can be considered a typical urban area. By contrast, Kiyose City can be described as relatively less urbanized compared with other urban regions in Japan. The indicators of the degree of urbanization (e.g., the mobility and density of the population) may affect the number of social ties, which is an intervening variable of this study. However, the effects of the crime rate adjusted for the degree of urbanization can be examined by obtaining data from both an area with a high population density and an area with a relatively low population density.

To explore the impact of neighborhood crime on social participation, multilevel analyses

using both individual- and neighborhood-level data were conducted. The neighborhood-level unit in this study was the *choumoku*, which is a small neighborhood unit in Japan (the average areal size of the target areas for this survey was 0.2223 km^2). Forty-three neighborhood units were included in the present analyses.

Measurements

For the social participation variable, an ultimate outcome of this study, the sum of the respondents' participation in the following five neighborhood associations was used: residents' associations, volunteer groups, Japan Agricultural Cooperatives or business associations, citizens' organizations, and political support groups.

The number of friendship ties was measured with the following item: "How many friends do you have in your city?" The number of acquaintanceship ties was measured with the following item: "How many acquaintances (other than your friends) do you have in your city?" The friendship and acquaintanceship ties were not measured on a scale. Because responses to this type of question have a power law distribution or a lognormal distribution, responses to these network items were transformed into natural logarithms.

Generalized trust was assessed with the following items: "Most people can be trusted," "Most people are basically good and kind" and "I basically trust other people." The responses

were captured on a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree). In the analysis, the average of these three items was used.

Sex, duration of residence, annual household income, educational attainment and fear of crime as well as a dummy variable for Musashino City were included as control variables. For annual household income, the participants were asked to identify their income level using 12 predetermined categories (1 = less than 2 million yen, 2 = 2-3 million yen, 3 = 3-4 million yen, 4 = 4-5 million yen, 5 = 5-6 million yen, 6 = 6-7 million yen, 7 = 7-8 million yen, 8 = 8-10 million yen, 9 = 10-12 million yen, 10 = 12-14 million yen, 11 = 14-20 million yen, 12 = more than 20 million yen). Annual household income was treated as a continuous variable in the analyses. Educational attainment was obtained from responses to one question that asked participants to select one response from 6 categories (1 = elementary school, 2 = junior high school, 3 = high school, 4 = two-year college/technical college, 5 = four-year college, 6 = graduate school). The educational attainment variable was also treated as a continuous variable in the analyses. Fear of crime was assessed by asking about each respondent's fear of "theft," "assault," "burglary" and "purse-snatching" victimization. The responses were arranged on a 4-point Likert scale (1 = Not anxious at all, 2 = Not very anxious, 3 = Somewhat anxious, 4 = Highly anxious). In the analysis, the average of these four items was used.

For the indices of neighborhood-level crime, this study used the number of larcenies

(e.g., burglary of private homes, breaking/entering a business office, and breaking/entering a store) and other instances of theft (e.g., motor vehicle theft, vehicle load theft, purse-snatching, and pick-pocketing) per *choumoku* reported by the Tokyo Metropolitan Police Department from January to December 2008. Although some previous studies have measured respondents' experiences of crime victimization, self-reported victimization is thought to be overestimated by selection bias and recall bias. Thus, when a crime-related index is included in analyses as a neighborhood-level explanatory variable, the official crime record is less likely to produce bias than the aggregated individual responses regarding crime victimization. Therefore, this study used the official crime numbers reported by the public agency. These indices were translated into the number of crimes per 1,000 people using each *choumoku*'s denominator population from census data. In the analyses, the crime rates were transformed into natural logarithms.

Statistical analysis

A multilevel regression model was used, with the individual level as level 1 and the neighborhood level as level 2. The neighborhood-level unit was the *choumoku* (n = 43). The average number of respondents who were embedded in each *choumoku* was 10.1. The software used was HLM6.

The present study's analyses included two stages. First, models estimating the effects of

neighborhood-level crime rates and the cross-level interactions (individual-level trust × neighborhood-level crime rates) on the number of friendship ties and acquaintanceship ties were analyzed. Second, friendship ties and acquaintanceship ties were included as independent variables in addition to the above-mentioned independent variables, and the effects of these explanatory variables on the respondents' social participation were explored. In the latter analysis, because social participation was represented as count data, a multilevel Poisson regression analysis was conducted.

Results

Table 4-1 contains the descriptive statistics for the individual-level variables and neighborhood-level crime data from the Tokyo Metropolitan Police Department.

Table 4-1. Descriptive statistics of Study 5

Items	Mean	SD	Items	%
Friendship ties[a]	5.80	9.94	**Sex**	
Acquaintanceship ties[a]	9.48	26.57	Male	44.3
			Female	55.7
Generalized trust (4-point scale) (r = .807)				
"Most people can be trusted"	2.39	0.70	**Annual household income**	
"Most people are basically good and kind"	2.57	0.68	Less than 2 million yen	6.3
"I basically trust in other people"	2.75	0.66	2-3 million yen	7.8
Mean	2.57	0.58	3-4 million yen	9.9
			4-5 million yen	9.3
Social participation (0-5)	0.86	1.11	5-6 million yen	7.9
			6-7 million yen	7.2
Years of residence	21.47	16.09	7-8 million yen	5.6
			8-10 million yen	10.3
Fear of crime (4-point scale) (α = .907)			10-12 million yen	5.8
Theft	2.72	0.85	12-14 million yen	3.9
Assault	2.63	0.84	14-20 million yen	4.5
Burglary	3.12	0.76	More than 20 million yen	2.8
Purse-snatching	2.85	0.80	DK/NA	18.6
Mean	2.83	0.70		
			Educational attainment	
The crime rates (per 1,000 people)			Elementary school	0.2
(Neighborhood-level variable)[a]			Junior high school	7.6
			High school	34.9
2008 Larceny - property break-in	2.37	1.64	Two year college/technical college	21.4
2008 Larceny - other forms of theft	10.42	13.33	University	30.6
			Graduate school	3.6
			DK/NA	1.6
			City of residence	
			Kiyose City	47.2
			Musashino City	52.8

[a] The values for the number of social ties and the crime rates shown in this table have not been transformed into natural logarithms.

Table 4-2 shows the main effects of crime rates on friendship ties (Model 1) and acquaintanceship ties (Model 2). In addition, the table shows the cross-level interaction effects of individual-level trust and neighborhood-level crime rates on the network indices.

Table 4-2. Main effects and interaction effects of the crime rates on social ties

	Model 1	Model 2
Independent Variables	Friendship ties Coefficient	Acquaintance ties Coefficient
Individual-level Variables		
Intercept	0.17	0.79 †
Sex (male = 1, female = 0)	-0.42 ***	-0.33 **
Duration of residency	0.02 ***	0.02 ***
Annual household income	0.03 †	0.04 *
Educational background	-0.05	-0.17 *
Musashino City (dummy)	-0.17	0.05
Trust	0.15 *	0.13 *
Reciprocity	0.11 *	0.08
Fear of crime	0.09	0.09
Neighborhood-level Variables		
2008 Larceny on burglary	0.17 *	-0.68 *
2008 Larceny on non-burglary	0.02	0.09
Individual × Neighborhood		
Trust × Burglary	0.16 †	0.28 *
Trust × Non-burglary	-0.02	-0.02
Random Effect	Variance Component	Variance Component
Intercept	0.06	0.01
Individual-Level *n*	436	436
Neighborhood-Level *n*	43	43

Note: ***p<.001, **p<.01, *p<.05, †p<.10

As predicted, past neighborhood-level burglaries had a positive effect on friendship ties (coefficient = 0.17, p < .05) and a negative effect on acquaintanceship ties (coefficient = -0.68, p <. 05). The cross-level interaction effect of neighborhood-level burglaries and individual-level trust was positive for the number of acquaintanceship ties in Model 2 (coefficient = 0.28, p < .05). This result demonstrated that the effect of generalized trust on increasing acquaintanceship ties was large in neighborhoods where the level of crime was high. Figure 4-2 represents the cross-

level interaction effect of burglary and trust on acquaintanceship ties.

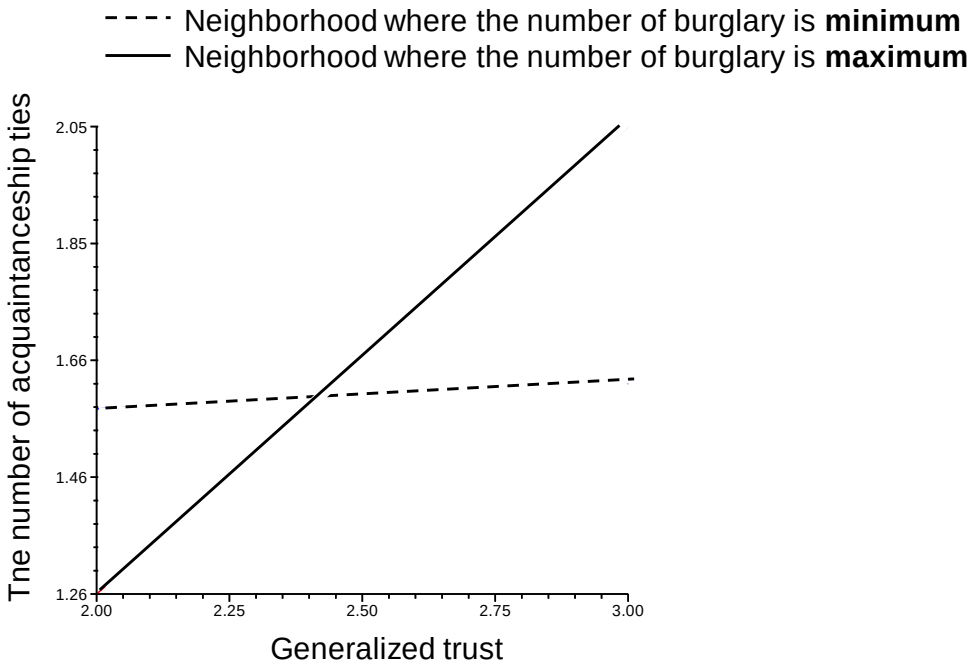

Figure 4-2. Cross-level interaction effect of larceny (property break-in) and trust on acquaintanceship ties

Next, friendship ties and acquaintanceship ties were included in a model as independent variables, and the effects of crime rates and social ties on social participation were examined (Table 4-3).

Table 4-3. Effects of crime rates and social ties on social participation

	Model 3
	Social participation
Independent Variables	Coefficient
Individual-level Variables	
Intercept	0.05
Sex (male = 1, female = 0)	-0.16 **
Duration of residency	0.01 ***
Annual household income	0.01
Educational background	0.04
Musashino City (dummy)	0.02
Trust	0.11 *
Reciprocity	0.11 *
Fear of crime	0.01
Friendship ties	0.09 ***
Acquaintance ties	0.09 ***
Neighborhood-level Variables	
2008 Larceny on burglary	0.14
2008 Larceny on non-burglary	-0.03 *
Individual × Neighborhood	
Trust × Burglary	-0.02
Trust × Non-burglary	0.01 *
Random Effect	Variance Component
Intercept	0.01
Individual-Level *n*	407
Neighborhood-Level *n*	43

Note: ***$p<.001$, **$p<.01$, *$p<.05$, †$p<.10$

Table 4-3 shows that both friendship ties and acquaintanceship ties exert a positive influence on social participation. Combined with the results of Table 4-2, neighborhood-level crime affects social participation through the following two distinct pathways: 1) a “promoting path”, in which burglary indirectly promotes social participation by increasing friendship ties, and 2) an “inhibitory path”, in which burglary indirectly suppresses social participation by decreasing

acquaintanceship ties. Moreover, the number of larcenies not associated with property break-ins directly reduced social participation. As Table 4-3 shows, however, the inhibiting effect of these crimes on social participation was buffered by the respondents' generalized trust. Figure 4-3 shows the cross-level interaction effect of larceny (other forms of theft) and trust on social participation.

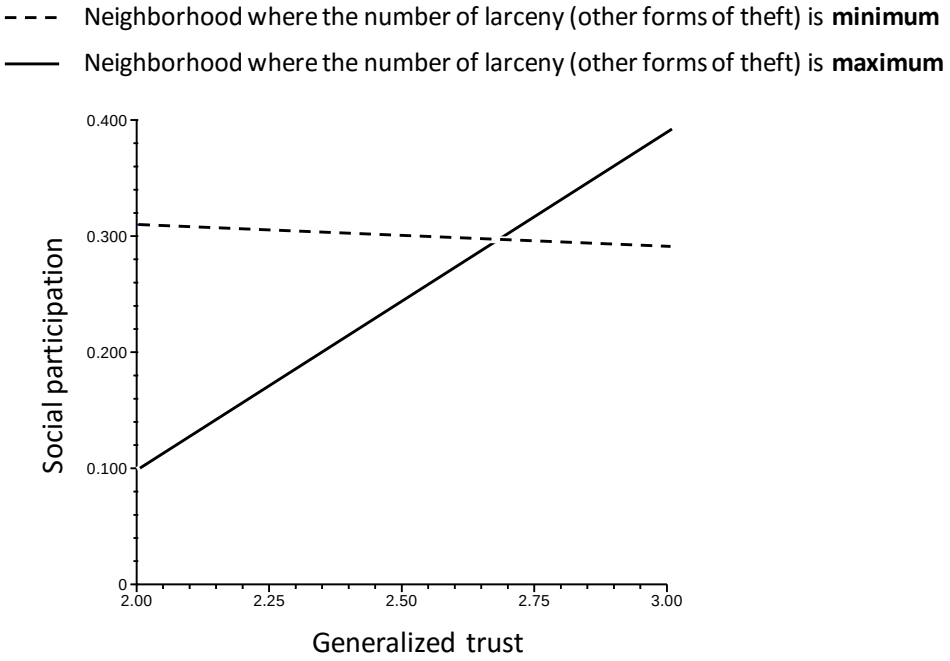

Figure 4-3. Cross-level interaction effect of larceny (other forms of theft) and trust on social participation

Figure 4-4 summarizes the results (main effects only).

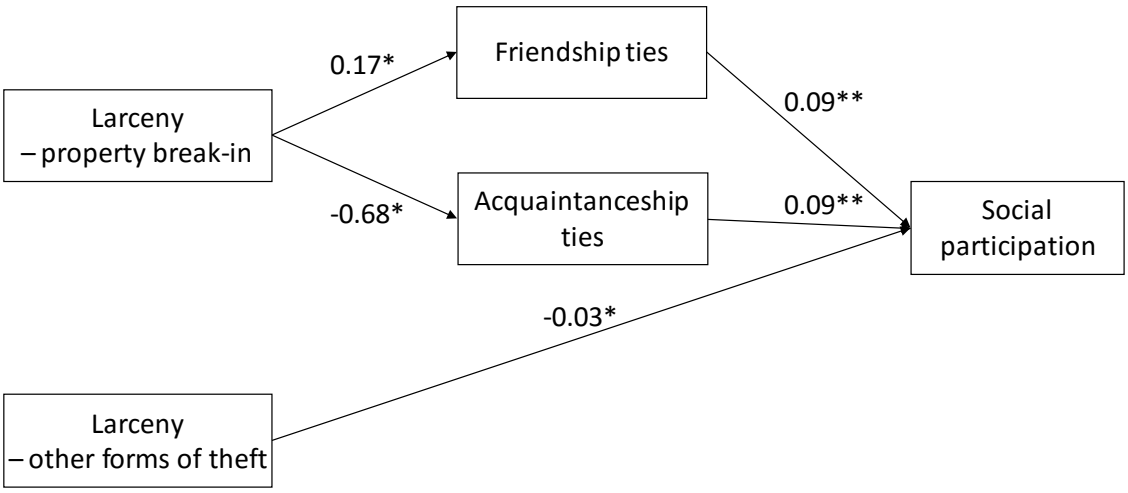

Figure 4-4. Summary of the effects of crime rates on social participation

Discussion

The present study's results showed that in neighborhoods with high larceny rates (property break-ins), people tended to have more friendship ties but fewer acquaintanceship ties. Model 3 in Table 4-3 showed that these two types of social ties had significant facilitation effects on social participation. Thus, this type of crime indirectly facilitates social participation by enhancing residents' friendship ties while indirectly lowering their social participation by weakening acquaintanceship ties. These results may help to explain the inconsistencies in findings from previous empirical research. In addition, larceny involving other types of theft (e.g., pick-pocketing and purse-snatching) indicated a direct inhibitory effect on social participation, as Table 4-3 shows.

The finding that crime facilitates people's participation by increasing intimate social ties

is consistent with the findings of Taylor (1996), Berkowitz (2000), and Wandersman and Florin (2000), which showed that crime draws residents closer together and stimulates their social participation as a means of coping with external threats. The finding that crime directly and indirectly reduces social participation by reducing weak social ties is consistent with the findings of Skogan (1990) and Saegert and Winkel (2004), which showed that crime encourages people to withdraw socially from their neighborhood and disrupts the neighborhood's ability to organize.

An additional interesting finding of this study is the interaction effects of neighborhood crime and individual generalized trust. As Figure 4-2 shows, the effect of generalized trust on the number of acquaintanceship ties is larger for neighborhoods with higher crime rates. Similarly, Figure 4-3 suggests that the effect of generalized trust on social participation is stronger for neighborhoods with higher crime rates. In other words, these results suggest that the importance of generalized trust increases in neighborhoods with high crime rates. Because of the high social uncertainty induced by crime, people need generalized trust to connect with unfamiliar people. Thus, people with low generalized trust are only able to form tight and close networks in response to a rise in crime because they constrict their open networks as an antidote to crime. These results suggest that people who have low generalized trust abandon relationships with unfamiliar people and restrict their networks to those with whom they are familiar. Some researchers have noted the spread of gated communities in the U.S. as an example of a change in the community structure

arising in response to the fear of crime (Blakely & Snyder, 1999; Low, 2003). Although the physical enclosure of communities (e.g., gated communities) has not become common in Japan despite the spread of apartments with automatically lockable doors, people can maintain "gated relationships" in response to the need for a psychological sense of security. This may lead to constricted social relationships. Closed and exclusive networks are undesirable because they restrict people's opportunities to gain the benefit of a diversity of networks.

Some limitations of the present study should be noted. First, the survey response rate was low (Musashino: 33.6%, Kiyose: 30.6%); however, mail surveys in Japan have been found to have relatively low response rates, typically no higher than 20-40% (Harada, Waki, & Mizutani, 2001; Sakurai & Jacobson, 2010). Thus, the present study's response rate was comparable to, if not better than, typical community-based surveys of this type conducted in Japan. Nevertheless, the possibility that the present study's results may be biased by the low response rate should be acknowledged. For example, in the present study's dataset, the proportion of young respondents (20-29 years old) was considerably lower than the proportion of participants in the older age groups. Therefore, the present study's samples included an artificially high number of homemakers and retirees, who are more likely to have social ties in the neighborhood than people in other social groups.

Second, although the present study used crime data from one year prior to the survey,

the other data were cross-sectional. Additionally, it is unclear whether crime data of a year ago are appropriate for examining the effect of crime on neighborhood social ties, and this study cannot reject the possibility of reverse causation. The present study's results must be replicated with longitudinal samples.

Study 6: What Does Surveillance Provide for Society? The Influences of Security Cameras in Public Spaces on Neighborhood Cohesion and Trust

Introduction

One of the effects of crime on society is that it changes communities. For example, it has been noted that gated communities have become widespread in the U.S. in response to the deterioration of public safety (Blakely & Snyder, 1999; Low, 2003). Study 5 described the possibilities of an increase in friendship ties and a decrease in acquaintanceship ties in response to the crime rate as one aspect of the crime-induced changes in community-dwelling residents' psychological and social contexts. One social consequence implied by the results is that closed and exclusive personal relationships are formed in response to crime. Study 6 focuses on an additional aspect of the social changes caused by crime, i.e., the surveillance society. The present study examined security cameras as an example of the surveillance society and investigated how neighborhood surveillance has led to changes in social relationships. One context of this study is the phenomenon of "crime prevention community design" (*bouhan machizukuri* in Japanese), which is a recent social reaction to crime.

Recently, the installation of security cameras in public spaces as an anti-crime measure has increased worldwide (Welsh & Farrington, 2009). In the U.K., where the installation of

security cameras was promoted early across the country, cameras have been installed in many public spaces, such as city centers, shopping malls, parking lots, and workplaces, and citizens have exhibited largely positive attitudes toward them (Gill, Bryan, & Allen, 2007). However, citizens' attitudes toward the installation of cameras in residential areas have not been as deeply investigated.

In Japan, security cameras in public spaces are becoming popular because of societal demands for such measures as antiterrorism protection for busy streets and public transportation systems, countermeasures against purse-snatching and auto theft, and the prevention of the victimization of children in public spaces, including streets and parks (Shimada, 2012). One of Japan's major street security camera installation projects (more precisely, closed circuit television or CCTV) was conducted in Ichikawa City, Chiba Prefecture (Amemiya, Shimada, & Takagi, 2011), where the municipal government installed 150 CCTV cameras in the city's stations, school roads and parks between 2008 and 2009. Although many CCTV installation projects are conducted around stations and busy streets, the project in Ichikawa City was characterized by the installation of CCTV cameras in common living spaces, such as school roads and residential zones. In addition, although installations of surveillance cameras in relatively private spaces, such as apartment buildings and workplaces, have become commonplace, the present study focused on surveillance cameras installed in more public spaces, i.e., public streets and parks in

neighborhoods. As represented by the Ichikawa project, anticrime policies, including surveillance, are becoming increasingly popular in the context of the crime prevention community design in Japan.

However, many criticisms of this type of crime prevention community design have been raised (Amemiya, Hino, Kojima, & Yokohari, 2007). For example, from the perspective of the surveillance society, Hamai and Serizawa (2006) argued that if the crime prevention community design is overpromoted, society will be shaped by certain exclusionary values that will prevent many socially vulnerable individuals from being part of society. This will create an environment in which such individuals are considered “suspicious people” and are aggressively excluded from the city. Abe and Narumi (2006) argued that residential neighborhoods with excessive crime prevention capabilities tend to close off the people living within the community from the outside. In Western countries, neighborhood surveillance measures are likely to result from citizens’ perceptions that the police and criminal justice systems have failed to reduce crime and to maintain social order. By contrast, in Japan, there is the perception that neighborhood surveillance is motivated by reductions in citizens’ social norms and the attenuation of human relationships (Ogino, 2006). Thus, introducing surveillance into neighborhoods can be considered a success of the local community inWestern countries (i.e., the result of citizens’ collective efforts), whereas neighborhood surveillance in Japan can be viewed as the result of an unsuccessful local society.

In addition, Lyon (2001) suggested that surveillance increases suspicion in neighborhoods and threatens the social cohesion that represents the affluence of residents' social ties and solidarity. For example, surveillance through CCTV cameras can be viewed as a sign of low cohesion among residents, i.e., people may believe that "camera surveillance is conducted because residents' social cohesion is low in this neighborhood."

Conversely, the surveillance function can enhance a type of social trust that corresponds to "assurance" (*anshin*) in Yamagishi's (1998) theory of trust. The concept of assurance is the expectation that other people will behave cooperatively *without* social uncertainty. Thus, social uncertainty is reduced by surveillance because people can assume that others will not do wrong because they are being monitored, meaning that people can "trust" one another.

In summary, surveillance seems to have two contradictory effects, lowering the perception of neighborhood social cohesion and increasing residents' trust in others. The purpose of this study was to investigate the relationships between exposure to CCTV cameras and perceived social cohesion and trust using survey data from Ichikawa City to reveal the impact that surveillance has on society.

Incidentally, although we can view the installation of CCTV cameras in Ichikawa City as a type of social experiment, exposure to CCTV cameras was poorly randomized for a social experiment, i.e., this project was not a randomized controlled trial (RCT). Therefore, there may

be selection biases and unobserved confounders in the relationship between exposure to CCTV cameras and perceived cohesion/trust, such that the validation of the causal relationship is threatened. Thus, this study examined the adequacy of the causal relationship using an instrumental variables (IV) method.

The IV method uses instrumental variables that are not directly associated with the outcomes (more precisely, error terms of outcomes) but are correlated with the independent variables. This is synonymous with using variables corresponding to a "coin toss." For example, if we can assign participants to an "exposure to CCTV cameras group" and a "non-exposure group" using coin tosses, we can detect the "pure" effect of CCTV cameras on neighborhood cohesion and trust as though an RCT had been conducted (Figure 4-5). Identifying the instrumental variables that correspond to the "coin toss" in the dataset is an important step in studies that use the IV method.

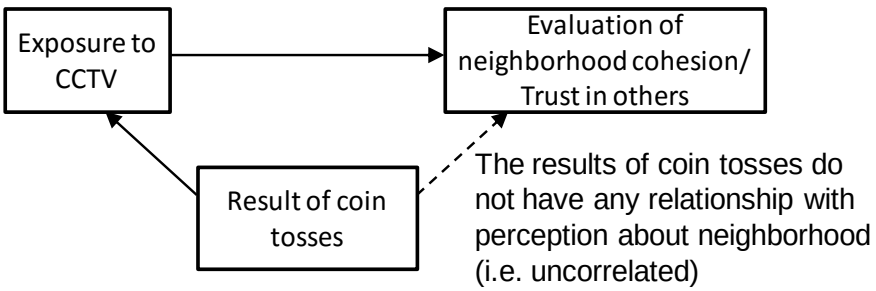

Figure 4-5. A schematic of the IV method

No studies, including the current study, have conducted an RCT to examine the effect of exposure to CCTV cameras on residents' perceptions of their neighborhoods. The next best option is to identify instrumental variables and observe changes in the dependent variable associated with quasi-experimental variations in the independent variables (Ichida et al., 2013; Kawachi, Ichida, Tampubolon, & Fujiwara, 2013). The instrumental variables used in this study are explained in the Methods section.

The final goal of this study was to reveal both the positive and negative aspects of security cameras and discuss their anticipated social consequences.

Methods

Data

In 2010, investigators for the National Research Institute of Police Science (NRIPS) mailed a survey to 2,632 residents aged 20-74 years living in Ichikawa City, Chiba Prefecture. Ichikawa City is located in northwestern Chiba Prefecture, has a population of approximately 470,000 and is a bedroom suburb of the Tokyo Metropolitan Area (according to census figures in 2010, the percentage of people who commuted from Ichikawa City to one of Tokyo's 23 wards was 46.5%). As previously mentioned, Ichikawa City is an advanced area where the municipality-led installation of surveillance cameras in common spaces has been conducted in areas other than

the fronts of stations and busy downtown streets. Therefore, at the moment, this area can be referred to as the most suitable place for a social experiment on the effects of surveillance on neighborhoods.

The present survey was the third wave of a series of mail surveys conducted since 2007 by NRIPS and the Ichikawa City government (Shimada, 2013). In the first survey wave, which was conducted in November 2007, a questionnaire was mailed to 2,000 (40 neighborhoods × 50 people) residents of Ichikawa City, who were selected using two-stage random sampling from the Basic Resident Resister. The neighborhood unit was the *choumoku*, and the response rate was 59.2% (n = 1,184). In the second wave survey, which was conducted in February 2010, a survey was mailed to 983 respondents of the first wave survey and 3,090 residents newly sampled from the Basic Resident Register. The response rate of the second wave was 58.7% (n = 2,392). In the third wave survey, which was conducted in February 2012, a questionnaire was mailed to 2,332 residents who were respondents of the first or second surveys, plus 300 residents newly sampled from the Basic Resident Register. The response rate was 75.9% (n = 1,998)

This study used data from the third wave survey. The number of observations used in the analyses was reduced to 647 because there were several versions of the questionnaire and the current study only used data from respondents who responded to questionnaires that included items about perceived social cohesion and trust in others.

Measurements

Perceived neighborhood social cohesion and trust in others were measured as outcome variables. Perceived social cohesion was measured with the following item: “Residents of this neighborhood do not know each other well.” The responses were captured on a 4-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree). In the analyses, the score of this variable was reversed – i.e., high scores for this item represent high estimates of neighborhood cohesion. Trust in others was measured with the following item: “Most people can be trusted.” Responses were arranged on a 5-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3= Neither, 4 = Agree, 5 = Strongly agree).

Exposure to CCTV cameras, the exposure variable of this study, was measured by asking the respondents the following question: “The Ichikawa City government installed 152 CCTV cameras in parks and roads of the city between 2009 and 2011. Were you aware of this?” The respondents were asked to mark one response from 3 categories (1 = I was not aware of this, 2 = I was aware, but I have not actually seen the CCTV cameras, 3 = I actually saw the CCTV cameras). To examine the effect of “actual exposure” to CCTV cameras on perceived cohesion/trust, respondents who reported that they saw CCTV cameras in the city were coded as 1, and the other respondents were coded as 0.

This study included respondents’ sex, age, annual household income, and fear of crime

as individual-level covariates. Fear of crime was assessed by asking about each respondent's fear of "burglary," "vandalism to cars or houses," "auto or bike theft/car break-ins," "street crimes" and "life-threatening crimes." Responses were arranged on a 4-point Likert scale (1 = Not anxious at all, 2 = Somewhat anxious, 3 = Anxious, 4 = Highly anxious). In the analysis, the average of these five items was used. The number of street crimes and burglaries in 2011, population density per km^2 in 2011, and the presence of CCTV cameras in each neighborhood (*choumoku*) were included as neighborhood-level covariates. The numbers of crimes were translated into the crime rates per 1,000 people. In the analyses, the crime rates and population density were transformed into logarithms. For the variable of the presence of CCTV cameras, the neighborhoods where CCTV cameras were installed were coded as 1, and the other neighborhoods were coded as 0.

This study used two instrumental variables that correlated with the exposure variable but not the outcome variables, as follows: perceptions of volunteer patrols and the blue light patrol cars in the city. The current study adopted these two instrumental variables for the following reasons. First, these variables were thought to be associated with the independent variable (i.e., exposure to CCTV). Crime prevention strategies that are exercised in a neighborhood are not conducted at spatially random locations; rather, they are spatially overlapped. That is, although there is a possibility of the existence of other confounders, people who are exposed to a certain anticrime activity (e.g., volunteer patrols and the blue light patrol cars) are also likely to be

exposed to CCTV cameras. Second, these instrumental variables are not assumed to be related to the dependent variable. Because volunteer patrols and the blue light patrol cars are relatively less likely to include features of surveillance and have a smaller impact than CCTV cameras, their association with the dependent variables (i.e., respondents' perception of neighborhood cohesion and trust in others) is considered to be weak. The respondents were asked the following question about the perception of volunteer patrols: "Ichikawa City government is implementing volunteer patrols by asking citizens to conduct patrols as they jog or walk, with a formal cap provided by the government. Were you aware of this?" The respondents chose one of the 4 predetermined categories (1 = I was not aware of this, 2 = I was aware, but have not actually seen the patrols, 3 = I saw people wearing the caps, 4 = I have participated in these activities). The respondents who chose 2, 3, and 4 were coded as 1, and those who chose 1 were coded as 0. Residents' perceptions of the blue light patrol cars were obtained from responses to the following question: "In Ichikawa City, the blue light patrol cars are patrolling the whole city. Were you aware of this?" The respondents were asked to mark one response from 4 categories (1 = I was not aware of this, 2 = I was aware, but I have not actually seen the cars, 3 = I have seen the cars once, 4 = I have seen the cars two or more times). Respondents who chose 2, 3, and 4 were coded as 1, and those who chose 1 were coded as 0.

Statistical analyses

The IV method was conducted through a two-stage least-square (2SLS) test. In the first stage, the following model was analyzed:

$$\hat{p} = \alpha_0 + \alpha_1 v + \alpha_2 b + \alpha_k \textit{ Other Predictor}$$

where $\hat{p}$ is a predicted value of the exposure variable (exposure to CCTV cameras) and v and b represent the instrumental variables (v = perception of the volunteer patrols, b = perception of the blue light patrol cars).

In the second stage, $\hat{p}$, the predicted value of exposure to CCTV cameras, was included in the regression equations as an explanatory variable that explains the outcome variables (e.g., perception of cohesion).

$$C = \beta_0 + \beta_1 \hat{p} + \beta_k \textit{ Other Predictor} + \varepsilon$$

where C is the perception of cohesion and β_1 represents the "pure" effect of exposure to CCTV cameras. The same model was also applied to the analysis of trust in others.

Because the exposure variable, exposure to CCTV cameras, was binary in this study, the first-stage model was estimated using a probit model. For these analyses, the *treatreg* command in STATA was used.

The analyses targeted 647 respondents who were sampled from 39 neighborhoods (*chomoku*) and responded to the questionnaire versions that included items about social cohesion

and trust. However, respondents with missing values were omitted using the list-wise case deletion in each analysis. Thus, the numbers of observations used in the analyses differed between models.

Because respondents living in the same neighborhood may have high intra-class correlations, the variance between observations is likely to be underestimated. Guided by previous studies (Inamasu & Ikeda, 2009; Rogers, 1994), the current study clustered respondents who lived in the same neighborhood and calculated robust standard errors by weighting the matrix calculations for standard errors of regression coefficients under the assumption that there is a certain level of intra-class correlation within the clusters but that clusters are independent from each other.

To examine whether appropriate instrumental variables were used in the analyses, (1) the association, (2) endogeneity of the exposure variable, and (3) lack of correlation between the instrumental variables and an error term of the outcome variable were checked. For the association, the correlation of the instrumental variables (in this study, perception of volunteer patrols and the blue light patrol cars) with the exposure variable was tested. The endogeneity of an exposure variable was checked by testing whether perceived CCTV cameras (used as the exposure variable) was an endogenous variable. For the lack of correlation between instrumental variables and an error term of the outcome variable, this study tested whether the instrumental variables met the

IV method's major premise that instrumental variables are correlated with the exposure variable but are not correlated with the error term of the outcome variable. This study examined the appropriateness of the instrumental variables used in the study through the above three tests.

Results

Table 4-4 presents the descriptive statistics of this study.

Table 4-4. Descriptive statistics of Study 6

Items	Mean	SD	Items	%
Perception of social cohesion (4-point scale)	2.75	0.84	**Sex**	
			Male	42.0
Trust in others (5-point scale)	3.00	0.84	Female	58.0
Fear of crime (4-point scale) (α = 0.93)			**Perception of CCTV cameras**	
Burglary	2.55	0.90	"I had not known that" or "I had known that, but I had not actually seen CCTV cameras"	40.0
Vandalisms to cars or houses	2.33	0.86		
auto or bike theft/car break-in	2.32	0.88		
Street crimes	2.53	0.91	"I had actually seen the CCTV cameras"	60.0
Life-threatening crimes	2.54	1.06		
Mean	2.45	0.82	**Perception of volunteer patrols**	
Neighborhood crime rates (per 1,000 people)			"I had known that, but I had not actually seen that", "I had seen those people wearing the cap" or "I had participated in those activities"	42.8
Street crime	10.87	7.92		
Burglary	5.23	4.22		
			"I had not known that"	57.2
Neighborhood population density (per km^2)	14504.69	6492.38		
			Perception of blue light patrol cars	
			"I had known that, but I had not actually seen that", "I had seen that one time" or "I had seen that more than two times"	84.2
			"I had not known that"	15.8
			Age	
			20-29 years old	3.7
			30-39 years old	15.3
			40-49 years old	24.7
			50-59 years old	23.0
			60 or older	33.2
			Annual household income	
			Less than 3 million yen	21.5
			3-6 million yen	38.3
			6-9 million yen	25.5
			More than 9 million yen	14.7
			Presence of CCTV in neighborhoods	
			Neighborhood where CCTV cameras exist	35.7
			Neighborhood where CCTV cameras do not exist	64.3

Table 4-4 shows that 60% of respondents had seen the CCTV cameras in the city. Whereas the percentage of respondents who were unaware of the volunteer patrols by local

residents was approximately 60%, only 15% were unaware of the blue light patrol cars.

Table 4-5 contains the Ordinary Least Square (OLS) (Model 1) and 2SLS (Model 2 and 3) estimations for the effect of exposure to CCTV cameras on perceived social cohesion.

Table 4-5. OLS and 2SLS estimations of the effect of exposure to CCTV cameras on perceived social cohesion

	Model 1 OLS		Model 2 2SLS 1st stage (Probit model)		Model 3 2SLS 2nd stage	
Dependent variables:	Social cohesion		Perception of CCTV		Social cohesion	
	Coefficient	Robust std. error	Coefficient	Robust std. error	Coefficient	Robust std. error
Perception of CCTV	**-0.333 ****	**(0.082)**				
Perception of CCTV predicted by IV					**-0.825 ***	**(0.321)**
Perception of volunteer patrols			**0.562 ****	**(0.108)**		
Perception of blue light patrol cars			**0.422 ****	**(0.158)**		
Sex						
Male	0.094	(0.075)	0.062	(0.107)	0.100	(0.072)
Female	Reference		Reference		Reference	
Age						
20-29	0.399 †	(0.221)	0.010	(0.286)	0.400 †	(0.242)
30-39	0.268 †	(0.151)	0.021	(0.171)	0.269 †	(0.149)
40-49	0.246 †	(0.129)	0.254 †	(0.148)	0.299 *	(0.132)
50-59	0.252 *	(0.093)	0.261 †	(0.150)	0.293 **	(0.097)
60 or older	Reference		Reference		Reference	
Annual household income						
Less than 3 million yen	-0.236 †	(0.125)	0.172	(0.192)	-0.197	(0.130)
3-6 million yen	-0.097	(0.118)	0.242	(0.167)	-0.038	(0.123)
6-9 million yen	0.063	(0.108)	0.151	(0.172)	0.104	(0.105)
More than 9 million yen	Reference		Reference		Reference	
Fear of crime	0.010	(0.049)	-0.137 *	(0.067)	-0.017	(0.056)
Burglary crime rate (log)	0.534 †	(0.308)	-0.038	(0.551)	0.432	(0.331)
Street crime rate (log)	-0.384	(0.253)	-0.160	(0.435)	-0.333	(0.271)
Population density (log)	0.208 †	(0.116)	-0.003	(0.102)	0.215 †	(0.129)
Presence of CCTV cameras	-0.043	(0.089)	0.206 †	(0.113)	-0.011	(0.084)
Constant	-1.986 †	(1.096)	-0.481	(1.068)	-1.810	(1.229)
Observations	629		629		629	
Clusters	39		39		39	
Adjusted R^2	.107				.054	
Partial R^2			.042			

** p <.01, * p <.05, † p <.10

Model 1 (OLS estimations) in Table 4-5 shows that the exposure to CCTV cameras was negatively associated with perceived social cohesion (coefficient = -0.333, $p<.01$). In Model 2, the first stage of 2SLS, exposure to CCTV cameras was predicted by the instrumental variables of perceived volunteer patrols and the blue light patrol cars. Both instrumental variables were positively related to exposure to CCTV cameras. In Model 3, the second stage of 2SLS, the predicted value of exposure to CCTV cameras that was calculated in Model 2 was included as an independent variable and its association with perceived social cohesion was estimated. The instrumented exposure to CCTV cameras showed a negative effect on perceived social cohesion (coefficient = -0.825, $p<.05$). Based on the results, it is suggested that the IV method detected stronger associations than those estimated by OLS for the relationship between CCTV cameras and perceived social cohesion.

Table 4-6 shows the effect of exposure to CCTV cameras on trust in others as estimated with the same analytical framework as Table 4-5.

Table 4-6. OLS and 2SLS estimations of the effect of exposure to CCTV on trust in others

	Model 1 OLS		Model 2 2SLS 1st stage (Probit model)		Model 3 2SLS 2nd stage	
Dependent variables:	Trust in others		Perception of CCTV		Trust in others	
	Coefficient	Robust std. error	Coefficient	Robust std. error	Coefficient	Robust std. error
Perception of CCTV	**0.054**	**(0.078)**				
Perception of CCTV predicted by IV					**0.631 ** **	**(0.235)**
Perception of volunteer patrols			**0.561 ** **	**(0.107)**		
Perception of blue light patrol cars			**0.405 ** **	**(0.155)**		
Sex						
Male	0.018	(0.079)	0.032	(0.106)	0.014	(0.082)
Female	Reference		Reference		Reference	
Age						
20-29	-0.979 **	(0.202)	0.017	(0.285)	-0.983 **	(0.203)
30-39	-0.502 **	(0.121)	0.048	(0.168)	-0.507 **	(0.118)
40-49	-0.365 **	(0.108)	0.247 †	(0.146)	-0.429 **	(0.103)
50-59	-0.221 †	(0.113)	0.262 †	(0.147)	-0.270 *	(0.110)
60 or older	Reference		Reference		Reference	
Annual household income						
Less than 3 million yen	-0.178	(0.144)	0.146	(0.188)	-0.220	(0.155)
3-6 million yen	0.027	(0.124)	0.266	(0.166)	-0.047	(0.129)
6-9 million yen	0.072	(0.135)	0.169	(0.171)	0.020	(0.146)
More than 9 million yen	Reference		Reference		Reference	
Fear of crime	-0.133 *	(0.056)	-0.137 *	(0.065)	-0.101 †	(0.060)
Burglary crime rate (log)	-0.110	(0.262)	-0.185	(0.553)	0.028	(0.276)
Street crime rate (log)	0.100	(0.224)	-0.047	(0.435)	0.026	(0.244)
Population density (log)	0.118 *	(0.049)	0.012	(0.100)	0.106 †	(0.057)
Presence of CCTV cameras	0.032	(0.082)	0.174	(0.112)	0.000	(0.085)
Constant	-0.521	(0.522)	-0.611	(1.046)	-0.693	(0.629)
Observations	647		647		647	
Clusters	39		39		39	
Adjusted R^2	.084				.082	
Partial R^2			.043			

** p <.01, * p <.05, † p <.10

The OLS analysis (Model 1 in Table 4-6) shows that the exposure to CCTV cameras was not correlated with trust (coefficient = 0.054, *n.s.*). By contrast, Model 3 in Table 4-6, which includes the predicted value of the exposure to CCTV as estimated by instrumental variables, shows that exposure to CCTV cameras was positively associated with trust in others (coefficient = 0.631, p<.01).

To test whether the instrumental variables that were used in this study were appropriate, several posttests were conducted. Concerning the association between instrumental variables and the exposure variable, *F* statistics of 2SLS's first stage can be used. The *F* statistics were 38.36 for the analysis on social cohesion and 30.79 for the analysis on trust. Because these values are sufficiently higher than the recommended threshold value of 10 (Staiger & Stock, 1997), the instrumental variables that were used in this study were not "weak instrumental variables" (Angrist & Pischke, 2008) – i.e., the present study's instrumental variables had appropriate associations with the dependent variables.

Second, concerning the endogeneity of exposure to CCTV, Durbin-Wu-Hausman's *F* statistics for the endogeneity of the regressor in the 2SLS second stage (i.e., the exposure to CCTV cameras) were 4.12 ($p<.05$) for the analysis of social cohesion and 4.19 ($p<.05$) for the analysis of trust. Thus, the null hypothesis (H_0 = "the exposure to CCTV cameras is exogenous") was rejected for both models. Thus, the exposure to CCTV cameras was endogenous and the use of instrumental variables was appropriate.

Finally, a joint null hypothesis (i.e., instrumental variables are not correlated with the error term of the outcome and the models are correctly identified) was checked by the Sargan test. The Sargan χ^2 statistics were 1.97 (*n.s.*) for the analysis of cohesion and 2.15 (*n.s.*) for the analysis of trust. Because the null hypothesis was not rejected, this study concluded that the instrumental

variables were not correlated with the error term of the outcome and that the models were correctly identified.

Discussion

The IV analysis results showed that people who were exposed to CCTV cameras in neighborhoods underestimated neighborhood social cohesion. The effect of instrumented CCTV exposure ("predicted exposure to CCTV cameras," excluding endogeneity) was twice as strong as that estimated by OLS. This result suggests that "pure" exposure to CCTV cameras, excluding the influences of selection biases and unobserved confounders, is quite strongly associated with perceived neighborhood social cohesion. In the short term, people who observed the "surveillance" conducted in the neighborhood may have believed that the residents' cohesion was low and, consequently, may have underestimated the neighborhood's social cohesion. In future studies, a question concerning whether CCTV cameras have longer-term impacts on neighborhoods – i.e., whether CCTV cameras disturb the development of neighborhood cohesion – should be examined. For example, as a longitudinal mechanism, in a situation in which CCTV surveillance is effective, the need for and importance of residents' "natural surveillance" may be reduced and the significance of neighborhood cohesion may also be relatively lowered. In neighborhoods where residents' cohesion is high, strangers can easily be identified and natural surveillance by residents

can function with little additional effort (Sampson et al., 1997), whereas CCTV cameras assume these monitoring functions in the neighborhoods. Sustained resident surveillance ("eyes on the street") built on social capital among neighbors (Jacobs, 1961) can be taken over by machines (the term "electronic eyes of social capital" (Uveda, Donadello, Gasparin, & Macke, 2011) has emerged to describe this function). In such a situation, it may be difficult to develop social cohesion. Additionally, the social cohesion question item that was used in the current study ("Residents of this neighborhood do not know each other well") may capture residents' neighborhood mobility. Namely, the negative relationship between exposure to CCTV cameras and perception of low social cohesion may reflect a consequence that people who observed CCTV cameras thought that "residential stability may be low in this neighborhood." In neighborhoods where the mobility of residents is high and, thus, stability is low, residents have difficulties exerting informal social controls and camera surveillances are likely to be required. If ignorance about neighborhood residents represents high residential mobility and low residential stability, in such neighborhoods the formation of social networks may be disturbed, local society may be disorganized, and the crime prevention functions may be decreased. In this regard, future research should examine whether CCTV cameras will enhance the perception of neighborhood residential instability in the long run.

On the other hand, respondents who were exposed to CCTV cameras reported high trust

in others. The effect of CCTV cameras on trust, as estimated by OLS, was small and non-significant, whereas instrumented exposure to CCTV cameras showed a positive significant effect. The finding that CCTV cameras increase people's social trust is identical to the mechanism of the formation of "assurance" in generalized trust theory. Because this type of trust is expected to produce positive effects on people's health and safety (Kawachi, Takao, & Subramanian, 2013), the association between CCTV exposure and trust may be viewed as a positive effect of surveillance.

The important point of the present study's findings is that camera surveillance had a seemingly imbalanced effect whereby it both decreased social cohesion and increased trust (assurance) in others. For an extreme example, in a society where crime is perfectly controlled by surveillance, people can secure their "assurance" due to the absolute surveillance; however, connections between people may be reduced. We assume that such a society pays a hefty price for its reassurance (e.g., the monetary cost of surveillance, deteriorated social relationships, and lower innovation due to decreased diversity or openness in people's social ties). This situation is in opposition to the present study's idea of treating crime prevention as a by-product of social capital. Future studies should investigate whether CCTV cameras and other types of surveillance obstruct the development of cohesion rather than securing assurances and whether "human eyes" will be replaced by "electronic eyes" as a social consequence of the present study's findings. In

addition, a unique phenomenon of contemporary society is that electronic machines are replacing the surveillance (and subsequent sanction) that has been traditionally exerted by local residents. This situation might be associated with a second-order dilemma that questions who should incur the costs of system maintenance. In this respect, surveillance may be detrimental to society.

If the installation processes of CCTV cameras (e.g., decision making regarding installation sites) are spearheaded by residents in a democratic fashion, there is a possibility that residents may believe that "residents of this neighborhood are cohesive because they can cooperatively introduce CCTV cameras" and estimate neighborhood cohesion as high. Conversely, if CCTV cameras are "coercively" introduced to society through a government initiative, they may be viewed as monitoring by the state (or *okami*, the nominal designation for government in Japan when emphasizing its paternalism), possibly causing a reduction in perceived neighborhood cohesion. Although neighborhood associations (outwardly) determined the CCTV installation sites in Ichikawa City in a democratic manner, few respondents were aware of this (based on a question that asked whether respondents were aware that installation sites were determined by requests from neighborhood associations – only 7% of respondents responded positively). This result implies that many residents believe that the installation project was led by the government. The "adverse effect" of CCTV cameras on society may be moderated by the artifice of contriving the installation process.

The limitations of this study should be noted. The trust question that was used in the survey cannot distinguish whether the trust that was enhanced by CCTV cameras was "assurance" or a different type of trust (e.g., generalized trust). As Grootaert and Bastelaer (2002) and Tsuji and Harihara(2002) noted, the trust measured in the current study may be the particularized trust in "local residents." For example, Stugis and Smith (2010) reported that immediately after answering the generalized trust question, if respondents were asked to report who came to mind when they formulated their response, a substantial number of respondents reported that they thought about people whom they knew personally. Furthermore, respondents who called personally well-known persons to mind showed higher levels of trust than those who called "people in general" to mind (Stugis & Smith, 2010). In the present study, the feeling that was increased by "surveillance" was theoretically considered to be "assurance." From this perspective, a concept that is similar to particularized trust such as "trust in local residents" may fit more comfortably into the present study's analytic models than generalized trust. However, the possibility that the concept that was measured here and the concept that was theoretically inferred differed should be noted as one of the present study's limitations.

In conclusion, this study demonstrates the potential causal association between CCTV cameras and perceptions of communal society; that is, camera surveillance had a positive effect on trust in others and a negative effect on perceived social cohesion. The results suggest the

importance of implementing social policies with consideration for their potential adverse effects. The analytical method that was used in this study is also useful for other intervention studies. For example, when examining whether residents' participation in voluntary anticrime activities increases social capital, reverse causality is possible such that affluence in social capital facilitates people's participation. The IV method can effectively estimate the effect of this "social experience".

General Discussion

A question that has been posed throughout this dissertation is whether social capital, the softer aspect of neighborhood environment than the existing anticrime town development, is effective for crime prevention in Japan. Although statements that "social capital is useful for crime prevention" have been frequently mentioned in the context of crime prevention in Japan, they remain in anecdotal stories. In addition, few studies have examined the crime prevention effects of social capital using advanced statistical methods such as multilevel models and spatial analytic techniques even though these analytic methods have been essential in the fields of criminology, public health, and epidemiology in Western countries.

Then, does the current dissertation provide an answer to the above question? The answer is "yes." Study 1 showed that neighborhood management activities that were facilitated by social capital but apparently unrelated to crime prevention had a crime reduction effect. Study 3 demonstrated the direct effect of neighborhood social capital on larceny victimization using multiple geographic definitions of neighborhood. In addition, Study 4 detected the inhibitory effect of neighbors' trust on crime both in the model mediated by informal and formal social controls and the model mediated by neighborhood management activities. Multiple models were examined to clarify the effects of social capital indices on crime in this dissertation. The models demonstrated that placing social capital at the starting point of the models was effective.

Especially, as Studies 1 and 4 demonstrated, the significant inhibitory effects of behaviors that are not directly associated with crime preventions, such as neighborhood management activities (e.g., cleanup activity), on crime victimization are interesting and important. Namely, this type of crime prevention effect can cover the shortcomings of the recent crime prevention community design – i.e., fortification and exclusionism of the community and the budgetary restrictions of the municipalities. That is, if activities that are seemingly unrelated to crime can be diverted to crime prevention, we can aim for a society that differs from the "fortified society."

Additionally, one strong point in diverting social capital to the crime prevention models is that we can introduce the economic concepts of externality and (intentional and unintentional) investment in neighborhood to traditional criminological models. This point was glaringly apparent in the findings of Study 1 – i.e., respondents' own cooperative behaviors did not have a crime prevention effect but their neighbors' cooperative behaviors had an effect. These results represented the spillover effect of social capital in that even residents who do not invest in the neighborhood can enjoy the positive effects of neighbors' social capital. Because the externality/spillover effect can provide benefits for vulnerable residents who cannot devote their resources to the neighborhood (e.g., the poor people, older people etc.), it has a favorable aspect for society. On the other hand, based on the assumption that the nature of externality/spillover can be a source of free-riding, Study 2 focused on the social dilemmatic features of neighborhood

collective anticrime activities. In Japan, the fear of crime and the actual crime victimization that occurs in neighborhoods have been mentioned as the primal motivations to start collective anticrime activities. However, it has been noted that the motivations to *maintain* these activities are social solidarity and public spirit (Ogino, 2006). However, these hypotheses have remained at anecdotal discourses and have not been empirically demonstrated. Study 2 empirically revealed that the reduction of cost is important for the maintenance of collective anticrime activities and that neighborhood social capital reduces the cost.

The features of social capital examined in this dissertation fit well with current criminal policy. Current criminal policy in Japan is shifting the idea from "crime control through an increase in arrest rate" to "crime control through crime prevention" due to the reduced arrest rate and relatively decreased police forces. If the number of neighborhoods where crime can be prevented through residents' investment in the local community is increased, police activities are made more efficient through the reallocation of the extra police forces to neighborhoods with relatively low resident investments. Study 4 suggests that neighborhoods where residents' trust in the police is high can draw police resources. Given the results that neighborhood social capital is useful in utilizing police resources, the police can aggressively give more time and attention to the neighborhoods where the level of residents' social capital is low.

Furthermore, the spread of crime prevention through social capital in large areas enables

the role allotment between residents and the police – i.e., residents prevent minor offense and the police control major incidents. If crime such as burglary in a neighboring area can be prevented by residents' social capital, as suggested in the present dissertation, the police can allocate their forces to crime that cannot be controlled by residents' social capital (e.g., cybercrime, "hey-it's-me" scam, crime syndicate, etc.). Additionally, if residents concentrate their efforts on conducting anticrime activities, the police can provide crime prevention coaching, information on criminal occurrence, and counseling. The availability of these role allotments can be viewed as a positive utility that is generated from crime prevention through neighborhood social capital.

Geographic perspectives of neighborhood social capital and crime

One of the progressive approaches of this dissertation is the introduction GIS and spatial analytic techniques into analyses on psychosocial factors such as trust, norms of reciprocity, and social participation. Characteristics of neighborhoods and neighbors have not been rigorously examined in the field of psychology even though social psychology stresses the importance of the social contexts in which people are embedded. Studies 3 and 4's findings that the effects of social capital indices can vary according to geographic definitions of neighborhood illustrate the interaction processes between "micro" neighborhood residents that have not been captured in

traditional multilevel models using such geographic boundaries such as *choumoku*. Furthermore, Study 4's suggestion that the significant geographic range of neighborhood may depend on the theoretical models adopted in research can provide clues about the neighborhood range and strategies to employ when planning community-based interventions.

Additionally, these techniques introduce new perspectives into the theory development of this field. Some neighborhood factors that have been insignificant in the framework of commonly used multilevel models may not be unrelated to the outcomes; rather, they have been incorrectly examined using inappropriate neighborhood definitions. For example, if indices of the systemic model, which were examined in Study 4, are not significant in a multilevel analysis that sets street blocks as the "neighborhood level," there is a possibility that the street block is simply overly small to detect the effects of the systemic model.

Influence processes among residents cannot be ignored when studying social capital in terms of the resources that are embedded in the neighborhood. However, studies that focus solely on the macro social context cannot capture its internal dynamics. Although studies using GIS and spatial analyses in the field of social psychology have only recently begun (e.g., Takagi, Ikeda, & Kawachi, 2012), the number of studies on the relationships between social capital and crime using these techniques are fewer in Japan than in the Western countries. We hope that future studies that utilize these new techniques will be accumulated in the psychology-related fields in Japan.

Social consequences of rising crime and surveillance: Recommendations for social interventions

The current dissertation also investigated how the crime rate and the exercise of social surveillance affect local communities. In terms of the effects of the crime rate, this dissertation suggests that rising crime is positively associated with the number of intimate social networks and, contrarily, is negatively related to the number of unfamiliar acquaintanceships – i.e., rising crime may fractionalize social relationships into cliques. These findings imply an important recommendation to future criminal policy and crime prevention. Given that cliquing social relationships in neighborhoods is facilitated by rising crime, we should bridge between the cliques in neighborhoods with high crime rates. The police and experts can serve as bridges between the cliques in the case that people's social relationships are fragmented. The "Crime Reduction" movement (*"Herasou Hanzai" Undou*) in Hiroshima City and the "Convenience Police Box Project" in Chiba City can serve as useful references. In Hiroshima City, a chamber of town development was established in 2006 to unite community-based organizations. The chamber has successfully cohered and linked anticrime activities that were exercised by small groups, with the participation of the police and experts (Hiroshima city, 2006). In Chiba City, the "Convenience Police Box" was placed in the parking lot of a convenience store. Residents' anticrime volunteer patrols have been conducted based on the Convenience Police Box, where retired policemen

reside (The Chiba Prefectural Police, 2014). In this project, multiple volunteer patrol groups are expected to be linked to each other. Thus, through the establishment of chambers and "hubs" for anticrime activities in neighborhoods, social mechanisms that connect individual residents to each other can be introduced. Situational crime prevention (Clarke, 1995), defensible space (Newman, 1972), and Crime Prevention through Environmental Design (CPTED) (Crowe, 1991), which have been the basis for traditional town development, have largely focused on the physical hardware of neighborhood environments in practice (Matsukawa et al., 2009). Compared to these theories, efforts to build social networks among residents or organizations have been relatively recently "resuscitated" with the concept of the 2nd generation of CPTED (Cozens et al., 2005; Reynald, 2011) in the field of crime prevention community design (in this sense, the surveillance camera installation project that was addressed in Study 6 can be viewed as an idea from the "1st generation"). The current dissertation particularly focused on the function of social capital as a complement to the shortcomings of physical environmental improvement plans (e.g., monetary cost and fortification). Although the impacts of these efforts on the neighborhood have not been sufficiently investigated, future studies should empirically examine the effects of such social mechanisms not only on crime but also on neighborhood social capital.

One of the purposes of Study 6 was to provide evidence about the merits and demerits of the recent crime prevention community design (i.e., fortification and exclusionism in the

neighborhood). Because the effects of surveillance cameras on local communities have seldom been empirically examined, the results of Study 6 offer new insights into this field. This study suggested that the exposure to surveillance cameras had imbalanced effects in that it decreased residents' evaluation of neighborhood cohesion and, contrarily, increased their trust in others. These results imply that surveillance society has the potential to sacrifice some positive factors instead of ensuring residents' assurance and security. This study does not claim that surveillance should not be exercised in society; rather, it underscores the importance of balance in surveillance. The results of this study lend support to the necessity of the idea of "crime prevention through social capital" rather than the excessive progression of crime prevention community design including surveillance. However, research on the sole case of surveillance cameras is insufficient to fully explore the merits and demerits of the recent crime prevention community design improvements of the physical environments. Future studies should reveal the effects of the crime prevention community design (e.g., street lights, parks with poor visibility, mixed land use/building use, etc.) beyond surveillance cameras on residents' perceptions and attitudes toward the neighborhood.

Incidentally, this dissertation does not claim that interventions by public administration or the police are effective only for the bridging of the software aspect of the neighborhood. Rather, it argues that such bridging is one of the functions that public administration and the police should

play. If neighborhood crime prevention works smoothly due to bridges between residents, as previously mentioned, minor offenses can be controlled by residents' efforts without excessive dependence on interventions by public administration and the police. Presumably, some neighborhoods need aggressive interventions from public administration and the police, who should actively intervene in such neighborhoods. However, one of the utilities of crime prevention through social capital is that it enables many neighborhoods to require fewer (if any) such interventions by public administration and the police.

Remaining problems

Then, does not crime prevention through social capital include the risks of social exclusion and elimination? The answer, unfortunately, is "yes." For example, it is possible that residents who participate in collective anticrime activities alienate and exclude residents who do not participate in these activities. Nevertheless, the excluded residents may enjoy the benefits of public safety that result from the externality/spillover effect of neighborhood social capital. However, such a society may be far from healthy. These concerns are applicable not only to direct anticrime behaviors, such as collective anticrime activities (e.g., neighborhood watches), but also to neighborhood management activities and informal social controls (e.g., reprimanding youths who are idling in the neighborhood). To solve the above-mentioned problem, it is important to

build a mechanism that forms bridges between residents. For example, in the field of social psychology, some experimental studies have demonstrated that some interventions can enhance residents' trust in others. Mutz (2009) used an experimental technique to show that positive experiences increase participants' generalized trust. Ikeda and Richey (2011) demonstrated that the use of a local currency in a community can heighten residents' trust. Given the findings of these previous studies, we posit that the social capital of neighborhood residents can be developed. As previously mentioned, relatively powerful actors, such as the police and legislative chambers, can undertake the key role in interventions. In addition to the residents' grass-roots social capital, which was the main type that was examined in this dissertation, links in the social capital of public agencies, social organizations, and social institutions must be established.

Despite the remaining problems, one major practical meaning of social capital lies in the point that the crime prevention effect is a by-product of social capital. Namely, although many people do not interact with others for the purpose of crime prevention, the ties that are built for other purposes are beneficial for crime prevention at certain moments. From this viewpoint, for community crime prevention, approaches that foster the fundamental relationships demonstrated in this dissertation are important, regardless of the presence of physical environmental designs that are specialized for crime control. The introduction of "social structures" that promote

connections among people, such as women's associations, child-rearing circles, and community festivals, is recommended for safe (not "fortified") town development. Additionally, although this dissertation does not directly examine this issue, the presence of anticrime activity groups in a neighborhood may also yield desirable effects on mutual aid at times of disaster, child-raising and residents' health.

Second, the current dissertation suggests the "regionality" of social capital – i.e., the variation in the amount of social capital depends on geographical areas and the fact that neighborhoods have a high or low crime prevention ability from the standpoint of social capital (and that the difference is not dependent on administrative boundaries). Thus, the utilization of GIS will be substantially useful for "visualizing" neighborhood social capital. The visualization of the spatial distribution of social capital can facilitate cooperation between academic researchers and administrative officers. For example, researchers measure social capital through social surveys and combine the data with geographic information, and public administration can plan interventions for high-risk neighborhoods using this information. In contrast to physically fortifying vulnerable neighborhoods against crime, the facilitation of social capital in high-risk neighborhoods can improve various outcomes that are not limited to neighborhood safety (Putnam, 2000). This is precisely one of the reasons that this dissertation emphasizes the by-product effects of social capital. While strategies that promote neighborhood social capital still need further

consideration, an important practical recommendation of this dissertation is that researchers should help public administration to detect neighborhoods that are at risk in terms of social capital. By doing so, we can plan to avoid the spread of the hardware aspect of anticrime measures, such as the installation of surveillance cameras throughout Japan, and focus on building a safe society without excessive surveillance.

As described above, the current dissertation expresses many implications of social capital and crime. As previously mentioned, residents' trust can be developed by building social mechanisms (Ikeda & Richey, 2009; Mutz, 2009). Researchers should introduce such strategies into local communities and investigate how they affect people's social capital and crime. For example, future studies should investigate how the creation of consociations that integrate isolated anticrime activities and the establishment of places that can be hubs for multiple groups in relatively broad areas affect neighborhood crime rates and residents' social ties. Additionally, although this dissertation examined respondents' experience of actual crime victimization as an outcome, the effects of social capital on people's perception of public safety should also be investigated. Perceived public safety is an important index that is associated with people's enjoyment of life in good mental health (Chandola, 2001; Green, Gilbertson, & Grimsley, 2002; Stafford, Chandola, & Marmot, 2007). In addition to the prevention of actual crime, models that are relevant to the reduction of fear through social capital should be proposed. Furthermore, time-

oriented sustainability and variability of crime prevention through social capital should be examined. Because neighborhood residents are replaced due to various reasons, especially in urban areas, neighborhood-level social capital and the crime prevention effects of social capital are expected to change over time. To explore the time-oriented changes, time-series analyses such as cox regression models and latent curve models using longitudinal data are preferable. If the effects of social capital on crime vary over time, a new challenge to devise a method with temporally stable crime prevention effects on the neighborhood will arise.

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