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Fertile Ground for Community: Inner-City Neighborhood Common Spaces[1]

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Research suggests that the formation of neighborhood social ties (NSTs) may substantially depend on the informal social contact which occurs in neighborhood common spaces, and that in inner-city neighborhoods where common spaces are often barren no-man's lands, the presence of trees and grass supports common space use and informal social contact among neighbors. We found that for 145 urban public housing residents randomly assigned to 18 architecturally identical buildings, levels of vegetation in common spaces predict both use of common spaces and NSTs; further, use of common spaces mediated the relationship between vegetation and NSTs. In addition, vegetation and NSTs were significantly related to residents' senses of safety and adjustment. These findings suggest that the use and characteristics of common spaces may

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play a vital role in the natural growth of community, and that improving common spaces may be an especially productive focus for community organizing efforts in inner-city neighborhoods.

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Neighborhood social ties are the glue which makes a collection of unrelated neighbors into a neighborhood—a source of social support and sense of community (Unger & Wandersman, 1985; McMillan & Chavis, 1986, respectively), and a social unit more capable of forming local organizations (e.g. Warren, 1981), defending against crime (e.g., Perkins, Florin, Rich, Wandersman, & Chavis, 1990; Taylor, Gottfredson, & Brower, 1981), and mobilizing for political purposes (e.g., Greenbaum, 1982). Thus a central question for community psychologists has been how neighborhood social ties develop, and how these ties might be fostered.

Neighborhood social ties (NSTs) became a focus of interest for community psychologists in the 1970s with Sarason's book, *The Psychological Sense of Community* (1974), and have been of continued interest through the 1980s and 1990s (e.g., Buckner, 1988; Chavis & Wandersman, 1990; Glynn, 1986; Riger & Lavrakas, 1981; Skjaeveland, Garling, & Maeland, 1996; Unger & Wandersman, 1985). Along the way, community researchers have discovered much about how the formation of neighborhood social ties is affected by the characteristics of the individuals comprising the neighborhood. For example, there is evidence that NSTs are more likely when neighbors are similar in socioeconomic status (SES) or other characteristics (e.g., Unger & Wandersman, 1982), when neighbors have children living at home (e.g., Robinson & Wilkinson, 1995), and when neighbors are poor (e.g., Campbell & Lee, 1992; Robinson & Wilkinson, 1995) or minority (e.g., Lee, Campbell, & Miller, 1991) or have lived there for a number of years (e.g., Adams, 1992).

But a neighborhood is both a collection of individuals and a place; the people who live there and the place itself. Are NSTs solely a function of the people? To what extent does the *place* have a role in transforming a mere collection of unrelated individuals into a real community? Perkins and colleagues have studied effects of the neighborhood environment on residents' participation in neighborhood organizations, which is in turn associated with neighborhood social ties (Perkins, Brown, & Taylor, 1996; Perkins *et al.*, 1990), but only recently has research in community psychology directly examined the effects of the neighborhood environment on the development of NSTs (Plas & Lewis, 1996).

As Plas and Lewis pointed out, environmental psychologists and environmental designers have long been interested in ways in which residential architecture, building layout, and the features of public and semipublic spaces might facilitate the formation of stronger communities (e.g., Altman, 1975; Brown & Werner, 1985). Urban planners, in particular, have sought to identify features of a townscape that might foster community (e.g., Calthorpe, 1991). In this paper, we bring an environmental design research perspective to the question of neighborhood social ties. This has at least two benefits for community psychology: the potential for a fuller understanding of how neighborhood social ties develop, and new possibilities for community-building interventions. Indeed, as Shinn (1996) noted in introducing the *American Journal of Community Psychology*'s recent Special Issue on Ecological Assessment, the physical environment might constitute an important new focus for theory, research and practice in community psychology.

This paper provides a brief overview of the neighborhood environment's effects on neighborhood social ties, proposes a specific feature of neighborhoods that may have an especially large role in promoting NSTs, and tests this notion in the context of an inner-city community.

The Role of the Setting in the Development of Neighborhood Social Ties

There is considerable evidence to suggest that social ties do not form solely as a function of the people involved, but also as a function of the setting. Crowded, dangerous, and noisy settings all appear to inhibit the formation of NSTs: Conditions of crowding and high-density living have been linked to poor social relations in a variety of communities (Keane, 1991; McCarthy & Saegert, 1978; Tognoli, 1987); settings in which there is high crime or high fear of crime are associated with a lack of neighborhood cohesion (Conklin, 1971; Rohe & Burby, 1988); and individuals are less likely to contribute to community activities in loud or noisy settings (S. Cohen & Lezak, 1977). Furthermore, Festinger, Schacter, and Back (1950) provided convincing evidence that two neighbors are most likely to form social ties with each other if they use the same semipublic access paths or staircases. Thus characteristics of settings have an effect on both the likelihood that NSTs will develop, and on which NSTs will develop.

A closer examination of the literature suggests a potential mechanism for the effects of settings on NSTs. It appears these effects are primarily mediated through the physical setting's influence on the quantity and quality of informal social contact among neighbors. Each of the environmental features affecting NSTs has also been shown to affect the quantity and qual-

ity of informal social contact among neighbors. Crowded, high-density living conditions have been linked to social withdrawal (Baum & Valins, 1979; Ittelson, Proshansky, & Rivlin, 1970). High-crime settings are associated with neighbors staying home (Rohe & Burby, 1988) and avoiding local social contact (Conklin, 1971). The quality of social contact suffers under noisy conditions—exposure to noise renders individuals less likely to help others (Mathews & Canon, 1975) and less aware of subtle social cues (S. Cohen & Lezak, 1977). Finally, it is obvious that neighbors who share common paths have more opportunities for informal contact than neighbors who share no common paths (Festinger *et al.*, 1950; Fleming, Baum, & Singer, 1985).

The quantity and quality of informal social contact among neighbors is, in turn, critical in the formation of NSTs. According to Greenbaum (1982), relations among neighbors grow primarily in the course of repeated visual contacts and through short-duration outdoor talks and greetings. Consistent with this, the frequency of face-to-face contacts with neighbors is a strong predictor of both the probability that neighbors are friends and the strength of liking between neighbors (Ebbesen, Kjos, & Konecni, 1976).

In sum, the environmental and social psychology literature to date suggests that NSTs are likely to be inhibited by the presence of neighborhood crowding, crime, and noise; further, the literature suggests that NSTs are promoted by environmental features that enhance the quantity and quality of informal social contact among neighbors. If, as Fleming *et al.* (1985) found, neighborhood common spaces are one of the most important venues for casual social contact among neighbors, it seems likely that the characteristics of neighborhood common spaces play a material role in the development of social ties among neighbors. This study grows from such a perspective, and explores the possibility that, in the inner city, one ordinary and easily overlooked feature of neighborhood common spaces has a substantial influence on NSTs.

"Greenness" of Common Spaces and NSTs in Inner-City Neighborhoods

Although there are wonderful exceptions, inner-city neighborhood common spaces all too often consist of vacant lots—barren, deserted no-man's lands. A series of studies conducted by our Laboratory suggests that one of the most important features of these common spaces is the presence of trees and grass. We have found that residents dislike and fear these spaces when they are devoid of vegetation, but that the simple addition of trees and grass is sufficient to transform residents' responses to a space—whereas residents reported that they liked an outdoor common space in

its currently barren condition *not at all,* they liked photosimulations showing that same space with trees and grass *quite a lot* or *very much* (Kuo, Bacaicoa, & Sullivan, 1998).

Not surprisingly then, we found in another recent study that the amount of time residents spent in equal-sized common spaces was strongly predicted by the presence, location, and number of trees (Coley, Kuo, & Sullivan, 1997). The presence of trees consistently predicted greater use of outdoor spaces in two inner-city neighborhoods—by adults, by youths, and by mixed-age groups of youth and adults. The closer trees were to residential buildings, and thus the more visually and physically accessible they were, the more people spent time outside near them. Finally, not only did common spaces with trees appear to attract larger groups than similar spaces without trees, but the greater the number of trees in a space of a given size, the greater the number of people observed simultaneously occupying that space. These findings have now been replicated in another, larger study (DePooter, 1997).

It appears that trees and grass play an important role in attracting people to neighborhood common spaces in inner-city neighborhoods. If informal social contact among neighbors is a key factor in the development of NSTs, and the level of vegetation in neighborhood common spaces is a key factor in the shared use of those spaces (and hence, opportunities for informal social contact), perhaps the level of vegetation in such spaces can ultimately affect the development of neighborhood social ties. The central hypothesis in this study, then, was that "greener" neighborhood common spaces give rise to stronger neighborhood social ties.

This central hypothesis, if correct, raises a number of additional questions. First, what is the mechanism underlying this relationship? And second, what are the implications of such a relationship? Accordingly, one set of secondary hypotheses in this study concerned the possible *mediators* for a link between greenness and NSTs; another set concerned some of the possible *by-products.*

Clearly, one possible mediator for a link between greenness and NSTs is the use of common space. In addition, previous research in environmental psychology has established that "nature," ranging from wilderness to a view of trees and grass in an urban setting, has at least three systematic, positive effects on individuals. Each of these effects might also plausibly mediate the relationship between greenness and NSTs. Contact with nature in a variety of forms has been shown to (a) reduce mental fatigue (e.g., Cimprich, 1992; Hartig, Mang, & Evans, 1991; R. Kaplan & Kaplan, 1989), (b) relieve feelings of stress and arousal due to stress (e.g., Hull & Michaels, 1995; Ulrich, 1981), and (c) have positive effects on mood (e.g., Hull & Michaels, 1995); thus, individuals living in relatively barren sur-

roundings might be generally characterized by greater levels of mental fatigue, stress, and by generally less positive moods. It seems possible that mental fatigue, a state characterized by difficulty paying attention and a sense of strain and irritability (S. Cohen & Spacapan, 1987; S. Kaplan, 1987), might lower the quality of social interaction. Similarly, it seems possible that stress might lower the quality of social interaction, and there is evidence that even mild mood changes can affect social interaction (Isen & Shalker, 1982). Thus mental fatigue, stress, and mood constitute three possible alternative mediators for a relationship between greenness of common space and neighborhood social ties. Accordingly, this study examined not only common space use, but also mental fatigue, stress, and mood as possible mediators.

In addition to examining some of the possible mediators of a relationship between greenness and NSTs, this study began to explore some of the possible by-products of such a relationship. It seemed likely to us that a neighborhood feature contributing to NSTs might also yield other beneficial by-products, and that two of these possible by-products might be of special relevance for individuals in an inner city or public housing community: sense of safety, and sense of adjustment. The essence of living in poverty and danger is likely to be a fundamental sense of vulnerability; under these conditions, it would seem that an individual for whom "neighbors" represent unknown and possibly hostile entities must necessarily feel less sense of safety and adjustment than would an individual with at least some positive social ties to neighbors. Indeed, Riger, LeBailly, and Gordon (1981) found that individuals living in a dangerous neighborhood who had no ties to their neighbors felt less safe and had more fear of crime than individuals who had some ties to their neighbors. And Lee *et al.* (1991) found that individuals who had more intimates in the neighborhood, knew their nearby neighbors, and had more frequent contact with their nearby neighbors, reported greater neighborhood attachment and greater neighborhood satisfaction—outcomes likely to be associated with a sense of adjustment. Thus, this study examined whether, in an urban public housing community, higher levels of vegetation (trees and grass) in common spaces might yield not only stronger neighborhood social ties, but also a greater sense of safety and adjustment among residents. Implicit in this formulation is the expectation that NSTs would mediate the relationships between greenness of common spaces and a greater sense of safety and adjustment.

To test for the hypothesized relationship between levels of vegetation in common spaces and NSTs, the possible mediators of such a relationship, and the possible by-products of such a relationship, structured interviews were conducted with 145 residents of an inner-city public housing development in which residents are randomly assigned to levels of nearby vegetation.

METHOD

The data presented here were drawn from the Coping with Poverty archive, a multistudy research effort examining the effects of the physical environment on the functioning of individuals, families, and communities residing in urban public housing.

Site and Design

The site was Robert Taylor Homes, a large public housing development in Chicago, IL.[3] Robert Taylor Homes (RTH) has a number of important methodological features as a site for studying effects of the greenness of common spaces on neighborhood social ties.

First, while the amount of vegetation in neighborhood common spaces at RTH varies considerably from building to building, the buildings are identical in architecture and share a single three-mile corridor (see Fig. 1). Thus RTH is distinct from most communities, in which vegetation is confounded with physical environmental factors related to income. At RTH, such physical factors as building size, building layout, the number of residential units in a building, and building location are unconfounded with vegetation and held constant, removing several important sources of extraneous variability.

Second, RTH residents constitute a strikingly homogeneous population with respect to many of the individual factors which might be expected to affect neighborhood social ties—income, education, and life circumstances. This again decreases sources of extraneous variability, increasing power to detect variability associated with differences in the physical environment.

Third, landscape management practices at RTH are such that the level of vegetation in a given common space cannot be attributed to residents living in a particularly cohesive building and working to plant or maintain the vegetation. RTH was originally built in the 1960s with trees and grass around each of the 28 high-rise buildings. Over time, the majority of these green spaces have been paved in an effort to keep dust down and maintenance costs low; this paving has killed many of the original trees, leaving some buildings with completely barren common spaces, others with a few scattered trees, and still others with leftover pockets of green. Ongoing

[3]Robert Taylor Homes is intentionally identified by name in this article. In the media, this community is portrayed as emblematic of the ills of the inner city; RTH residents and staff are anxious that a more complete picture of their community be made available. Perhaps unsurprisingly, the findings in this study reveal a more positive, more complex picture than the typical media portrayal.

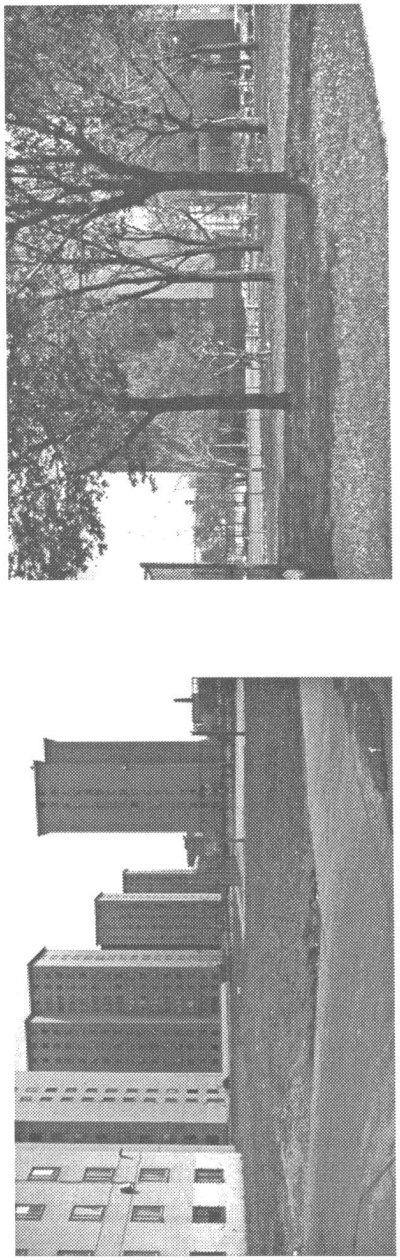

Fig. 1. Some buildings at Robert Taylor Homes are surrounded by common spaces that contain only concrete and asphalt, while other buildings have outdoor common spaces with trees, grass, and even flowers.

landscape maintenance at RTH is handled entirely by a small landscaping crew serving all of the developments managed by the Chicago Housing Authority; residents are not involved in maintenance, and funds are inadequate to fulfill special requests from residents. Thus a relationship between greenness of common spaces and NSTs in this setting cannot be explained by a process in which NSTs contribute to resident greening efforts and greener spaces.

Finally and perhaps most important, the apartment allocation process at RTH results in *de facto* random assignment of residents to different levels of vegetation. Applicants for urban public housing have some choice in the particular development to which they are assigned, but have little choice regarding the particular apartment (or apartment building). A family generally waits for an apartment at RTH for 12 to 24 months. When their name comes to the top of the waiting list, the family is shown one apartment. If they choose not to accept that particular apartment, they can wait until the next apartment becomes available. If a family rejects three apartments, they are placed at the bottom of the list and their wait starts over. Given the desperate financial conditions that lead families to apply for public housing, it is not surprising that the vast majority of families take the first apartment they are shown, and that the level of nearby vegetation does not play a significant role in their decisions.

A number of checks were used to verify that participant characteristics were indeed independent of levels of common space vegetation. Participants were asked to report criteria that were important to them in choosing a place to live: Of 118 responses, 93% were clearly unrelated to levels of vegetation (47% "just needed a place," 12% safety or cleanliness, 10% access to work/school/family, 9% cost, 8% space or number of bedrooms, 6% low floor (possibly because of the frequency of elevator malfunctions), and 1 participant mentioned sense of community). Seven percent of criteria elicited could possibly be related to levels of vegetation (e.g., location, neighborhood, area, environment), and one participant (of 145) specifically reported that "natural setting" was important to her in choosing a place to live; however, these participants lived in no greener areas, on average, than the remainder of the participants in this study. Moreover, a series of analyses confirmed that there was no systematic relationship between the greenness of common spaces and participants' age, education, marital status, work status, income, Aid to Families with Dependent Children (AFDC) status, number of children at home, or length of residence.

Robert Taylor Homes thus constitutes a naturally occurring field experiment on the effects of greenness of common spaces, with random assignment of individuals to conditions and a host of environmental and social variables held constant.

Participants and Procedure

To maximize potential rapport with interviewers, three African American woman residents of RTH were hired and trained to conduct the recruitment, interviewing and testing for this research. All three were long-time residents of RTH (19 years or more), residing in buildings outside the study sample. In preparation for interviewing and testing, interviewers completed extensive training (70 hours of general training in interview methods, 12 hours learning the specific interview measures used, and 14 hours of supervised and unsupervised practice in performing practice interviews). In addition, an on-site research supervisor met regularly with the interviewers to review procedures and address any difficulties or questions. Interviewers did not interview individuals with whom they were familiar. Both interviewers and the order of interviews were counterbalanced for levels of vegetation in common spaces.

Participants were recruited from 18 buildings spanning the range in common space vegetation at RTH and excluding buildings adjacent to parks, police stations, and other facilities which might affect residents' use of common spaces or NSTs. Within these buildings, recruitment was conducted door-to-door on floors 2–4, where residents' had maximal physical and visual access to the common spaces outside their building (there are no residences on the first floors). Because official adult residents in urban public housing are predominately female (80% in RTH; Chicago Housing Authority, 1995), the sample was restricted to adult women residents; specifically, female heads of household under 60 years old. Female heads of household of the appropriate age range, living on floors 2–4 of the 18 buildings sampled, were invited to participate in "a University of Illinois study about life at RTH." Participants were told they could refuse to answer any question and could stop the interview at any time, and that they would receive $10 upon completion of the interview.

Of the 207 qualified residents invited, 70% chose to participate, yielding a final sample of 145 residents. The composite participant profile is that of an African American single woman with a high school/GED diploma, raising three children on an annual household income less than $10,000; 80% of the participants received AFDC. Participants ranged from 20–59 years old, with a mean of age 34.

The data presented here were drawn from a two-part structured interview: Participants' ratings of greenness, mood, stress, and mental fatigue were collected in the first part of the interview; information about participants' neighborhood social ties, sense of safety, and sense of adjustment were collected in the second part. Interviews were conducted during the

summer and early fall months in participants' apartments. Each part of the interview lasted approximately 45 minutes, and the two parts of an interview were conducted within 2 weeks of each other.

Measures

For each participant, measures were made of the "greenness" of their building's common space, their use of that common space, their neighborhood social ties, sense of safety and sense of adjustment, and other variables which might mediate a relationship between greenness of common space and neighborhood social ties. Means and standard deviations for each of the measures are presented in the Results.

The central independent variable in this study was Greenness of Common Spaces. As Bronfenbrenner (1979) pointed out, context exists at a variety of scales; thus, levels of nearby vegetation can be assessed at more than one scale, and it is unclear which scale(s) may be most important. For this study, levels of vegetation in nearby common spaces were assessed at two scales: at the scale of the individual building, and at the scale of the individual apartment.

Previous research suggests that the use of neighborhood common spaces may be related to the level of vegetation at both these scales: common space use is a function of both the total number of trees next to a building, and the proximity of those trees to individual apartments (Coley *et al.*, 1997). Similarly, research has shown that a mere view of vegetation suffices to produce reliable effects on stress and affect (e.g., Ulrich, 1981; Ulrich *et al.*, 1991); thus the greenness associated with individual apartments (and views) may be an important component of total greenness.

Moreover, because the buildings at RTH are much larger than the occasional pockets of green, even within a "very green building" many of the individual apartments have very little visual access to green common spaces (see Fig. 2). Consequently, at RTH the amount of vegetation associated with a building is relatively independent of the amount of vegetation associated with an apartment, and measuring the former gives little indication of the latter.

Assessing the common space vegetation associated with a particular building is relatively straightforward: The semipublic nature of the common spaces around a building make it feasible to take a comprehensive set of photographs of the area, which can then be assessed for levels of vegetation by independent raters. Thus to assess greenness at the building level, for each of the 18 buildings, a set of 16 photographs corresponding to specified

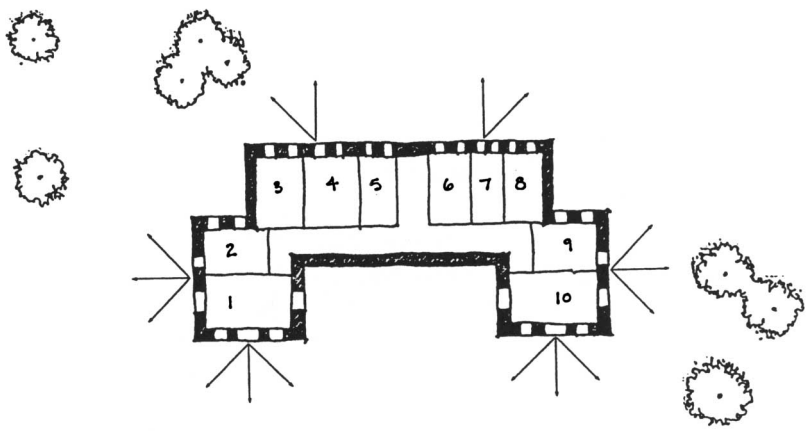

Fig. 2. Plan view of an apartment building at Robert Taylor Homes with nearby trees. The numbers within the building indicate apartments. The arrows indicate the position from which photographs were taken (for each building) that were then rated by 22 independent raters. Note that despite the presence of trees outside a building, residents in particular apartments may have little or no visual access to trees.

vantage points were taken of the area immediately surrounding the building. Figure 2 shows a plan view of the vantage points photographed for each building. Each set of photographs was then rated on a 5-point Likert scale from 0 (*not at all green*) to 4 (*very green*) by 22 independent raters (students in Horticulture).

With these data, agreement between raters is analogous to the reliability of items in a scale; the hope is that different raters will respond to a particular building in a similar fashion. Thus to assess interrater agreement, a Cronbach's alpha was calculated, with individual raters treated like individual items in a scale, and individual buildings treated like individual respondents. This procedure yielded an alpha of .97, indicating a high level of agreement between raters regarding building greenness. Ratings ranged from 0.56 to 3.63; the median mean rating was 2.0.

Assessing the common space vegetation associated with a particular apartment is less straightforward: it would be obtrusive and impractical to have independent raters assess the level of vegetation visible from residents' individual apartments. Thus, each participant was asked to assess the levels of vegetation associated with their individual apartment (How much of the view is of nature—trees, plants, water?). Participants responded on a 5-point Likert scale (0 *none,* 1 *some,* 2 *half,* 3 *most,* 4

all). Ratings of Apartment Greenness ranged from 0 to 4 with a median of 2.[4]

The central dependent variable in this study was Neighborhood Social Ties (NSTs). NSTs were assessed through 8 items with responses on a 5-point Likert scale from 0 (*not at all*) to 4 (*very much*). Principal components analysis with varimax rotation yielded three factors; items for the factors were summed to create three subscales, each of which demonstrated acceptable reliability—Socializing at Taylor, Nearby Neighbors, and Local Sense of Community. Socializing at Taylor includes two items ("Do you have many visitors every day?" and "Do you socialize a lot within the building?"), with an alpha of .73. Nearby Neighbors includes two items ("How well do you know the people next door?" and "How well do you know the people on your floor?"), with an alpha of .81. Local Sense of Community includes three items ("Are people here concerned with helping and supporting one another?", "Do people here acknowledge one another when passing in the hallway?", and "Is there a strong feeling of belonging here?"), with an alpha of .67. The overall Neighborhood Social ties scale had acceptable reliability ($\alpha = .80$).

In addition to residents' NSTs, residents' General Social Ties—their broader social networks, unrestricted to the housing development—were assessed. Two items ("Are you content with the number of close friends you have in general?" and "Do you have many acquaintances?") with responses on a 5 point Likert scale from 0 (*not at all*) to 4 (*very much*) had an alpha of .67.

In addition to the central independent and dependent variables, four possible mediators of the hypothesized relationship and two possible by-products were assessed.

One of the four possible mediators, Mental Fatigue, was assessed through a performance task, the Digit Span Backwards test. Digit Span Backwards is a standardized neurocognitive measure used both in the clinical measurement of attention (Lezak, 1983; Mesulam, 1985) and in the research on attentional fatigue (e.g., Cimprich, 1992; Tennessen & Cimprich, 1995). It is easy to administer: The administrator reads aloud a series of digits (e.g., "2 . . . 5 . . . 1"), and participants are asked to repeat back the series in reverse order (e.g., "1 . . . 5 . . . 2"). Series are administered in increasing length; if a participant fails a series of a given length, a second

[4]Building Greenness was assessed not only through ratings by independent observers but also through ratings by the residents themselves. It is worth noting that these two measures of building greenness were significantly correlated; moreover, residents' ratings of Building Greenness showed the same relationships to dependent variables as did the other measures of Greenness employed in this study. The apparent validity of residents' assessments of Building Greenness gives us some confidence in their assessments of Apartment Greenness.

series of equal length is administered. Scoring is based on the longest series performed correctly within two attempts.

The remaining mediators and by-products were assessed through self-report, using the same 0 to 4 Likert scale (0 *not at all*, 1 *a little*, 2 *a medium amount*, 3 *quite a lot*, 4 *very much*). Residents were asked about their Use of Outdoor Common Spaces ("How much time do you spend outdoors in the areas just outside the apartment?") and levels of Stress ("How stressful is this period in your life?"). Residents' Positive Mood was assessed using the six-item Positive Mood subscale from the short version of the Profile of Mood States (POMS, 37 items). Participants rated themselves on six adjectives (lively, active, energetic, cheerful, full of pep, and vigorous). The POMS has been shown to be a valid and reliable instrument for the measure of mood states across numerous studies (McNair, Lorr, & Droppleman, 1981). Finally, residents' Sense of Safety and Sense of Adjustment were assessed ("How safe do you feel living here?" and "How well have you adjusted to living here?").

RESULTS

Table I presents the means and standard deviations for all variables. It is notable that, even in an environment of rampant unemployment and poverty, participants' responses do not indicate extremely low levels of well-being. The average stress score was a bit below the midrange score a *medium amount*, while positive mood and adjustment are both above the midrange, between a *medium amount* and *quite a lot*. The average rating of how safe respondents feel was more negative, between *a little* and *a medium amount*. With respect to neighboring and general levels of social integration, on average residents socialized *a little* or *somewhat* at Taylor, knew their nearby neighbors *somewhat*, had *somewhat* of a local sense of community, and were *somewhat* or *quite satisfied* with the number of friends and acquaintances they had in general. Altogether, these findings paint a less negative picture of Chicago's public housing than reported in media portrayals or ethnographic and sociological work on poor inner-city neighborhoods (e.g., West, 1993; W. J. Wilson, 1987, 1996).

Preliminary Analyses

The central hypothesis of this study was that the greener a neighborhood common space, the stronger the social ties among residents living near that space. Such an effect might exist at, and be modeled at, a variety

Table I. Means and Standard Deviations for All Variables (N = 145)

Variable	M	SD
Greenness of comon spaces (0 = *not at all green*, 4 = *very green*)	1.96	0.65
Apartment greenness (0 = *none*, 4 = *all*)	2.01	1.02
Building greenness (0 = *not at all green*, 4 = *very green*)	1.91	0.85
Use of outdoor common spaces (0 = *not at all*, 4 = *very much*)	1.99	1.02
Stress (0 = *not at all*, 4 = *very much*)	1.84	1.20
Mental fatigue	4.81	1.11
Positive mood (0 = *not at all*, 4 = *very much*)	2.38	0.67
Neighborhood social ties (0 = *not at all*, 4 = *very much*)	1.81	0.69
Socializing at Taylor (0 = *not at all*, 4 = *very much*)	1.43	0.92
Nearby neighbors (0 = *not at all*, 4 = *very much*)	2.23	1.00
Local sense of community (0 = *not at all*, 4 = *very much*)	1.90	0.78
General social ties (0 = *not at all*, 4 = *very much*)	2.32	0.95
Feeling safe (0 = *not at all*, 4 = *very much*)	1.55	1.06
Feeling adjusted (0 = *not at all*, 4 = *very much*)	2.47	1.04

of scales: analyses might compare individuals, building floors, or buildings, and it is unclear which scale or scales of analysis would best capture the effect. Moreover, to the extent that the social ties among residents within a floor (or within a building) are nonindependent, analyses should, if possible, explicitly model differences in social ties at these larger scales. Although the data in this study did not allow for the modeling of differences in social ties at the scale of the floor (too few residents sampled per floor), they were sufficient that building-level differences might begin to be captured (18 buildings, with an average of 8.1 residents per building). Accordingly, a number of preliminary analyses were conducted to determine whether modeling should include building-level differences in addition to, or instead of, individual-level differences.

A series of one-way ANOVAs were conducted where buildings were the factor, individuals were nested within buildings, and both buildings and individuals were tested as random effects. As described in O'Brian (1990), the mean squares generated from such an analysis can be used to estimate the reliability of aggregate measures; to estimate reliability at the individual level, Cronbach's alphas were calculated. Table II presents the building level and individual level reliability coefficients for the central dependent variable, Neighborhood Social Ties, its three subscales, and General Social Ties. Whereas the individual level reliabilities (αs) range from .67 to .81 and are thus acceptable, the building level reliabilities range from –.91 to .35, indicating that there was virtually no agreement among residents within a building for the various measures of social ties. Moreover, there were no significant differences among buildings with respect to any of these meas-

Table II. Individual- and Building-Level Reliabilities

	Individual-level reliability	Building-level reliability
Neighborhood Social Ties	.80	.23
Socializing at Taylor	.73	.35
Nearby neighbors	.81	.29
Local sense of community	.67	.10
General Social Ties	.67	−.91

ures in either the one-way ANOVAs or in additional analyses in which both building and Greenness of Common Space were modeled.

These preliminary analyses indicate that although the data in this study allow for the explicit modeling of building-level differences, either these differences do not exist, or they exist but were not reliably measured.[5] We conclude that differences in NSTs at RTH can be measured reliably at the individual level, that the NSTs of residents sharing the same building appear to be largely independent, and that there are no significant differences in NSTs between buildings. To test our central hypothesis, then, the individual resident was used as the unit of analysis, and building-level similarities and differences among residents were not modeled.

The Central Hypothesis

To test for relationships between each of the two complementary vegetation measures and individual residents' NSTs, multiple regressions were conducted with Building Greenness and Apartment Greenness predicting NSTs and each of the NST subscales. As Table III shows, each of the two greenness measures are significant predictors of NSTs at the scale level, although some of these relationships do not reach significance at the subscale level. Overall, Apartment Greenness emerges as a stronger pre-

[5]There is some reason to think that the low building-level reliabilities and lack of a building effect on NSTs can be attributed to the absence of building-level effects, as opposed to the mere unreliability of the measures. A recent study (Coulton, Korbin, & Su, 1996) with similar numbers of aggregate units and individuals per aggregate (16 blocks, with 9–10 households per block, as compared to 18 buildings, with 8 households per building in this study) obtained very acceptable aggregate level reliabilities for some variables (.83, .84, and .76, for mobility, disorder, and neighborhood quality, respectively), while obtaining very low aggregate reliabilities for others (−.46 for neighborhood interaction and .32 for stop delinquency). Thus the low aggregate reliabilities obtained here cannot be attributed to low *n*s per se, nor can they be attributed to insufficiently high individual-level reliabilities—in the study described above, mobility had a .83 reliability at the aggregate level, and a .52 reliability at the individual level (well below the individual reliabilities obtained here). We suggest that if building differences existed, the data here are sufficient to allow for their detection; it seems likely that, at Robert Taylor Homes, NSTs are simply not a building-level phenomenon.

Table III. Multiple Regressions Using Apartment Greenness and Building Greenness to Predict Social Ties

		Subscales			
	Neighborhood social ties	Socializing at Taylor	Nearby neighbors	Local sense of community	General social ties
Model					
R^2	.15	.07	.10	.11	.02 (ns)
Apartment greenness					
β	.25	.22	.29	.25	.09
p	.0001	.01	.001	.0001	.28
Building greenness					
β	.12	.13	.14	.11	.10
p	.05	.14	.14	.12	.26

dictor than Building Greenness, perhaps because Building Greenness is a necessary but not sufficient condition for Apartment Greenness. At the same time, it is important to note that Building Greenness, a measure of greenness derived from independent observers, predicts NSTs even when its partner measure is held constant, suggesting that the relationship between measures of greenness and NSTs cannot be attributed to a simple response bias on the part of participants. Whereas both greenness measures are related to Neighborhood Social Ties, neither is significantly related to General Social Ties in this model. Overall, these findings indicate that the more vegetation associated with a resident's apartment and building, the more she socialized with neighbors, the more familiar with nearby neighbors she was, and the greater her sense of community.

Testing for Mediators

The hypothesized relationship between levels of common space vegetation and neighborhood social ties was observed. To explore the possible mediators of this relationship, a series of ordinary least square (OLS) regression analyses were conducted following the mediation testing procedure recommended by Baron and Kenny (1986). In this procedure, three steps must be successfully completed to show mediation.

In Step I of the procedure, a simple regression is performed between the independent variable and the dependent variable, and the beta associated with the independent variable is noted for later comparison. For the purpose of this procedure, and for ease of later comparison, the two complementary vegetation measures were combined into a single, summary variable, Greenness of Common Spaces. The NST scale, NST subscales,

Table IV. Simple Regressions Using Greenness of Common Space to Predict Social Ties

	Neighborhood social ties	Subscales: Socializing at Taylor	Nearby neighbors	Local sense of community	General social ties
R^2	.14	.07	.10	.09	.02
β	.40	.38	.50	.36	.22
p	.0001	.01	.0001	.001	.08

Table V. Simple Regressions Using Greenness of Common Space to Predict Four Possible Mediators

	Use of outdoor common spaces	Stress	Mental fatigue	Positive mood
R^2	.04	.04	.001	.005
β	.31	-.35	-.05	.08
p	.05	.05	ns	ns

and General Social Ties scale were then regressed on Greenness of Common Spaces. Table IV presents the results for these regressions.

Like its constituent measures, the summary measure for common space vegetation significantly predicts NSTs. In addition, it significantly predicts each of the three NSTs subscales—Socializing at Taylor, Nearby Neighbors, and Local Sense of Community—and has a marginally significant relationship to the broader measure of General Social Ties. The requirements of Step I are thus fulfilled: The independent variable is significantly related to the dependent variable.

In Step II of the Baron and Kenny procedure, a simple regression is performed between the independent variable and the hypothesized mediator. Step II requires that the independent variable must significantly predict any proposed mediators. Table V presents the results for regressions in which Greenness of Common Spaces is used to predict each of the possible mediators (Use of Common Spaces, Stress, Mental Fatigue, and Positive Mood) in turn.

Results indicate that although two of the proposed mediators fulfill the requirements of this step, two do not. Greenness of Common Spaces relates significantly to Use of Common Spaces and to Stress, but not to Mental Fatigue or Positive Mood. Thus, residents who live adjacent to common spaces with higher levels of vegetation report using those spaces more often and experiencing lower amounts of general life stress than residents who live adjacent to spaces with lower levels of vegetation. These findings indicate that the relationship between levels of vegetation and neighbor-

Table VI. Multiple Regressions Using Greenness of Common Space and Two Possible Mediators to Predict Social Ties

		Subscales		
	Neighborhood social ties	Socializing at Taylor	Nearby neighbors	Local sense of community
Model				
R^2	.21	.11	.15	.12
Greenness of common space				
β	.33	.31	.42	.30
p	.0001	.01	.001	.01
Use of common space				
β	.19	.19	.22	.16
p	.001	.01	.01	.05
Model				
R^2	.14	.07	.13	.08
Greenness of common space				
β	.41	.36	.57	.36
p	.0001	.01	.0001	.001
Stress				
β	.03	−.02	.12	.04
p	ns	ns	ns	ns

hood social ties found here cannot be mediated by either mental fatigue or mood, but could be mediated by either use of common spaces or stress.

In Step III of the mediation test, a multiple regression is performed in which the independent and mediator variables are entered as predictors of the dependent variable. To show mediation, the mediator must significantly predict the dependent variable in this model; in addition, the introduction of the mediator into the regression must result in a decrease in the beta associated with the independent variable (relative to its beta in Step I). If the independent variable becomes nonsignificant, the results indicate full mediation; if the independent variable shows a significant reduction in predictive power but is still a significant predictor, the results indicate partial mediation.

Table VI shows the betas and significance values for multiple regressions involving Greenness of Common Spaces and each of the two remaining candidate mediators, Use of Common Space and Stress. As Table VI shows, only Use significantly predicts the dependent variables. Further, comparisons between Table IV and Table VI show that the predictive power for Greenness (the independent variable) does indeed drop when Use (the mediator) is introduced. A test for significant difference in independent betas (J. Cohen & Cohen; 1983) reveals that the drop in betas for Greenness of Common Spaces is significant for the NST scale, $t(279) = 1.82$,

$p < .05$, one-tailed, although it does not reach significance for the individual subscales.

In sum, only one of the four possible mediators, Use of Common Space, fulfills each of the three steps in the mediation test. These tests indicate that the relationship between common space greenness and NSTs is not mediated by stress, mental fatigue, or mood, and that the relationship is partially, but not wholly, mediated through use of common spaces.

Testing for By-Products

It was hypothesized that any effects of common space vegetation on the formation of neighborhood social ties might be accompanied by additional effects on residents' Sense of Safety and Sense of Adjustment. Thus, mediation tests were conducted to test whether Greenness of Common Spaces increases Sense of Safety and Sense of Adjustment through its effect on NSTs.

As Table VII indicates, Greenness of Common Spaces relates significantly to both Sense of Safety and Sense of Adjustment in simple regressions, fulfilling Step I. As shown earlier, Greenness (the independent variable) and NSTs (the mediator in this case) are also significantly related, fulfilling Step II. When NSTs are added to the equation (Step III), NSTs significantly predict both Sense of Safety and Sense of Adjustment. In addition, Greenness drops in effectiveness as a predictor for Sense of Safety, and becomes nonsignificant as a predictor for Sense of Adjustment. Tests of significant differences in independent betas confirmed that these decreases were significant, $t(278) = 3.53$ for Safety, $p < .0005$, one-tailed; $t(280) = 4.16$ for Adjustment, $p < .0005$, one-tailed.

These results suggest that, indeed, higher levels of common space vegetation may yield not only the proximal benefit of stronger NSTs but also the more distal benefits of greater sense of safety and adjustment. Moreover, as can be seen in Table VII, the weak relationship between Greenness of Common Spaces and residents' General Social Ties, seems to function entirely through the effect of vegetation on Neighborhood Social Ties.

DISCUSSION

This study was predicated on the notion that the existence (or absence) of social ties among neighbors rests in part on the quality and use of neighborhood common spaces. Previous research has shown that inner-city

Table VII. Predicting Sense of Safety, Sense of Adjustment, and General Social Ties with Greenness of Common Spaces and Neighborhood Social Ties

	Feel safe	Feel adjusted	General social ties
Simple regression			
R^2	.08	.03	.02
Greenness of common space			
β	.48	.30	.22
p	.001	.05	.08
Multiple regression			
R^2	.19	.18	.20
Greenness of common space			
β	.27	.06	-.02
p	.05	ns	ns
Neighborhood social ties			
β	.52	.61	.61
p	.0001	.0001	.0001

neighborhood common spaces with higher levels of vegetation receive higher levels of use by residents, thus providing more opportunities for informal social interaction among neighbors (Coley *et al.*, 1997; DePooter, 1997). In this study, we found that the more vegetation in a common space, the stronger the neighborhood social ties near that space—compared to residents living adjacent to relatively barren spaces, individuals living adjacent to greener common spaces had more social activities and more visitors, knew more of their neighbors, reported their neighbors were more concerned with helping and supporting one another, and had stronger feelings of belonging.

The central hypothesis of this study, and one interpretation of these findings, is that greener common spaces facilitate the development and maintenance of NSTs. Another interpretation might be that stronger NSTs lead to greener common spaces—that is, small bands of residents might work together to improve their common spaces through the addition of trees and grass. As described earlier, however, landscaping has historically been managed centrally at the Chicago Housing Authority, and neither individual residents nor groups of residents have had significant input into decisions regarding common space vegetation; indeed, we have observed trees taken down outside apartment buildings without consultation or notification of residents. (It is important to note that the Chicago Housing Authority has a laudable practice of involving residents in all major decisions about Housing programs and policies; outdoor vegetation has simply fallen outside the purview of this practice.)

Another possible interpretation of the association between greenness of common spaces and NSTs might be that extroverted residents self-select into buildings with greener common spaces—particularly sociable individuals might "work the system" to obtain apartments in buildings with more nearby vegetation, and once housed in those buildings, form stronger ties with their neighbors. Three considerations make this interpretation unlikely: the apartment allocation process at RTH results in *de facto* random assignment of residents to various levels of vegetation; only one of the participants specifically mentioned "a natural setting" as an important criterion in choosing an apartment; and those participants who reported "environment" as a selection criteria live in no greener areas, on average, than the sample as a whole.

In our view, the most plausible interpretation of the greenness–NST relationship found here is that the level of vegetation in a common space affects its use, and that the use of a common space affects NSTs by providing opportunities for informal social contact among neighbors. The mediation findings provide additional support for this interpretation. In addition, this interpretation fits the general pattern of findings in environmental and social psychology indicating that environmental factors affecting the quantity or quality of informal social contact among neighbors have systematic effects on the development of neighborhood social ties.

Generalizability

Robert Taylor Homes differs from some communities and resembles others in both its physical features and its resident population. Here, we consider some of these differences and commonalities, and how the effects found in this study might be weaker in some communities and stronger in others.

Relative to middle- and upper-income residential settings, RTH is characterized by exceptionally bleak neighborhood outdoor spaces and few alternative common spaces. It seems likely that levels of vegetation in outdoor spaces are less important in settings where the outdoor spaces have other attractive, sociopetal features and in settings where neighbors have alternative indoor common spaces (e.g., nearby community buildings). On the other hand, RTH hardly has a monopoly on bleak neighborhood spaces. Although common space vegetation may play a smaller role in the development of NSTs in wealthier communities, its effects seem likely to generalize to many other poor urban communities.

Relative to many communities, RTH is characterized by multiple environmental features which work against the formation of NSTs: architec-

tural design, crowding, noise, and high rates of crime. Yancey (1971) has argued that the architectural design of high-rise buildings can make it difficult for residents to form ties to neighbors, and crowding, noise, and high rates of crime have each been shown to inhibit social integration (e.g., Baum, Davis, & Aiello, 1978; S. Cohen & Lezak, 1977; Mathews & Cannon, 1975; McCarthy & Saegert, 1978; G. Wilson & Baldassare, 1996). It seems likely that the effects of greenness on NSTs may be moderated by these factors. The question for future research, then, is how: The use of neighborhood common spaces might be especially important in a setting which discourages the formation of NSTs; at the same time, the use of neighborhood common spaces might have an especially large (synergistic) effect on NSTs in a setting which supports their formation.

Relative to many settings, the social characteristics of RTH are particularly conducive to the formation of NSTs. Residents at RTH are similar in ethnicity (99.7% African American), similar in SES (96.5% unemployed), and nearly half of residents have children living at home (Casey, 1995). Similarity in SES, similarity in ethnicity, and the presence of children at home have each been found to predict high levels of neighboring in a variety of populations (Gerson, Steuve, & Fischer, 1977; Mayo, 1979; Riger & Lavrakas, 1981; Unger & Wandersman, 1982). It seems likely that the neighborhood integration effects of attractive, well-used common spaces will be weaker in neighborhoods where residents have less propensity to form NSTs, and stronger where the potential for NSTs is greater.

Finally, individuals at RTH are likely to be severely limited in mobility by children and lack of transportation (cf. Gobster & Delgado, 1993); this lack of mobility constrains individuals in their access to both places and people outside the neighborhood. Consequently, resident mobility may play an especially important role in the relationship between levels of common space vegetation and neighborhood social ties. It seems likely that in more mobile communities, where individuals spend less time at home and have many opportunities to form social ties outside the neighborhood, the presence of pleasant neighborhood spaces might have less effect on NSTs. In contrast, it seems likely that these effects will be stronger in other, less mobile populations—poor urban communities in and outside of public housing, elderly individuals, and handicapped individuals. Future research might focus on the relationship between green common spaces and social integration for individuals with limited mobility.

In sum, it seems likely that the relationship between greenness of common spaces and NSTs found in this study is moderated by a number of factors: the condition and availability of other neighborhood common spaces, the extent to which other features of the physical environment are supportive of NSTs, the inherent potential for NSTs in a population, and

levels of resident mobility. Poor urban neighborhoods seem likely to combine the features in which the effects of greenness on social ties are likely to be most powerful. For middle and upper SES individuals, the effects of attractive, well-used common spaces an local social ties might be more visible in work and school settings (cf. Campbell & Campbell's 1988 study on academic department common space characteristics, common space use, and informal social interaction in departmental lounges).

Implications

Although the implications of these findings for wealthier communities await further research, it is clear the findings have compelling implications for many inner-city communities. Indeed, we believe that in the context of previous research, the present findings bespeak both great tragedy and great promise.

Previous research in community psychology indicates that almost every individual- and group-level characteristic of inner-city minority neighborhoods—ethnicity, social class, family structure, length of residence, and homogeneity of ethnicity and social class—would suggest a propensity for strong neighborhood ties. Moreover, research suggests that while NSTs are beneficial in all populations, they may serve an especially critical function in low-income communities. In poverty, one important survival strategy is to share resources through family and friendship networks (Belle, 1982; Stack, 1974). Because poor families tend to be limited in mobility and have limited access to more distant family and friends, they have few options other than nearby neighbors for resource-sharing (Gerson *et al.*, 1977; Riger & Lavrakas, 1981; Tognoli, 1987; Yancey, 1971; Wellman & Leighton, 1979). Thus, in low-income inner-city communities NSTs may provide an irreplaceable safety net that middle-class or upper-income communities have little need for. At the same time, the previous research in social and environmental psychology and the present findings indicate that almost every physical characteristic of inner-city neighborhoods—crime rate, levels of noise, crowding, and barren common spaces—systematically works against the formation of neighborhood ties.

The tragedy, then, lies in the enormity of the mismatch between what inner-city communities want and need in the way of neighborhood social ties, and what the physical environment of many inner-city neighborhoods supports. Some readers may be familiar with the concept of person–environment fit (e.g., French, Rodgers, & Cobb, 1974); we suggest that the concept of community–environment fit may be useful as well, and that poor

inner-city neighborhoods may represent an extreme case of community–environment misfit (see Yancey, 1971).

The promise here lies in the exciting possibilities for action and research (and action research) on the facilitation of NSTs in low-income urban communities. One exciting possibility is that of a new, low-cost intervention for the facilitation of NSTs. Efforts to plant trees and grass in neighborhood common spaces, as well as other efforts to increase residents' use of these common spaces, are likely to have significant, positive impacts on NSTs. Future research might begin to systematically tease apart the relative contributions of green views, versus the availability of green common spaces per se, thus guiding planting efforts.

A related possibility is that of using greening as a focus for community organizing efforts in inner-city neighborhoods. It is a widely ignored principle that the development of usable outdoor common spaces in neighborhoods requires the participation of local residents (Hester, 1984). Community organizers and urban planners might involve residents in decisions to create green common spaces and in the specific design of those spaces. The participation and cooperation of local residents in such endeavors are likely to bring heightened interest in the protection of newly planted trees, while simultaneously planting seeds of community among residents (see Brunson, Kuo, & Sullivan, in preparation). A recent study indicates that inner-city residents may be very willing to participate in greening efforts; striking numbers of residents at RTH indicated they would be willing to help plant and take care of trees in their courtyard (Kuo *et al.*, 1998). As planting and maintenance are the chief costs in greening programs, resident involvement in such efforts might not only play a key role in their long-term success but also make them widely affordable.

The possibility that levels of common space vegetation might have indirect, positive effects on inner-city residents' sense of safety and sense of adjustment seems worth further exploration. It seems plausible that an individual would feel safer in a setting if they had some level of trust in their neighbors, or better, if they felt that neighbors might be counted on to watch out for them. Indeed, we found that greenness of common spaces was related to feeling safe and feeling adjusted, and mediation tests were consistent with the hypothesis that these relationships were mediated by the strength of local social ties. The findings here on sense of safety are consistent with Riger *et al.*'s (1981) finding, and findings from Kuo *et al.* (1998). Future research might test for effects of greening using more thorough measures of sense of safety and sense of adjustment than the single-item measures employed here.

Related to the possibility that vegetation increases sense of safety in this context is the intriguing possibility that higher levels of vegetation may

lead to greater levels of actual safety.[6] Research indicates that neighbors who have strong social relations are more effective at instituting social control over negative or unwanted behaviors, thus discouraging criminal activities (Greenberg, Rohe, & Williams, 1982; Newman, 1972; Newman & Franck, 1980). To the extent that the presence of trees and grass in common spaces leads to stronger NSTs, the greening of these spaces may yield surprising indirect benefits in the form of lower levels of crime.

A final source of promise in the present findings lies in the potential for fruitful collaboration between community psychologists and environmental design researchers. Not only do the researchers in these two areas share an interest in intervention, but the combined perspectives of the two research traditions seem likely to contribute a fuller understanding of NSTs—the factors supporting their development, the specific processes by which they develop, and their benefits.

Conclusion

Attractive, well-used neighborhood common spaces in the inner city may provide important benefits to residents and communities. Greener common spaces appear to attract people outdoors, increasing opportunities for casual social encounters among neighbors and fostering the development of neighborhood social ties. Ultimately, the outcome of community-based greening efforts might be physically and socially more supportive places to live. For individuals who live in poor inner-city neighborhoods and who face an array of difficult circumstances, greener outdoor common spaces may make the world a more supportive place.

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[6]As one of our reviewers pointed out, to the extent that vegetation increases the perception of safety without increasing actual safety, greening interventions might have the unintended consequence of increasing residents' exposure to unsafe conditions. This is an important concern and deserves empirical attention. At present, we can report only that, in initial analyses of Chicago police crime report data, simple regressions yield a strong and significant *negative* relationship between levels of vegetation outside an apartment building and the number of crimes reported at that address over a 2-year period. Whether these relations will hold once appropriate controls (building size, vacancy rates, etc.) are entered awaits further analyses and a more complete database.

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