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Perceived Neighborhood Safety and Adolescent School Functioning

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Abstract

This study examined the association between adolescents' perceptions of their neighborhoods' safety and multiple elements of their functioning in school with data on 15 year olds from the NICHD Study of Early Child Care and Youth Development ($n = 924$). In general, perceived neighborhood safety was more strongly associated with aspects of schooling that were more psychosocial in nature (e.g., school attachment) than those that were more cognitive (e.g., test scores). Examination of neighborhood and family moderators of these associations revealed that perceived neighborhood safety was negatively associated with grades for youth from low-income families but was positively associated with school attachment for youth from such families when they lived in neighborhoods rated by observers as high in physical disorder.

Different dimensions of school functioning (e.g., test scores, academic achievement, and school attachment) in adolescence have been repeatedly linked with individual economic and health outcomes across the life course (Lantz et al., 1998; Lleras-Muney, 2005). These findings underline the importance of identifying ecological factors that promote positive schooling. Theory has long emphasized the complex systems of social and physical features that make up every day ecologies (Bronfenbrenner, 1979; Lerner, 1991; Lerner & Castellino, 2002). For neighborhoods, these systems can now be more fully captured using increasingly sophisticated methods, such as systematic social observations and geographic information systems protocols (e.g., Raudenbush & Sampson, 1999). In many ways, these methods help empirical research catch up with theory. Yet, their usefulness for understanding the contexts in which individuals live should not obscure the continued theoretical and applied significance of how individuals experience these contexts. After all, one person may see her or his neighborhood differently than another in that same neighborhood, and the perceptions of both may vary depending on age-salient features of that neighborhood as well as change in the neighborhood over time. This variation in perception speaks to larger theoretical questions about how individuals are shaped by and react to their surroundings (Sampson & Raudenbush, 2004; Sharkey 2006; Wen, Hawkey, Cacioppo, 2006). It may be especially important to consider during adolescence, when developing cognitive and socioemotional capacities and gradual exposure to the world away from parents increases youth's opportunities to experience positive and negative aspects of

their neighborhoods (Gonzales, Cauce, Friedman & Mason, 1996; Leventhal & Brooks-Gunn, 2004).

The goal of this study was to examine the association between perceived neighborhood safety and three dimensions of schooling (test scores, grades, school attachment). Employing ecologically-informed models of development, these associations were examined in three ways. First, the significance of perceived neighborhood safety, above and beyond other individual, family, and externally measurable neighborhood characteristics was explored to assess if perceptions of safety mattered only inasmuch as they reflected other salient characteristics of the developmental environment. Second, variation in the meaning of neighborhood safety for school outcomes was assessed by external neighborhood characteristics and family socioeconomic status. Finally, perceived neighborhood safety was explored as a mechanism by which external neighborhood characteristics like census-based neighborhood socioeconomic composition (neighborhood SES for short) or observer-rated neighborhood disorder were associated with school outcomes. These goals were addressed with observational and survey data from the NICHD Study of Early Child Care and Youth Development (SECCYD).

Theoretical Background

Past research has demonstrated that children and youth generally do better in social, emotional, and behavioral terms when they view their neighborhoods as safe (Lambert, Brown, Phillips & Ialongo, 2004). Focusing on perceived neighborhood safety during middle adolescence highlights a factor strongly associated with psychosocial wellbeing during a developmental period in which neighborhoods serve a unique protective role for individual resilience and identity development (Hay, 1998; Klaff et al., 2001). Multiple theoretical perspectives, including developmental systems, ecological systems, and person-context interaction theories address the importance of examining development within a multi-level, dynamic framework (Bronfenbrenner, 1979; Lerner 1991; Lerner, 2006). Like ecological theory (Bronfenbrenner, 1979), developmental systems theory situates individual development within an interrelated series of evolving individual, family, and neighborhood factors; in particular emphasizing the role of people as agents in their own development (Lerner, 2006; Lerner, Theokas, & Jelicic, 2005). By emphasizing the agentic role of the individual in determining how she or he interacts with broader environmental systems, this perspective highlights why an individual's perceptions of the environment are so valuable in understanding the developmental significance of neighborhoods. Ultimately, understanding how development is embedded within neighborhood contexts is advanced by considering how neighborhoods are evaluated by youth, not just adults, as these perceptions influence how youth interpret and react to their surroundings (Sharkey, 2006; Sharkey & Sampson, 2010). Focusing on individuals as agents in their own development is a starting point for understanding how perceived safety may inform how broader ecological factors influence individual development and how these perceptions mediate between externally accessible neighborhood and individual psychosocial outcomes.

The meaning of perceived neighborhood safety may also vary according to family and neighborhood characteristics. Person-interaction models (Lerner, 1991) emphasize how

individual characteristics (e.g., perceptions) interact with the broader context (e.g., socioeconomic stratification or neighborhood poverty) (Lynam et al., 2000). For example, perceiving a neighborhood as safe may enhance wellbeing in a safe neighborhood but increases the risk of exposure to danger in an unsafe neighborhood. Focusing on perceived neighborhood safety not just as an intermediary (e.g., mediating) mechanism but also as one that varies in relevance according to the wider developmental context allows for a more complex understanding of how these perceptions are related to adolescent development.

Perceived Neighborhood Safety and Schooling

Importantly, the significance of perceptions of neighborhood safety for youth appears to extend to schooling, reflecting how schools are often nested within neighborhoods and how schooling experiences can be shaped by the feelings of comfort or stress that young people have about their lives more generally (Milam, Furr-Holden, & Leaf, 2010). Evidence of links between perceived safety and schooling can be found—albeit to varying degrees of magnitude and consistency—for a variety of dimensions of school functioning, such as standardized test achievement, grades, and feelings of school belonging (Bowen, Rose, Powers & Glennie, 2008; Grogan-Kaylor & Woolley, 2010; Kitsantas, Ware, & Martinez-Arias, 2004). Although school outcomes vary in their reflection of cognitive and socioemotional processes, a growing literature supports associations among more socioemotional factors (e.g., school attachment) and more cognitive factors (e.g., grades), such that sense of school belonging is strongly tied to more concrete assessments such as academic achievement (Crosnoe, 2011; Pittman & Richmond, 2007). Our goal is to *compare* how perceptions of neighborhood safety might factor into these three schooling outcomes. Doing so illustrates how the importance of perceptions of neighborhoods might differ depending on how schools elicit, reward, and evaluate different behaviors and create communities of people. The general argument is that perceptions of safety will matter more to aspects of schooling that reflect informal connections between students and the socioemotional contexts of their schools and less to aspects of schooling that are linked to the formal instructional and pedagogical processes of schooling (Crosnoe, 2011).

The first aspect of schooling is academic achievement, measured through standardized test performance. Achievement captures the skill development targeted by academic curricula in ways that impact school accountability assessments as well as on adolescents' current and future prospects, such as later college matriculation (Lee, Smith, & Croninger, 1997). This dimension of school functioning has been linked to neighborhood socioeconomic conditions and social disorganization (Leventhal, Xue, & Brooks-Gunn, 2006; Sharkey & Elwert, 2011; Whipple et al., 2010; Woolley et al., 2008), but its association with perceived neighborhood safety is less clear (Milam et al., 2010). We view it as a more cognitively-based aspect of schooling that is highly cumulative over time and closely tied to the formal processes of classrooms and curricula.

Another aspect of schooling is school attachment, which encompasses how much students feel a part of school and whether they view their schools as accepting, fair, and caring environments (Huebner & McCullough, 2000). The importance of this dimension reflects the idea that school functioning should not be assessed solely in terms of cognitive skill

development but also in terms of socioemotional adjustment (Crosnoe, 2011; Eccles et al., 1993). School attachment is an indicator of wellbeing but one that is strongly implicated in academic performance and deeply grounded in the general features of adolescents' contexts in and outside school (Crosnoe, Johnson & Elder, 2004). School attachment is more about how students feel about their place in school than what they are learning in school and, accordingly, can fluctuate widely by time and place (Johnson, Crosnoe, & Thaden, 2006). This aspect of schooling has been previously correlated with perceptions of neighborhood safety (Daly, Shin, Thakral, Selders & Vera, 2009; Kitsantas et al., 2004; Williams, Davis, Cribbs, Saunders & Williams, 2002).

A final aspect of school functioning is graded performance, which falls between test scores and school attachment in tapping cognitive vs. socioemotional factors. Like test scores, school grades reflect skill development and forecast future education opportunities. More broadly, they gauge students' abilities and efforts to meet teachers' expectations for behavior—they are both a product and component of teacher-student relationships (Crosnoe & Riegle-Crumb, 2007; Rosenbaum, 2001). Grades have been linked to perceived neighborhood safety in past studies (Bowen et al., 2008; Grogan-Kaylor & Woolley, 2010; Williams et al., 2002).

In exploring how these aspects of schooling may be differentially associated with perceptions of neighborhood safety, we have developed a conceptual model (see Figure 1) positing a “sliding scale” of predictive power based on how much these school outcomes are tied to formal or informal processes of schooling (Crosnoe, 2011). School attachment, the dimension most closely linked to informal processes, will be most strongly associated with perceived neighborhood safety, while standardized test scores, the dimension most closely linked to formal processes, will be the least strongly associated. Grades, which mix the formal and informal, will fall in the middle. The first goal of this study is to examine this basic conceptual model.

Other Measures of Neighborhood Context

We argue that neighborhood safety may be a crucial factor in understanding how neighborhood context influences individual outcomes. The two other principal measures of neighborhood context, however, should also be introduced, as they may be confounded with observed “effects” of perceived neighborhood safety. To begin, census data describing neighborhood income or related factors have been repeatedly linked to youths' school outcomes (Andreias et al., 2010; Caughy & O'Campo, 2006; Whipple et al., 2010). Two different constructs typically derived from these data are neighborhood affluence and neighborhood poverty. Neighborhood affluence, reflecting factors such as the percentages of residents with professional/managerial jobs, is positively associated with academic achievement (Boyle, Georgiades, Racine & Mustard, 2007; Crane, 1991; Dupéré, Leventhal, Crosnoe & Dion, 2010). On the contrary, assessments of neighborhood poverty, reflecting such factors as the unemployment rate or percentage of residents below the poverty line, are negatively associated with achievement (Andreias et al., 2010; Caughy & O'Campo, 2006; Crane, 1991). Measuring both variables is important—although related, affluence may be

more relevant for understanding academic outcomes (e.g., Boyle et al., 2007; Dupéré et al., 2010).

A second commonly used method of assessing neighborhood context is via observer-rated neighborhood disorder. Disorder reflects the level of control individuals have over their neighborhoods, and manifests in the form of unmonitored youth, physical decay, and other factors suggesting reduced cohesion and collective efficacy to control problems (Perkins & Taylor, 1996; Skogan, 1990; Steenbeek & Hipp, 2011). Systematic social observations (e.g., Raudenbush & Sampson, 1999) or other kinds of third-party observational techniques have become central to conceptualizations and operationalizations of these aspects of the neighborhood ecology. They capture something about what everyone in the neighborhood is subjected to, regardless of personal circumstances (Franzini et al., 2008; Zenk et al., 2007).

Potential Spurious, Moderating, and Mediating roles of Perceived Neighborhood Safety

Understanding why any associations between perceived neighborhood safety and school outcomes occur, not just whether they exist, is important. As shown in the bottom panel of Figure 1, the compositional and environmental features of neighborhoods—such as physical neighborhood disorder and SES—could be worked into our conceptual model in several ways. We focus on three: spuriousness, moderation, and mediation. Although not mutually exclusive, these three mechanisms may function differently across the academic outcomes examined.

First, the association between perceived neighborhood safety and school outcomes may be *spurious*, leading to misattributions of cause to perceptions of neighborhood safety if left unaddressed. Returning to our theoretical framework, the many inter-related contexts of development emphasized by ecological and developmental systems models may subsume some differences in which factors are important for any one outcome. Indeed, perceived neighborhood safety is likely informed by externally measurable elements of neighborhood context (Austin, Furr, & Spine, 2002). These concrete dimensions of neighborhood context can also shape the school and family contexts that predict school outcomes (Ainsworth, 2002; Roche, Ghazarian, Little & Leventhal, 2010; Kirk, 2009). Tellingly, prior work linking neighborhood safety to schooling outcomes has not often included neighborhood assessments beyond individual perceptions (Bowen et al., 2008; Daly et al., 2009; Williams et al., 2002), compared neighborhood perceptions to other neighborhood data (Milam et al., 2006) or used measures beyond census-based assessments (Woolley & Grogan-Kaylor, 2006). Perceptions of neighborhoods may only matter because they reflect the concrete neighborhood conditions that actually matter. We expect that perceived safety and schooling outcomes, particularly those closely linked with structural factors like test scores and GPA, will be weakly associated with perceived neighborhood safety when controlling for other assessments of neighborhood context.

Second, drawing from a person-interaction model (Lerner, 1991), we explored variation in the meanings of perceived neighborhood across neighborhoods differing in conditions; in other words, how neighborhood conditions (as assessed via external measures) might *moderate* links between perceived safety and schooling. Previous work suggests that the consequences of individual level characteristics for developmental outcomes are more

severe for individuals in lower SES neighborhoods (Lynam et al., 2000). Perceived neighborhood safety, or lack thereof, may have different consequences for youth depending on their level of participation in that neighborhood (Gonzales et al., 1996; Ross & Jang, 2000). We are proposing that perceived neighborhood safety, as reflective of youth's frame for interacting with their neighborhoods, may be more closely linked with schooling when actual neighborhood conditions pose a developmental threat. We anticipate that perceived neighborhood safety will be more strongly tied to school outcomes among youth from neighborhoods high in physical disorder, high in census-based poverty, and low in census-based affluence compared to youth from neighborhoods low in disorder and poverty, and high in affluence. Exploring these moderated associations will clarify when perceived neighborhood matters and for whom.

Third, perceived neighborhood safety may *mediate* associations between neighborhood conditions and schooling outcomes. Drawing from a developmental systems perspective, youth perceptions of their neighborhoods may be part of the process by which youth internalize their broader context. A growing body of work supports neighborhood perception as mediating the associations between externally assessed elements of the environment and a variety of health and mental health outcomes (Hill, Ross, & Angel, 2005; Martin-Storey et al., 2013; Plunkett, Abarca-Mortensen, Behnke, & Sands, 2007). In cases in which perceived neighborhood safety is associated with schooling (e.g., when schooling variables are more reflective of psychosocial experiences), perceived neighborhood safety is anticipated to mediate the link between concrete neighborhood conditions (e.g., census based assessments of neighborhood) and school functioning.

The Role of Family SES

Person-interaction theory emphasizes individual differences in response to the environmental context (Lerner, 1991). Beyond measuring differences across various external measures of neighborhood context, we propose to examine family SES as being crucial for determining how neighborhood factors are associated with schooling. Perceived neighborhood safety, in particular, may matter differently according to the resources available to the individual. Lower perceived neighborhood safety is more strongly related to negative outcomes among low SES adults and children facing greater family adversity (Lima, Caughy, Nettles, & O'Campo, 2010; Martin-Storey et al., 2012). People with access to fewer resources may be more vulnerable to the dangers of their neighborhood environment and may be less able to marshal resources to protect their children or themselves from these dangers. If youth from low-SES families are more affected, in terms of their schooling, by their perceptions of neighborhood safety, then this vulnerability has implications for the spuriousness and mediation models of neighborhood conditions, perceived neighborhood safety, and schooling outlined in Figure 1. The potential for neighborhood conditions to shape perceptions of safety in these models, coupled with the argument of greater vulnerability to neighborhood conditions as SES declines, means that the spuriousness and mediation models are likely to be more powerful for youth whose parents are more socioeconomically disadvantaged.

Such socioeconomic variation in links among neighborhood conditions, perceived neighborhood safety, and schooling might also apply to the moderation model in Figure 1. Higher perceived safety among lower SES youth may render them more vulnerable to negative outcomes, reflecting increased exposure to inclement elements of their environment. Conversely, no association, or a mild positive association would be expected between perceived neighborhood safety and school functioning for higher SES youth whose environments were more likely to be secure (Gonzales et al., 2006; Milam et al., 2010).

Method

Data

The Study of Early Child Care and Youth Development (SECCYD) began in 1991 with the recruitment of 1,364 families with newborns from hospitals at 10 sites across the U.S. (see NICHD Early Child Care Research Network, 2005, and <http://www.nichd.nih.gov/research/supported/seccyd.cfm>). Families were only eligible to participate if the mother was aged 18 years or above, if they did not plan to move, if they spoke English, and if they did not have a substance abuse problem. Additionally, the child could not have been hospitalized after birth for more than seven days, could not have a twin, or could not have obvious disabilities. Although not nationally representative, the sample is socioeconomically diverse (albeit above the national average) and reflects the race/ethnicity and socioeconomic status of the 10 study areas. Families participated in data collection at regular intervals. The two intervals germane to this study occurred in late childhood/early adolescence (in grades 5 (mean age = 11.03, SD = .33, range 10.31-12.41) and 6 (Mean age = 11.95, SD = .36, range 11.06-13.36) and when the target youth were 15 years old (Mean = 15.06, SD = .16, range 14.22-15.85). Race/ethnicity was reported at birth (81.1% of the children were White, 12% African American, 1.4% Asian, .2% Native American or Alaskan, and 5.1% other, of whom most were Hispanic/Latino). The subsample of adolescents in the presented study were those youth for whom a family income to needs ratio, a focal stratifying variable in our conceptual and analytical models, could be constructed at 15 ($n = 924$, of whom 50.2% were girls).

Measures

Schooling outcomes—Test scores were measured with the Woodcock-Johnson Psycho-Educational Battery Revised (WJR: Woodcock & Johnson, 1989, 1990). When youth were in grade 5, and again at age 15, they were administered multiple subtests of the WJR by trained research assistants. The WJR Picture Vocabulary Score (assessing the ability to name and recognize pictured items testing verbal comprehension and crystallized intelligence), Passage Comprehension (testing the ability to complete phrases with words indicating appropriate analogies that measures fluid and crystallized intelligence), and Applied Problem Solving (measuring the problem solving of practical math questions) were used here. Previous research has validated the use of these scales with adolescent populations (e.g., Ferrer et al., 2007). These three scales were available at both time points and loaded onto a single factor. Descriptive statistics for these and other variables are presented in Table 1, using the non-imputed data.

Graded achievement was rated by the teacher in grade 6 and with the overall four-point grade point average (GPA) in grade 9, collected from the participant's report cards at the end of the year. The grade 6 teacher report was a 19-item mock report card that included items from the Madison Metropolitan School District report card and from the Teacher Checklist of Peer Relations (Coie & Dodge, 1988). This measure assessed the child's classroom performance across a variety of academic and behavioral dimensions on a scale of 1 to 5 (Cronbach's $\alpha = .97$) and included assessments of traditional academic material (e.g., reading, math and science) work habits (e.g., follows classroom procedure) and social and emotion development (e.g., accurately interprets what peers are trying to do).

School attachment was assessed at grade 6 and age 15 using the School Attachment Subscale of the What My School is Like Questionnaire, adapted from the New Hope Study (Duncan, Huston & Weisner, 2007). This scale (age 15 Cronbach's $\alpha = .76$, grade 6 Cronbach's $\alpha = .74$) summed five items, including "Teachers at my school treat others fairly" and "I am happy to be at my school" using a four point scale ranging from "not at all true" to "very true".

Neighborhood safety—Perceptions of neighborhood safety were assessed at age 15 using the Neighborhood Safety Subscale of the Self-Care Checklist (Posner & Vandell, 1994). This scale averaged four items (Cronbach's $\alpha = .77$), which included statements such as 'it's safe to walk around my neighborhood' and "I'm scared of people in my neighborhood" on a five point likert scale, with higher scores indicating greater neighborhood safety.

Other neighborhood variables—Adolescents' current home addresses were sent to an independent geocoding service, and block group data (the smallest unit for which data are available) from the 2000 Census, when the children were approximately nine years old, were used. Participants reported living in 848 neighborhoods, with four being the maximum number of study participants per neighborhood. The extremely low level of clustering of cases within block groups was below conventional thresholds necessitating explicit modeling procedures to adjust standard errors for the non-independence of cases (Guilkey & Murphy, 1993). These data were used to assess neighborhood poverty and neighborhood affluence.

Measures of both neighborhood poverty and neighborhood affluence were created to assess neighborhood SES. Although both indices are related, affluence and poverty tap into different elements of neighborhood context. Previous work including both suggests that they exert unique influences on individual outcomes (Wen, Browning, & Cagney, 2003). The three indices used to create the poverty index were percentage of block group families with incomes below the poverty level, percentage of individuals in a block group household with public assistance income, and percentage of individuals in the labor force who were unemployed. The affluence index included the percentage of block group adults with bachelor's degrees, who had annual household incomes of \$100,000 or above, and who had managerial or professional jobs, devised based on previous work with the SECCYD (Dupéré et al., 2010).

Observer-rated neighborhood physical disorder, measured when the participant was age 15, was based on a reduced version of the disorder scale developed by McGuire (1997). The area assessed by the observer included the participant's house and 500 feet in either direction from it, with most participants living in neighborhoods low in visible physical disorder. The observer answered four questions on the exterior quality of the house, the condition of the road, the presence of garbage, broken glass, drug and alcohol related paraphernalia, or condoms on the street, on the sidewalk, and other public places. These questions could be responded to using a four-point scale. For example, in the case of the exterior quality of the house, response options ranged from 1 (badly deteriorated, with vacant and burned out or boarded up housing or buildings in serious disrepair) to 4 (well kept: buildings in good repair and exterior surfaces intact). All observers had to complete a certification test, where the training center received a DVD of several neighborhood streets and the interviewer had to evaluate those streets. These evaluations were then judged against a gold standard, and the observers had to receive a passing score of 70% in order to be allowed to perform the evaluations. The final physical disorder score consisted of the summed average of these items and had a Cronbach's α of .74.

Neighborhood mobility may influence familiarity with a neighborhood and was assessed at age 15. In total, 48.4% of participants did not move block groups between grades 1 and age 15, 32.1% moved once, and 19.5% moved two or more times. Youth were coded as having moved or not. Finally, length of time spent living in the neighborhood may also influence youth perceived safety. This variable was calculated by subtracting the date at which the child had moved to their current address from the date at which the child had completed the study measures. Descriptive statistics for this variable are presented in Table 1.

Family income—When the participant was 15, an income to needs ratio was calculated by dividing the pre-tax income by the federal poverty threshold for the size of the family in question. This measure, rather than income, was used to account for variation in family size and because it more accurately captures family disadvantage (McLoyd, 1998). Analyses comparing low-income and non-low-income adolescents employed an income to needs ratio of two or below to define low-income families, in keeping with tradition in the SECCYD (NICHD ECCRN, 2005). Although the mean income of the sample was above the national average, 199 of the children lived in families with income to needs ratios below 2.

School, family, and child covariates—Due to the association between neighborhood and school conditions, two variables were included to account for school context. The number of children at the school receiving subsidized lunch was divided by the total number of children at the school (reported by school principals at age 15). The number of parents paying for school, as reported by parents, was also measured, with 13.4% paying for school at age 15.

A second set of factors tapped parent and child characteristics. Parents reported the presence of the father in the home (at age 15) and maternal education (recorded at the birth of the child). To control for attrition bias, a change in family structure (i.e. change in whether the father was present in the home) between birth and grade 5 was measured. When the child was 36 months old, mothers completed the Peabody Picture Vocabulary Test IV (Dunn &

Dunn, 2007). This variable was included because maternal verbal ability is related to factors that govern neighborhood context and predict child achievement. Another variable was included to address potential parenting confounds. At age 15, youth answered five questions about their mother's involvement in their school work, including whether their mother helped them with school work, went to school programs for parents, and helped them choose courses. Items were rated on a one to five scale and averaged (Cronbach's $\alpha = .71$). Finally, to control for youth delinquent behavior, youth completed the 55 item Things I Do questionnaire, which was used in the New Hope Study (Duncan et al., 2007). This scale was summed, had a Cronbach's α of .89, and contained items assessing substance use, gang involvement, risky driving, outcomes suggestive of risky sexual behavior, and vandalism.

Plan of Analyses

Analyses tested measurement models of the four factors employed (neighborhood poverty, neighborhood affluence, test scores at grade 5, and test scores at age 15) (Anderson & Gerbin, 1988). Following these preliminary analyses, the modeling plan had four basic parts.

First, to test for spuriousness, models examined the association of perceived neighborhood safety with test scores, grades, and school attachment at age 15, controlling for family and demographic factors as well as all three schooling measures at grades 5 and 6 (to account for any bidirectionality between outcomes and focal predictors). To test if the associations between perceived neighborhood safety and school outcomes reflected the association between perceived safety and other neighborhood factors, the first three models were estimated with and without the three external measures of neighborhood context.

Second, to assess moderation, adolescent perceived neighborhood safety was interacted with external measures of the neighborhood environment to predict the schooling outcomes. In Mplus, interactions were modeled in the analysis command when both variables were observed and in the model command when one or more of the variables was latent. To probe the interactions, simple slopes for each significant interaction were calculated at one standard deviation above and below the mean for perceived safety (Aiken & West, 1991). These interactions were considered to be significant if their slopes were significant one standard deviation above and one standard deviation below the sample mean, as this suggests that significance of the interaction fell within the actual range of the data.

Third, mediation was assessed by examining the indirect associations between external measures of neighborhood context and school outcomes via perceived neighborhood safety. Using MacKinnon's (2008) bootstrapping method, mediation was indicated when the coefficients of the indirect effects were significant and had confidence intervals above zero.

Fourth, the assessment of the spurious, moderating, and mediating associations between perceived neighborhood safety and school outcomes were estimated and compared across subsamples divided by family income to needs ratios.

All models were estimated with structural equation modeling (SEM) in Mplus (Muthén & Muthén, 2010). SEM is an ideal method for addressing these questions because it tests the associations among multiple predictor and outcome variables. SEM also informs the

association between the proposed model and the actual data, with fit indices such as a χ^2 significance test, the root mean square error of approximation (RMSEA), which is considered good at .05 or below, and the comparative fit index (CFI), which is considered good at .93 or above (Byrne, 1994; Stieger, 1990). Furthermore, SEM allows for the estimation of latent constructs used here to create latent factors assessing neighborhood affluence, neighborhood poverty and WJR scores.

Creating these models in Mplus also had several other advantages. Missing data were accounted for using the Full Information Maximum Likelihood (FIML) method, which estimates missing data based on the existing correlation matrices (Allison, 2001). Mplus provided the significance of both standardized (β) and unstandardized (B) estimates of the associations among variables. The unstandardized coefficients, when divided by the squared root of the variance of the outcome, established the effect size of the association between these variables in terms of the percentage of a standard deviation. The difference in model fit between two groups (e.g., youth from low income and not low income families) was constrained and compared. Finally, Mplus allowed for the testing of indirect effects with the Delta method (Preacher & Hayes, 2008), used here to examine the indirect effects of observer-rated physical neighborhood disorder on school attachment via adolescent-perceived neighborhood safety.

Results

Measurement Model

The factor structures of the four factors employed in this study were tested at the start of the analyses. For neighborhood poverty, the standardized factor loadings ranged from .63 for percentage of unemployed people to .88 for percentage of families living below the poverty level. For neighborhood affluence, the standardized factor loadings ranged from .78 for percentage of households with incomes of 100,000 a year or greater to .97 for percentage of neighborhood residents with a bachelor's degree or higher. For grade 5 test scores, the factor loadings ranged between .76 for applied problem solving to .81 for picture vocabulary score. Finally, for age 15 test scores, standardized loadings ranged from .77 for applied problems solving to .86 for passage comprehension.

Perceived Neighborhood Safety and Spuriousness

Baseline models, presented in Table 2, suggest that neighborhood safety was only significantly associated with school attachment after controlling for individual, family, and school level factors. Next, multivariate analyses tested the focal associations between perceived neighborhood safety and the three school outcomes, controlling for neighborhood poverty and affluence as well as observer-rated physical neighborhood disorder. These findings are also presented in Table 2, with the fit for all models being acceptable.

The link between perceived neighborhood safety and standardized test scores was not significant when other confounding variables were controlled. Indeed, no neighborhood measures were associated with test scores, likely reflecting the very strong continuity in test scores over time. Next, no significant association was found between perceived safety and

GPA, when individual, family, and school-level variables were controlled. A significant association was observed, however, between observer-rated physical neighborhood disorder and GPA, such that each standard deviation increase of physical neighborhood disorder was associated with 20.7% of a standard deviation decrease in GPA. Finally, as anticipated, perceived neighborhood safety was associated with higher levels of school attachment, with each standard deviation increase in perceived neighborhood safety being associated with 34.8% of a standard deviation increase in school attachment. Interestingly, neighborhood poverty was also positively associated with school attachment, such that each standard deviation increase in census-based neighborhood poverty was associated with 50.3% of a standard deviation increase in school attachment.

To review, initial findings support the hypothesis that the association between perceived neighborhood safety and schooling would differ across aspects of schooling. School attachment, the most socioemotional aspect of schooling, was the only outcome associated with perceived neighborhood safety when confounding factors were controlled.

Perceived Neighborhood Safety and Moderation

Interactions of perceived neighborhood safety and other neighborhood factors were included to assess how census and external observations of neighborhood served to moderate between perceptions of neighborhood safety and schooling. No significant interactions were observed for standardized test scores.

When GPA was the outcome, a significant interaction was observed between perceived neighborhood safety and observer-rated physical neighborhood disorder ($\beta = -.51, p < .01$). This interaction remained significant one standard deviation above the mean of neighborhood safety, ($\beta = -.45, p < .05$) as well as one standard deviation below the mean of neighborhood safety ($\beta = -.57, p < .05$), suggesting that the interaction was significant within the data range represented in the current sample. As can be seen in Figure 2, few differences in grades were observed for youth in neighborhoods rated as being high in physical disorder. For youth living in neighborhoods rated as being low in physical disorder, however, perceiving their neighborhood as safe was associated with higher grades.

Perceived neighborhood safety also interacted significantly with neighborhood affluence ($B = .05, p < .01$), but not neighborhood poverty, to predict grades. Probing suggested that this interaction was also significant at one standard deviation above the mean ($B = .06, p < .05$) and one standard deviation below the mean ($B = .06, p < .05$) of neighborhood safety, respectively. Higher neighborhood affluence was associated with having higher grades at higher levels of perceived neighborhood safety and with lower grades at lower levels of perceived safety.

Neighborhood Safety and Mediation

Testing the indirect association between neighborhood conditions and school attachment via perceived neighborhood safety assessed the potential mediating role of perceived safety. School attachment was the only outcome significantly predicted by adolescents' perceptions

of safety, which is why we focus on it here. Without any moderators considered, no significant indirect effects were observed.

Differences by Family Income to Needs

To explore if the association between perceived neighborhood safety and school functioning varied across the economic spectrum of families, the sample was split into two groups—youth from low-income families (i.e. families with income to needs ratios below 2) and other youth (i.e. families with income to needs ratios of 2 or above). The resulting analyses are presented in Table 3, with all the models showing acceptable fit.

As was the case for the total sample, the association between perceived neighborhood safety and standardized test scores remained non-significant when split by income. Differences did emerge, however, for GPA. For youth from low-income families, each standard deviation increase in perceived neighborhood safety was associated with 17% of a standard deviation decrease in GPA. For youth who were not from low-income families, no significant association between perceived safety and GPA was observed. Follow-up multi group analyses with a simplified constrained model suggested that this differences was significant ($\chi^2 \text{ diff} = 106.80, p < .001$). When the sample was divided by income to needs ratio, the association between observer-rated safety and GPA was no longer significant.

In line with testing the moderating role of perceived neighborhood safety, interactions between perceived neighborhood safety and school outcomes were also explored by family income. For GPA and standardized test scores, the interaction between physical neighborhood disorder and perceived neighborhood safety was not significant when the sample was split by income to needs ratio, nor were the interactions with either neighborhood poverty or neighborhood affluence. When school attachment was the outcome, a significant interaction was observed for youth from low-income families ($\beta = .24, p < .05$). When probed, this interaction was significant one standard deviation above the mean for perceived neighborhood safety ($\beta = .21, p < .05$), and one standard deviation below the mean ($\beta = .24, p < .05$). It suggested that little variation in the focal association occurred for youth living in neighborhoods low in physical disorder but that high perceived neighborhood safety was associated with higher levels of school attachment for youth in neighborhoods with high levels of physical disorder. This interaction was not found for youth not from low income families, although the significance of this interaction did not differ across family income to needs ratio group when explored in multi-group analyses ($\chi^2 \text{ diff} = 2.71, p < .10$).

Although perceived neighborhood safety was not linked to grades in the initial models (see Table 2), follow up analyses by the family income to needs ratio indicated that it did significantly interact with other assessments of neighborhood context to predict GPA (see Table 3). A similar finding was observed when low SES and non-low SES youth were compared, such that higher perceived neighborhood safety was a risk factor for low SES youth but was not associated with GPA among their higher SES peers. The opposite, however, was true for school attachment, as perceived neighborhood safety was protective only for youth from low-income families in neighborhoods with high levels of physical neighborhood disorder.

The mediational models were also estimated with group modeling by the family income to needs ratio. A significant indirect association was observed between neighborhood affluence and school attachment ($\beta = .03, p < .01, CI [.01, .07]$), via neighborhood safety, among adolescents whose families were not low-income. No other indirect effects were observed.

To summarize, perceived safety was somewhat of a risk factor for the GPAs of youth from low-income families but was not associated with GPAs of youth not from low-income families. When school attachment was concerned, perceived safety was protective for youth from low-income families who lived in neighborhoods with high levels of physical disorder. Finally, perceived neighborhood safety mediated the association between neighborhood affluence and school attachment only among youth whose families were not low-income.

Discussion

This study explored the complexities in the association between perceived neighborhood safety and school outcomes. As anticipated, the importance of perceived safety varied according to the psychosocial nature of the outcome being examined. Here, we focus on three particular associations for further discussion. First, partially supporting the first hypotheses, only perceived neighborhood safety was directly linked to school attachment when many important covariates were controlled. Second, the association between perceived neighborhood safety and GPA was moderated by other neighborhood factors. Youth in more disadvantaged situations (at either the family or neighborhood level) who perceived neighborhoods as being safe reported lower grades than their peers who perceived them as dangerous. Third, contrary to what was anticipated, few significant indirect effects, via perceived neighborhood safety, were observed.

These findings support previous work linking perceived neighborhood safety to school attachment (e.g., Daly et al., 2009; Kitsantas et al., 2004; Williams et al., 2002). Adding to this literature was the finding that neighborhood safety continued to predict school attachment controlling for many selection factors. Higher perceived neighborhood safety may be part of the secure context youth require in order to form the necessary psychosocial attachments with their school environment. Felt security at school, and associated attachment, may reflect felt security in their larger neighborhood environment. Ultimately, these findings support the interconnection of youth's assessments of safety across overlapping contexts, and suggest that this perceived safety may have important implications across different domains of functioning.

Perceived neighborhood safety was particularly important for school attachment among youth from low-income families in neighborhoods characterized by higher levels of physical disorder. This association was not significant for youth from more advantaged families. Although the directionality of these associations cannot be ascertained, youth from low-income families may be more likely to engage with their schools as a method of compensating for the dangerous and unpredictable elements of their neighborhoods (Daly et al., 2009). Alternatively, despite their higher levels of physical disorder, these neighborhoods may have mechanisms of fostering school attachment not visible to external observers. For youth in neighborhoods with few other resources, the school environment

may act as an important context of support. Second, youth who perceived their disadvantaged neighborhoods as safe may be more likely to engage with those neighborhoods to a greater degree than youth who perceive them as dangerous. The consequences of this increased engagement may be reduced academic performance as youth are negatively influenced by neighborhood social norms or are provided with opportunities to engage in behaviors (e.g., substance use, truancy) that hinder school functioning. Ultimately, feeling safe in disordered neighborhoods may also reflect individual-level delinquency, such that these youth feel safe while reducing the security of the neighborhood for those around them. Despite illustrating the benefit of including both advantaged and disadvantaged youth in the same sample, these findings should be replicated before firm conclusions are drawn.

The mediating function of perceived neighborhood safety in the association between neighborhood disorder and school attachment was only supported among youth from families with higher income to needs ratios. Indeed, previous work supporting mediating role of perceived neighborhood environment has focused on psychological outcomes (Hill et al., 2005; Martin-Storey et al., 2013; Plunkett et al. 2007). The lack of mediational findings in the present study may suggest that perceived neighborhood safety functions differently for academic and mental health outcomes, such that the immediate stressors associated with perceived neighborhood stress may matter more for linking neighborhood context to mental health.

Overall, the results support the complex associations between perceived neighborhood safety, other assessments of neighborhood context, and school outcomes. Several limitations, however, must be taken into consideration. First, youth become more mobile as they age (Dupr et al., 2009). By age 15, many youth are interacting with elements of their neighborhood beyond the area immediately outside their residences, so that the neighborhood perceived by the adolescent may reflect a different geographic location than the street assessed by the external observer, or the government assigned census block. Future research may address this issue by including measurements of youth's lived environments (Schaefer-McDaniel, Dunn, Minian & Katz, 2010). Second, the participants in the SECCYD were recruited from ten different locations across the U.S. but do not constitute a nationally representative sample. Future research with a larger, nationally representative sample, will clarify the generalizability of these findings across race/ethnicity and socioeconomic status. Third, although some of the data used in the current study were longitudinal, the correlational nature of these data limit causal interpretations of the links between neighborhood factors and school outcomes.

Despite these limitations, the present findings offer new insight into the complex and dynamic association between perceived neighborhood safety and varied facets of school functioning during adolescence. In particular, they suggest that individual contextual differences alter the meaning of perceived safety, in ways that matter for school outcomes. Ultimately, these findings suggest improving the safety of all neighborhoods. Furthermore, they suggest that efforts to address perceived neighborhood safety among youth in disadvantaged neighborhoods should focus on the factors that enhance or diminish their accuracy in perceiving the neighborhood environment.

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Panel 2. Illustrating the spurious, moderation and meditation models, respectively (Continuous line = significant association, broken line = non significant association).

Figure 1. Theoretical odels

Panel 1 Hypothesized association between perceived neighborhood and school outcomes (Thick line = strong association, medium line = moderate association, thin line = weak association)

Panel 2. Illustrating the spurious, moderation and meditation models, respectively (Continuous line = significant association, broken line = non significant association).

**External
Neighborhood Factors**

Moderation

Figure 2.

The interaction between perceived neighborhood safety and observer rated neighborhood disorder for GPA

Table 1

Descriptive statistics for the sample (n = 924)

	Mean	Standard Deviation	Minimum	Maximum
Perceived safety	4.53	.63	1.50	5.00
School Outcomes (Grade 9)				
Woodcock Johnson R				
Picture vocabulary score	518.71	12.11	451.00	563.00
Passage comprehension	520.58	12.43	446.00	554.00
Applied problem solving	524.74	16.81	444.00	591.00
Grade point average	3.04	.70	1.00	4.00
School attachment	16.50	5.00	5.00	20.00
Neighborhood Factors				
Observed disorder	1.42	.44	1.00	3.75
Census-Based Neighborhood Poverty				
% of families with incomes below the poverty level	5.67	7.42	.00	54.85
% of unemployed individuals over 25	4.05	4.18	.00	50.91
% of households on public assistance	2.18	3.25	.00	34.60
Census-Based Neighborhood Affluence				
% of individuals with BA or higher	33.52	20.22	.00	90.61
% of households with incomes greater than 100,000\$	18.39	16.77	.00	86.15
% of people who are professionals/ managers	39.67	16.61	2.96	85.59
% of families who move once or more	.52	.50	.00	1.00
Time in the current neighborhood (years)	7.75	5.21	.01	15.80
Demographic Factors				
Family income (/1000)	104.11	11.67	2500.00	1,001.00
Maternal education	14.48	2.45	7.00	21.00
School factors				
% of school peers with subsidized lunch	18.32	18.26	.00	1.00
Socioemotional Factors				
Maternal educational emphasis	1.50	.42	.00	2.00
Maternal verbal ability	99.94	18.49	40.00	159.00
Adolescent delinquent behavior	6.12	5.65	.00	53.00
School Outcomes (Grades 5-6)				
Woodcock Johnson				
Picture vocabulary score	506.16	11.87	440.00	542.00
Passage comprehension	505.29	12.63	394.00	542.00
Applied problem solving	510.13	12.44	438.00	547.00
School achievement	3.45	.52	1.20	4.00
School attachment	3.62	.87	1.00	5.00

Table 2Standardized coefficients (β) for models predicting each school outcome ($n = 924$)

	Tests Scores ¹		School Grades ²		School Attachment ³	
	Baseline	Full model	Baseline	Full model	Baseline	Full model
Adolescent Perceived Neighborhood Safety	.01	.00	.02	.00	.19**	.21**
Neighborhood factors						
Observer-rated physical neighborhood disorder		.01		-.09**		.01
Census-based neighborhood poverty		-.03		-.08**		-.22**
Census-based neighborhood affluence		.03		-.03		.07
Individual mobility		.03		.07		-.06
Time in current neighborhood		.03		.13**		-.02
School factors						
Paid for school or not	-.01	.00	-.04	-.04	.06	.06
% of students with subsidized lunch	.03	.04	-.03	-.01	-.10*	-.10*
Demographic factors						
Family structure (father at home at age 15)	.00	.00	.06	.03	-.01	-.02
Family structure change from birth to 5th grade	.03	.03	.01	.00	.03	.03
Maternal education	.01	.00	.16**	.14**	.01	.01
Total family income	-.01	.00	-.04	-.05	-.08*	-.07*
Race (non-white)	.01	.01	0.7*	0.4	-.01	.01
Gender	-.04	-.04	.8**	.8**	.01	.01
Prior school functioning						
Woodcock Johnson factor grade 5	.08	1.03**	.31**	.32**	.10	.11
Academic achievement grade 6	-.05	-.05	.25**	.23**	.00	.02
School attachment grade 6	1.04**	.08**	.09**	.10**	.29**	.27**
Socioemotional factors						
Maternal educational emphasis	.00	.00	.07*	.06*	.21**	.21**
Adolescent delinquent behavior	-.05	-.05*	-.16**	-.16**	-.17**	-.16**
Maternal verbal ability	-.03	-.04	-.08	-.09*	-.05	-.03

	Tests Scores ¹		School Grades ²		School Attachment ³	
	Baseline	Full model	Baseline	Full model	Baseline	Full model
R ²	undefined	undefined	.51**	.53**	.33**	.34**

t = p < .10,

Model 1: Base line model Chi² = 712.54, RMSEA = .09, CFI = .85; full model Chi² = 847.01, RMSEA = .06, CFI = .92.

Model 2: Base line model Chi² = 207.95, RMSEA = .06, CFI = .92; full model Chi² = 324.85, RMSEA = .04, CFI = .97.

Model 3: Base line model Chi² = 200.87, RMSEA = .06, CFI = .92; full model Chi² = 310.71, RMSEA = .04, CFI = .97.

* p < .05
** p < .01.

Table 3

Standardized coefficients (β) for models predicting each school outcome, by family SES ($n = 199$ low-income; $n = 725$ other)

	Tests Scores ¹		School Grades ²		School Attachment ³	
	Low-income	Not low-income	Low-income	Not low-income	Low-income	Not low-income
Adolescent Perceived Neighborhood Safety	-.05	.02	-.16*	.06 ^t	.23**	.21**
Neighborhood factors						
Observer-rated physical neighborhood disorder	.02	-.03	-.15 ^t	-.07 ^t	-.04	.01
Census-based neighborhood poverty	-.01	-.01	-.21	-.03	-.31**	-.16**
Census-based neighborhood affluence	.08	-.01	-.11	-.02	-.04	.12
Individual mobility	.10	.03	.10	.09	-.14	-.05
Time in current neighborhood	-.02	.05	.12	.15*	-.05	.00
School factors						
Paid for school or not	-.01	-.02	-.05	-.05	-.01	.08*
% of students with subsidized lunch	.01	.06	.03	-.02	-.16	-.07
Demographic factors						
Family structure (father at home at age 15)	.08	-.05	.05	.03	-.13	.06
Family structure change from birth to 5th grade	.02	.05	.00	.01	.15*	-.04
Maternal education	.07	-.02	.27**	.10*	.04	.02
Total family income	-.03	-.01	-.01	-.06	-.12	-.06
Race (non-white)	.07	-.01	.20*	.01	.18*	-.03
Gender	-.02	-.04	.09	.11**	-.02	.03
Prior school functioning						
Woodcock Johnson factor grade 5	1.03	1.09**	.10	.37**	.17	.07
Academic achievement grade 6	.07	-.13**	.22*	.22**	.07	-.02
School attachment grade 6	.07	.11**	.10	.10**	.27**	.27**
Socioemotional factors						
Maternal educational emphasis	-.02	.03	.07	.09*	.24**	.19**
Adolescent delinquent behavior	-.02	-.07*	-.20*	-.15**	-.10	-.19**
Maternal verbal ability	-.16**	-.03	-.15	-.08 ^t	-.07	-.03

R ²	Tests Scores ¹		School Grades ²		School Attachment ³	
	Low-income	Not low-income	Low-income	Not low-income	Low-income	Not low-income
	undefined	undefined	.44**	.48**	.43**	.35**

Model 1: $\chi^2 = 460.14$ (low-income), $\chi^2 = 685.68$ (non low-income), RMSEA = .07, CFI = .90
Model 2: $\chi^2 = 283.34$ (low-income), $\chi^2 = 245.87$ (non low-income), RMSEA = .05, CFI = .96.
Model 3: $\chi^2 = 269.10$ (low-income), $\chi^2 = 236.42$ (non low-income), RMSEA = .04, CFI = .96.

t
p < .10
*
p < .05
**
p < .01; Note: Low-income defined as income to needs ratio below 2.