Published in final edited form as:
J Abnorm Psychol. 2008 May ; 117(2): 377–385. doi:10.1037/0021-843X.117.2.377.

Impulsive and Callous Traits Are More Strongly Associated With Delinquent Behavior in Higher Risk Neighborhoods Among Boys and Girls

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Abstract

The purpose of the present study was to determine whether the effect of impulsive and callous personality traits on delinquent behavior varied across neighborhood context in a population-based, statewide sample of 85,000 Iowa schoolchildren ages 10–19. Two previous studies examining the association between impulsivity and delinquency across disadvantaged and affluent neighborhoods have yielded contrasting findings. Results of the present study suggested a robust moderating effect of neighborhood context on personality risk for delinquency. The relation between impulsivity and delinquency was greater in neighborhoods low in collective efficacy compared to neighborhoods high in collective efficacy. A similar interaction was found for callous personality traits, indicating the consistency of the moderating effect of neighborhood context on personality risk for delinquency. Gender differences were also examined, and results were replicated in a holdout sample.

Keywords

delinquency; neighborhood context; impulsivity; callousness; gender differences

Much research has demonstrated that children and adolescents with impulsive personality traits are at increased risk of engaging in delinquent behavior (Moffitt, Caspi, Rutter, & Silva, 2001; Sher & Trull, 1994; White et al., 1994), and more recent research indicates that callous/unemotional personality traits are also robust predictors of delinquent behavior (Frick, Cornell, Barry, Bodin, & Dane, 2003; Frick, Stickle, Dandreaux, Farrell, & Kimonis, 2005). Research on psychopathy in adolescents suggests that callous/unemotional traits are at least as important as impulsive traits in differentiating a subgroup of adolescents with severe and chronic conduct problems (Frick et al., 2005). Thus, adolescents who, for

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example, tend to act without thinking and have trouble delaying gratification or tend not to feel bad or guilty and are not concerned about others' feelings engage in more delinquent behavior than adolescents without these characteristics.

Though individual risk factors such as impulsive and callous personality traits are robustly associated with delinquent behavior, contextual factors are also involved in the commission of crimes. Crime is clearly concentrated in disadvantaged neighborhoods (Ingoldsby & Shaw, 2002), suggesting that aspects of the neighborhood may influence delinquent behavior. Sampson, Rauden-bush, and Earls (1997) proposed the collective efficacy model to explain why low neighborhood socioeconomic status (SES) is associated with criminal behavior. The collective efficacy model suggests that it is not poverty per se that contributes to criminal behavior. Rather, it is low informal social control, a lack of collective action among residents to keep the community safe and orderly, and low social cohesion or solidarity among residents that contributes to a criminogenic environment (Sampson et al., 1997). In support of the model, low neighborhood collective efficacy (low informal social control and low social cohesion) was found to mediate the impact of poverty on violence (Sampson et al., 1997). Thus, neighborhoods low in collective efficacy may be characterized by higher crime rates due to deficient collective socialization away from criminal behavior and increased opportunity for youth to engage in delinquent behavior.

Recently, there has been an increasing interest in the joint influences of personality and neighborhood risk factors on adolescent delinquent behavior (Lynam et al., 2000; Vazsonyi, Cleveland, & Wiebe, 2006). There are essentially three lines of thought regarding the joint impact of personality and neighborhood risk factors on delinquent behavior. One line of thought is that deficient collective socialization and increased opportunity for delinquent behavior apparent in high-risk neighborhoods exacerbate the impact of personality risk on delinquency, and sufficient collective socialization and decreased opportunity for delinquent behavior apparent in low-risk (i.e., protective) neighborhoods suppress the impact of personality risk on delinquency. Thus, personality risk factors will be more related to delinquency in high-risk than in low-risk neighborhoods. Alternatively, a second line of thought suggests that the relation between personality risk factors and delinquency will be greater in low-risk neighborhoods than in high-risk neighborhoods. That is, contextual risk factors apparent in high-risk neighborhoods are sufficient for delinquent behavior and do not require a characterological predisposition toward delinquency. Only in the absence of these contextual influences (i.e., low-risk neighborhoods) will personality risk become important. Finally, a third line of thought holds that personality risk for delinquency is invariant across neighborhood contexts.

Two empirical studies have specifically addressed the nature of the joint impact of impulsivity and neighborhood poverty on adolescent delinquent behavior and have yielded contrasting findings (Lynam et al., 2000; Vazsonyi et al., 2006). Lynam and colleagues (2000), in a study of 430 13-year-old boys from inner-city Pittsburgh (Pittsburgh Youth Study), found that the effect of impulsivity on self-reported delinquency was greater for boys from census-defined poor neighborhoods than for boys from more affluent neighborhoods. The relation between impulsivity and delinquency in low-SES neighborhoods was positive, substantial, and statistically significant, whereas the relation between impulsivity and delinquency in high-SES neighborhoods was small and non-significant. In a second study of 16-year-old adolescents (9,830 males, 10,012 females) from the National Longitudinal Study of Adolescent Health, Vazsonyi and colleagues (2006) found that the relation between impulsivity and self-reported delinquency was invariant across census-defined high- and low-SES neighborhoods for boys. For girls, there was some indication that the impact of impulsivity on delinquency was greater in high-SES compared to low-SES neighborhoods, though the effect was small.

The findings from the two aforementioned studies have very different implications. The implication of the results of the study by Lynam et al. (2000) is that personality risk for delinquency is exacerbated in high-risk neighborhoods and suppressed in low-risk neighborhoods, whereas results from the study by Vazsonyi et al. (2006) imply that personality risk for delinquency is impervious to neighborhood context. That is, adolescents characterologically predisposed toward delinquency will find an outlet to engage in deviant behavior, regardless of their neighborhood context. Further, Vazsonyi et al.'s findings suggested that the joint effects of personality and neighborhood risk factors may be different for boys and girls, though gender differences were not explicitly tested.

The reason for these discrepant findings is unclear, though they may be due to differences in measures. For example, Lynam et al. (2000) used a composite measure of impulsivity based on various performance tasks as well as self- and informant-reports and observer ratings, whereas Vazsonyi et al. (2006) developed a 4-item, self-report scale of impulsivity. This 4-item scale appeared to assess problem solving strategy, rather than impulsivity per se. Additionally, while both studies relied on census information to operationalize neighborhood disadvantage, the measure used by Lynam et al. distinguished between poverty and concentrated poverty by differentiating those neighborhoods in Pittsburgh characterized by high levels of public assistance housing. The significant interaction between neighborhood SES and impulsivity reported by Lynam et al. seemed to depend on the distinction between low-SES neighborhoods with and without public housing assistance. Given the theory and evidence that neighborhood disadvantage exerts its effect on delinquent behavior indirectly via low informal social control and social cohesion, perhaps Lynam and colleagues' measure of neighborhood disadvantage, which discriminated concentrated poverty from poverty, was a better proxy for low informal social control and social cohesion than that used by Vazsonyi et al.

The inconsistent findings regarding the joint impact of personality and neighborhood risk factors on delinquency suggest that further study is warranted and that neighborhood informal social control and social cohesion, rather than neighborhood disadvantage, should be examined. The purpose of the present study was to determine whether neighborhood informal social control and social cohesion moderate the effect of two personality risk factors, impulsivity and callousness, on delinquency in a population-based sample of boys and girls from the state of Iowa. Given the two previous contradictory findings that (a) personality risk for delinquency is moderated by neighborhood context or (b) personality risk for delinquency is invariant across neighborhood context, our rationale was that consistency of findings across the two personality risk factors, impulsivity and callousness, would provide greater support for one theory or the other. Gender differences in the joint influences of personality and neighborhood risk on delinquency were also examined.

Method

Participants

All 6th-, 8th-, and 11th-grade adolescents were recruited from all public school districts as well as alternative school programs in the state of Iowa (Iowa Consortium for Substance Abuse Research and Evaluation [ICSARE], 2000). Overall, 76%, 80%, and 69% of all 6th, 8th, and 11th graders, respectively, enrolled in Iowa public schools participated in the study. The extent to which alternative school students participated is unclear, because the Iowa Department of Education does not maintain records on alternative school program enrollment. Data were obtained from a total of 85,426 students. These data underwent 27 validity checks for inconsistent or patterned responses. Cases that failed five or more of these validity checks were removed ($n = 125$), leaving 85,301 useable questionnaires (ICSARE, 2000).

Participants ranged in age from 10 to 19 (M = 13.62, SD = 2.11). Thirty-two percent of the adolescents who participated in the study were 6th graders (n = 27,148; age: M = 11, SD = 0.50), 36% were 8th graders (n = 30,207; age: M = 13, SD = 0.50), and 31% were 11th graders (n = 26,034; age: M = 16, SD = 0.53). The remainder of the adolescents reported that they were in other grades or ungraded school programs (n = 1,480). Fifty percent of the adolescents were female (n = 42,088). Most participants were White (n = 74,469; 89%), and other ethnicities were approximately equally represented: African American (n = 1,937; 2%), Native American (n = 782; 1%), Asian or Pacific Islander (n = 1,377; 2%), Spanish or Hispanic (n = 1,996; 2%). Four percent of adolescents were from multiracial backgrounds (n = 3,561). The racial composition of this sample closely matches that for the state of Iowa obtained in the 2000 U.S. census (United States Census Bureau, 2005; 93.9% White, 2.1% African American, 0.3% Native American, 1.3% Asian, and 2.8% Hispanic).

Each county in Iowa was represented by at least 100 students. Most of these Iowa youth lived in rural areas or small towns; 13%(n = 10,743) lived in country/rural areas, 14% (n = 12,225) lived on farms, 26% (n = 22,166) lived in small cities with a population of less than 5,000, 25% (n = 20,968) lived in medium-sized cities with a population between 5,000 and 30,000, and 22% (n = 18,196) lived in “large” cities with a population greater than 30,000 (in 2000, there were only two cities in Iowa with a population of > 100,000, Des Moines [population of 198,682] and Cedar Rapids [population of 120,758]).

Procedure

A full account of the procedures is provided elsewhere (Meier, Slutske, Arndt, & Cadoret, 2007). Briefly, the 1999 Iowa Youth Survey was developed and conducted by ICSARE, and all procedures were approved by the University of Iowa Human Subjects Review Board. Every public school district (N = 375) in the state of Iowa was asked to participate in the 1999 Iowa Youth Survey. Eighty-eight percent (n = 329) of school districts agreed to participate, as did a laboratory school at the University of Northern Iowa. Consent and survey procedures were standardized across the state. Passive consent procedures were used whereby parents signed and returned a form if they did not want their child to participate. Teachers administered the surveys in class, and the adolescents were given a 50-min class period to complete the voluntary and anonymous survey. The survey was read to those students who had difficulty reading. All surveys were collected in unmarked envelopes to ensure confidentiality. Each school district appointed an Iowa Youth Survey coordinator to mail their district’s completed questionnaires to National Computer Systems for scanning.

Measures

Delinquency—Delinquent behavior was assessed with seven items concerning whether the participant had engaged in a specific delinquent behavior over the past year. The seven delinquency items were summed into a composite delinquency scale with values ranging from 0 to 7 (M = 0.91, SD = 1.45). Results from an exploratory factor analysis supported the formation of this composite scale, as a one-factor model fit the data best (root-mean-square error of approximation = .05), and all items loaded highly and approximately equally on this factor. Factor loadings did not differ meaningfully across gender. The coefficient alpha for these items was .75 (6th graders α = .72; 8th graders α= .77; 11th graders α=6). Table 1 is a list of the delinquency items, as well as item prevalence. Self-report methods of measuring delinquent behavior are known to be reliable and valid (Thornberry & Krohn, 2000).

Impulsivity—Impulsivity was measured with four items: “I think things through carefully before I make a decision,” “Even if it is dangerous, I like to do exciting things,” “I believe that working hard now will make my life successful in the future,” and “When I have problems, I am good at finding a way to fix them.” These items were assessed on a 4-point

scale (0 = *strongly agree*, 1 = *agree*, 2 = *disagree*, 3 = *strongly disagree*), with higher ratings indicating greater levels of impulsivity. One item, "Even if it is dangerous, I like to do exciting things," was reverse scored. These four items were summed into a composite impulsivity scale with values ranging from 0 to 12 (M =4.08, SD =1.90). These impulsivity items appear to reflect three different facets of impulsivity: lack of premeditation, sensation seeking, and lack of perseverance.[1] Further, these different facets of impulsivity may be features of two different domains of general personality structure: conscientiousness and extraversion (Whiteside & Lynam, 2001). As such, the coefficient alpha for this scale was expectedly low: .53 (6th graders α =.52; 8th graders α =.54; 11th graders α =.50).

Callousness/lack of empathy—Callousness/lack of empathy was measured with three items: "It is important to help other people," "I care about other people's feelings," and "I feel sorry for people who have things stolen or damaged." Items were assessed on a 4-point scale (0 = *strongly agree*, 1 = *agree*, 2 = *disagree*, 3 = *strongly disagree*), with higher ratings indicating greater levels of callousness. These three items were summed into a composite callousness scale with values ranging from 0 to 9 (M = 1.91, SD = 1.58), and the coefficient alpha for these items was .76 (6th graders α = .70; 8th graders α = .77; 11th graders α = .79).[2]

Neighborhood risk—Participants completed a self-report measure of neighborhood risk and were given the following instructions: "The questions regarding neighborhood in this part of the survey refer to the adults (age 21 and over) who currently live near you. If you live in the country, your neighborhood includes the adults who live closest to you." Participants answered seven questions about their neighborhood. The seven items are listed in Table 1, along with item prevalence. Items were scored on a 2-point scale (yes/no), with higher ratings indicating a higher risk neighborhood. Results of an exploratory factor analysis revealed that these items were best represented as a single factor. Factor loadings for the single factor did not differ meaningfully across gender. The seven items were summed into a composite scale with values ranging from 0 to 7 (M = 1.09, SD = 2.04). The coefficient alpha for these items was .80 (6th graders α = .76; 8th graders α = .79; 11th graders α = .77). Similar self-report measures of neighborhood risk and protective factors

[1]These impulsivity items were validated in a sample of 409 college students (age: M = 18, SD = 0.95), 60% of whom were female. The participants were administered the four Iowa impulsivity items used in the current study as well as the Urgency, Premeditation (lack of), Perseverance (lack of), and Sensation Seeking (UPPS) Impulsive Behavior Scale (Whiteside & Lynam, 2001) and a shortened (198-item) version of the Multidimensional Personality Questionnaire (Tellegen, 2000). The UPPS is composed of four factors (Urgency, Lack of Premeditation, Lack of Perseverance, and Sensation Seeking; Whiteside & Lynam, 2001), and correlational analyses revealed that the Iowa impulsivity items map on to three of the four UPPS factors. For example, "I think things through carefully before I make a decision" correlated most highly with the UPPS Premeditation factor (r with total Premeditation scale: .62); "Even if it is dangerous, I like to do exciting things" correlated most highly with the UPPS Sensation Seeking factor (r with total Sensation Seeking scale: .62); "I believe that working hard now will make my life successful in the future" correlated most highly with the UPPS Perseverance factor (r with total Perseverance scale: .48); and "When I have problems, I am good at finding a way to fix them" correlated most highly with the UPPS Perseverance factor (r with total Perseverance scale: .42). The correlation between our four-item impulsivity scale and the total 45-item UPPS scale (r = .67) approached the correlation between the UPPS scale and the 18-item MPQ Control versus Impulsivity scale (r = .71), upon which the UPPS was partially based. The correlation between our impulsivity scale and the 18-item MPQ Control versus Impulsivity scale was .58.

[2]The callousness items were also validated in the aforementioned college sample. Participants were administered the Youth Psychopathic Traits Inventory (YPI; Andershed, Kerr, Stattin, & Levander, 2002) as well as the three Iowa callousness items used in the current study. There are 10 subscales of the YPI, and each subscale is reported to load on one of three factors: the Dishonest Charm, Grandiosity, Lying, and Manipulation subscales load on Factor 1 (Grandiose-Manipulative Factor); the Remorselessness, Unemotionality, and Callousness subscales load on Factor 2 (Callous-Unemotional Factor); and the Thrill-Seeking, Impulsiveness, and Irresponsibility subscales load on Factor 3 (Impulsive-Irresponsible Factor; Andershed et al., 2002). Of the three factors of the YPI, the Iowa Callousness scale correlated most highly with the YPI Callous-Unemotional factor (r = .36) as expected. Additionally, of the 10 subscales of the YPI, the Iowa Callousness scale correlated most highly with the YPI Callousness subscale (full sample: r = .35; girls: r = .29; boys: r = .24). To put this correlation into perspective, the correlation between the callous/lack of empathy item from the Psychopathy Checklist: Youth Version (Forth, Kosson, & Hare, 2003) and the YPI Callousness subscale was r = .17 for boys and r = .33 for girls (Andershed, Hodgins, Tengström, 2007).

have been found to be reliable and valid for 6th, 8th, and 11th graders (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002).

Data Analysis

Hierarchical regression analyses were conducted in a series of steps, as shown in Tables 4 and 5, to test the independent and interactive effects of individual-level variables (impulsivity, callousness, gender) and contextual variables (neighborhood risk) on delinquency. Two models were tested for each of the personality traits of interest: impulsivity and callousness. First, we tested whether personality interacted with neighborhood risk to predict delinquent behavior. Second, we augmented this baseline model to test gender differences in the moderating effect of neighborhood on the relation between personality and delinquency. We also tested the relations of neighborhood risk and both impulsivity and callousness with delinquency within the same model (see Table 6).

For all analyses, age, gender, and race were entered as covariates. Age was entered as a continuous variable. Gender was entered as a dummy-coded variable, with 1 representing boys and 0 representing girls. Race was entered as a dummy-coded variable, with 1 representing Whites and 0 representing all other races. All independent variables, with exception of the dummy-coded variables were standardized prior to entering them in the regression equation (Aiken & West, 1991). Therefore, the unstandardized beta estimates we present are interpretable as standardized betas (β). Statistical tests of significance were based on unstandardized regression coefficients, because standardizing requires a stochastic adjustment that is subject to sampling error (Preacher, 2003).

We replicated our study by use of a holdout sample. We randomly selected two thirds of the entire sample (n = 56,988) for analyses and reserved the remaining one third of the sample (n = 28,313) for replication. Because the results of these analyses were so similar, we present results from the larger sample except where otherwise indicated. Because of missing data, between 83% and 86% of cases were useable for any given analysis.

Results

Higher means on delinquency, impulsivity, and callousness were obtained for boys relative to girls (see Table 2). Impulsivity, callousness, and neighborhood risk were all moderately and significantly related to delinquency (see Table 3), indicating that delinquent behavior was more common among impulsive and callous adolescents and adolescents living in higher risk neighborhoods. These relations were approximately equal for boys and girls.

Relations Among Delinquency, Impulsivity, and Neighborhood Risk

Age, gender, and race were all uniquely associated with delinquent behavior (see Table 4, Step 1). Delinquent behavior was more common among older, male, and non-White adolescents.

Impulsivity and neighborhood risk were each found to uniquely predict delinquent behavior (see Table 4, Step 2), over and above the effects of age, gender, and race. More impulsive adolescents as well as adolescents from higher risk neighborhoods tended to engage in more delinquent behavior than less impulsive adolescents and adolescents from lower risk neighborhoods. However, results suggested the presence of a two-way interaction between impulsivity and neighborhood risk in predicting delinquency, when we controlled for all effects in Steps 1 and 2 (see Table 4, Step 3). The effect of impulsivity on delinquency was greater for adolescents living in higher risk neighborhoods than for adolescents living in lower risk neighborhoods. This interaction is depicted in Figure 1. Simple slope analyses revealed significant effects of impulsivity in high-risk (β = .62, t = 78.40, p < .0001) and

low-risk (β = .35, $t = 40.69$, $p < .0001$) neighborhoods and significant effects of neighborhood risk in high-impulsive (β = .37, $t = 49.95$, $p < .0001$) and low-impulsive (β = .09, $t = 10.25$, $p < .0001$) youth.

The baseline model was extended to test gender differences in the relations among delinquency, impulsivity, and neighborhood risk. After we controlled for all effects in Steps 1 and 2, each two-way interaction among impulsivity, neighborhood risk, and gender uniquely predicted delinquency (see Table 4, Step 3). These results showed, again, that delinquency was most common among impulsive adolescents from high-risk neighborhoods and revealed that the effect of impulsivity as well as the effect of neighborhood risk on delinquent behavior was greater for boys than for girls. Simple slope analyses revealed that impulsivity and neighborhood risk were significantly associated with delinquency for both boys and girls. There was also evidence of a three-way interaction among impulsivity, neighborhood risk, and gender (see Table 4, Step 4), after we controlled for all effects in Steps 1, 2, and 3. Neighborhood context affected the impact of impulsive personality traits on delinquency more for girls than for boys. Results of simple slope analyses revealed a significant moderating effect of neighborhood on the relation between impulsivity and delinquency for both boys ($t = 13.00$, $p < .0001$) and girls ($t = 24.33$, $p < .0001$).

Relations Among Delinquency, Callousness, and Neighborhood Risk

Results for callous personality traits were similar to the results for impulsivity (see Table 5). The effect of callousness on delinquency was greatest in high-risk neighborhoods. Simple slope analyses revealed a significant effect of callousness on delinquency in high-risk (β = .55, $t = 78.30$, $p < .0001$) and low-risk (β = .27, $t = 31.50$, $p < .0001$) neighborhoods and a significant effect of neighborhood risk in adolescents high (β = .42, $t = 58.36$, $p < .0001$) and low (β = .14, $t = 16.38$, $p < .0001$) in callousness. Further, there was partial evidence of a gender difference in the moderating effect of neighborhood on the relation between callousness and delinquency, as the interaction was significant in the larger sample but not in the holdout sample. In the larger sample, neighborhood context affected the impact of callous personality traits on delinquency more for girls than for boys (see Figure 2). Results of simple slope analyses revealed a significant moderating effect of neighborhood on the relation between callousness and delinquency for both boys ($t = 15.90$, $p < .0001$) and girls ($t = 24.38$, $p < .0001$).

Unique Effects of Impulsivity and Callousness in Predicting Delinquency

Impulsivity, callousness, and neighborhood risk were each uniquely associated with delinquency (see Table 6, Step 2). The interaction of impulsivity with neighborhood risk decreased only slightly after we controlled for callousness (see Table 6, Step 3a), and the interaction of callousness with neighborhood risk did not decrease after we controlled for impulsivity (see Table 6, Step 3b). Further, the interaction of impulsivity with neighborhood risk was uniquely associated with delinquency over and above the interaction of callousness with neighborhood risk, and the interaction of callousness with neighborhood risk was uniquely associated with delinquency over and above the interaction of impulsivity with neighborhood risk (see Table 6, Step 3c).

Relation Between Neighborhood Risk and Rural/Urban Residency

Adolescents from urban neighborhoods reported higher levels of neighborhood risk than adolescents from more rural neighborhoods. The mean level of neighborhood risk for adolescents living on a farm was 1.48 ($SD = 1.82$), living in the country but not on a farm was 1.79 (SD=1.97), living in a small city or town of population < 5,000 was 1.81 (SD = 1.97), living in a medium-sized city of population 5,000–30,000 was 2.02 (SD=2.10), and living in a large city of population > 30,000 was 2.24 ($SD = 2.20$).

Even though neighborhood risk was correlated with rural versus urban residency, the effect of neighborhood risk and the interactive effect of neighborhood and personality risk on delinquency were still evident even after we controlled for the effect of rural/urban residency. Parameter estimates for each effect reported in Tables 4–6 did not change at all after we controlled for rural/urban residency, regardless of how rural/urban residency was coded.[3] The effect of urbanicity was not a major focus of this article because: (a) Iowa is a relatively rural state, and (b) our measure of residency did not discriminate among cities with a population of > 30,000. Detecting differences between rural and urban settings may have been limited in our study of Iowa adolescents.

Discussion

The purpose of the present study was to determine whether neighborhood context moderated the relation between personality risk and delinquency in a population-based sample of boys and girls from the state of Iowa. We found that the association between both impulsive and callous personality traits and delinquency was greater for adolescents from neighborhoods characterized by low informal social control and social cohesion than for adolescents from more protective neighborhoods. These results are conceptually similar to those reported by Lynam et al. (2000), who found that adolescents from low-SES neighborhoods evidenced an exaggerated effect of impulsivity on delinquency, but they contrast with the general finding reported by Vazsonyi et al. (2006) that the association between impulsivity and delinquency is invariant across neighborhood SES. Earlier, we suggested that these discrepant findings may be due to differences in measures across the two studies. Our findings build on the results from Lynam et al. (2000) by demonstrating that it is not only neighborhood poverty that elevates risk for delinquency but also low neighborhood informal social control and social cohesion. In fact, some evidence suggests that low neighborhood social control and social cohesion may be one mechanism by which neighborhood poverty exerts its effect on delinquency (Sampson et al., 1997).

Results of the present study also suggested small gender differences in the relations among impulsivity, callousness, neighborhood risk, and delinquency. Research on gender differences in the correlates of antisocial behavior has revealed fewer differences than similarities (Moffitt et al., 2001). Thus, that gender differences emerged in this study is worth noting. Impulsivity, callousness, and neighborhood risk all appeared to be greater risk factors for delinquency for boys than for girls. Theorists have proposed that a greater association between neighborhood risk factors and delinquency among boys may be a result of greater exposure to these neighborhood factors on account of differential parenting practices (Kroneman, Loeber, & Hipwell, 2004). Girls tend to be monitored and supervised more closely and spend more time at home than boys, thus limiting their exposure to neighborhood risk factors (Kroneman et al., 2004). In future research on gender differences in neighborhood effects on adolescent delinquency, important mechanisms, such as parenting practices, should be explored. Further, we found that the moderating effect of neighborhood context on personality risk for delinquency was greater for girls than for boys, which suggests that reducing an adolescent's exposure to high-risk neighborhoods, perhaps through parenting practices, will attenuate the impact of impulsive and callous personality traits on delinquency more for girls than for boys.

[3]The two coding schemes for rural/urban residency were: (a) a single dichotomous indicator of rural/urban residency with living on a farm or in the country coded as rural dwelling and all others coded as urban dwelling, and (b) a set of two dummy codes corresponding to a comparison of adolescents living on a farm or in the country to adolescents living in a city with a population greater than 30,000, and a comparison of adolescents living in a city of population less than 30,000 to adolescents living in a city with a population greater than 30,000.

The interactions reported in this study were small in that they only accounted for about 1% of the variance in delinquency. However, interaction effects are notoriously difficult to detect in field research, and an interaction accounting for even 1% of the variance, as is common in field research, should not be dismissed as unimportant (McClelland & Judd, 1993). As McClelland and Judd (1993) demonstrated, an interaction accounting for 1% of the variance, even in a very large field study, might be more reflective of a lack of optimal research design rather than a trivial effect. That is, the small interactions in our study may be due to the lack of naturally occurring extremes on predictive variables, such as impulsivity, callousness, and neighborhood risk. Low variability in these predictive variables resulted in interaction terms with small variances and little ability to reduce error variance. In an optimally designed study, where variability on predictive variables is maximized, the interactions reported in our study would account for much more variance. Further, though the interactions in our study were small, the interactions of impulsivity and callousness with neighborhood risk were comparable in size to those reported by Lynam et al. (2000), who reported interactions accounting for between 0.1% and 2.8% of the variance in delinquency, and larger than those reported by Vazsonyi et al. (2006). Interactions of impulsivity and callousness with neighborhood risk were also reliable within our study as they were apparent in both the larger sample and the smaller holdout sample. Taken together, it appears to be a fairly robust phenomenon that individual-level risk factors for delinquency, such as impulsivity and callousness, are accentuated in high- risk neighborhoods.

There are several notable limitations to the present study. The first is the measurement of impulsivity and callousness, which were each assessed with four and three items, respectively. The measurement error in these predictive variables likely attenuated effect sizes. Second, unlike the two previous studies by Lynam et al. (2000) and Vazsonyi et al. (2006), our measure of neighborhood risk was based on adolescent self-report of their neighborhood environment, rather than census SES data. This allowed us to directly assess the adolescent's experience of neighborhood informal social control and social cohesion—the mechanism by which neighborhood disadvantage is thought to exert its influence on delinquent behavior. However, it is possible that the observed moderating effects of neighborhood context on the relation between personality risk and delinquency could be explained, either partially or completely, by a person/environment correlation. For example, the association between neighborhood risk and delinquency may be greater for impulsive and callous adolescents because impulsive and callous adolescents may elicit poor reactions from their neighbors rather than the alternative explanation that neighborhood context exacerbates or suppresses the effect of impulsive and callous traits on delinquency. However, our data suggest that the effect of a person/environment correlation is probably small as boys were significantly more impulsive, callous, and delinquent than girls, but there was no gender difference in self-reported neighborhood environment.

A third limitation is that we did not take into account family influences. Families have, to some extent, chosen to live in the neighborhoods in which they reside. Thus, it was not clear whether or to what extent particular characteristics of families could account for the greater effect of impulsivity or callousness on delinquency in high-risk compared to low-risk neighborhoods. However, preliminary research suggests that self-selection effects do not fully account for neighborhood effects on the development of antisocial behavior (Ingoldsby & Shaw, 2002), and most studies find that neighborhoods still account for variance in delinquency after controlling for demographic and familial influences (Leventhal & Brooks-Gunn, 2000).

A fourth limitation of this study is that we could not examine whether different facets of impulsivity (i.e., urgency, lack of perseverance, lack of premeditation, sensation seeking) differentially relate to delinquency or whether the moderating effect of neighborhood

context on the relation between impulsivity and delinquency depends on a particular facet of impulsivity. Yet, the robustness of the moderating effect of neighborhood context on personality risk for delinquency is suggested by the consistency of the findings for both impulsive and callous personality traits.

Finally, we did not have data linking adolescents to their neighborhoods, so we could not account for the clustered nature of the data. As such, standard errors of effects may have been downwardly biased, which may have resulted in artificially inflated tests of significance. However, by randomly assigning adolescents to the larger sample and the smaller holdout sample, we may have reduced some of the clustering. Further, because of the holdout sample, we did not need to rely on statistical significance testing. The magnitude of the effects from the smaller holdout sample was largely the same as that from the larger sample.

The results of our study have significant implications for prevention: increasing informal social control and social cohesion within a neighborhood may reduce delinquent behavior among adolescents characterologically predisposed toward delinquency. Neighborhoods characterized by high levels of informal social control and social cohesion are occupied by residents willing to monitor and supervise adolescents and intervene with delinquent adolescents to prevent crime for the benefit of the community. Though protective neighborhood environments may reduce delinquent behavior in at-risk adolescents, it is unclear whether such effects will persist into adulthood. On the one hand, it is possible that impulsive and callous adolescents in protective neighborhoods may attempt as many delinquent acts as their counterparts in high-risk neighborhoods, but they may merely be prevented from completing the delinquent acts. Thus, these adolescents may remain at risk for antisocial behavior in adulthood when there are greater opportunities for engaging in criminal behavior. On the other hand, the prevention of or reduction in delinquent behavior in at-risk adolescents may provide these adolescents with greater prosocial opportunities in adulthood, because they have not acquired the cumulative negative consequences that serve to maintain antisocial behavior (Moffitt, 1993). Moreover, protective neighborhoods may socialize at-risk adolescents toward prosocial behaviors, thereby redirecting the influence of impulsive and callous traits toward more socially acceptable activities.

Acknowledgments

This research was supported by the Iowa Consortium for Substance Abuse Research and Evaluation; Higher Plain, Inc. (with major funding provided by the U.S. Department of Education; Iowa Statewide Data Project, Grant S184G980007); Iowa Department of Education; Iowa Department of Public Health; Office of Drug Control Policy (formerly Governor's Alliance on Substance Abuse); and Office of Criminal and Juvenile Justice Planning. Preparation of this article was supported in part by National Institutes of Health Grants AA13526 and F31MH079683. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Mental Health or the National Institutes of Health.

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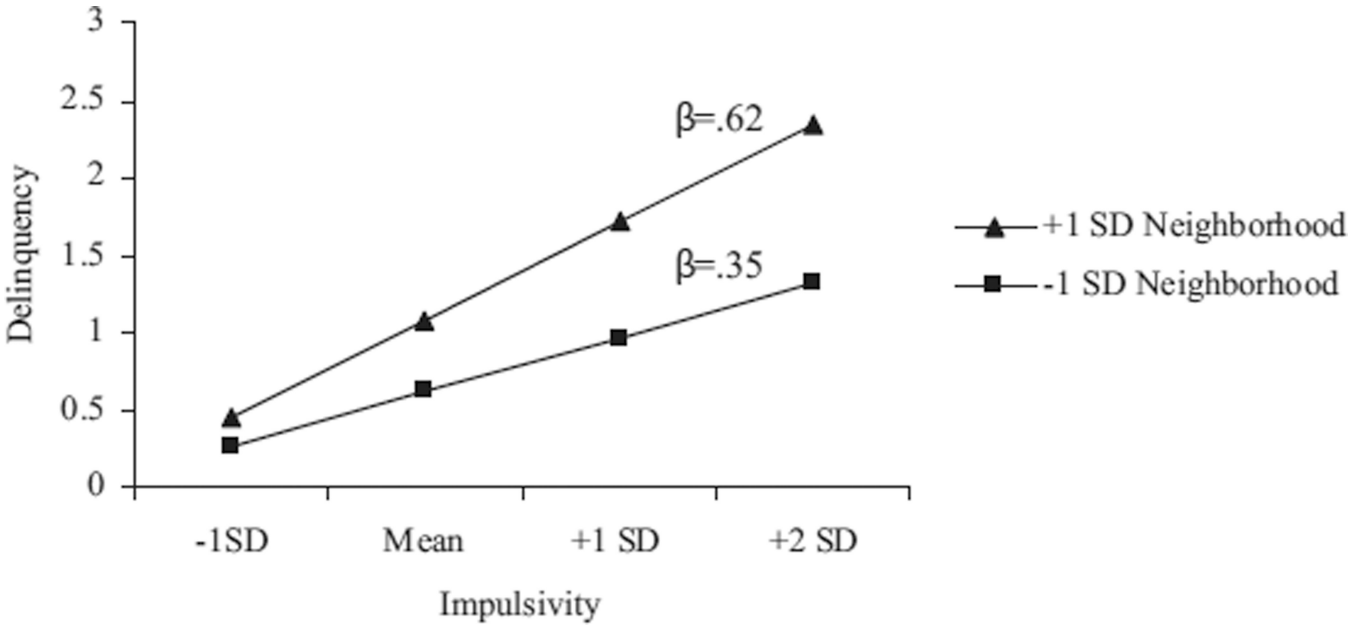

Figure 1.

The interaction of impulsivity and neighborhood risk in predicting delinquency. This plot is based on the larger sample. High risk neighborhood = 1 standard deviation above the mean on neighborhood risk. Low risk neighborhood = 1 standard deviation below the mean on neighborhood risk.

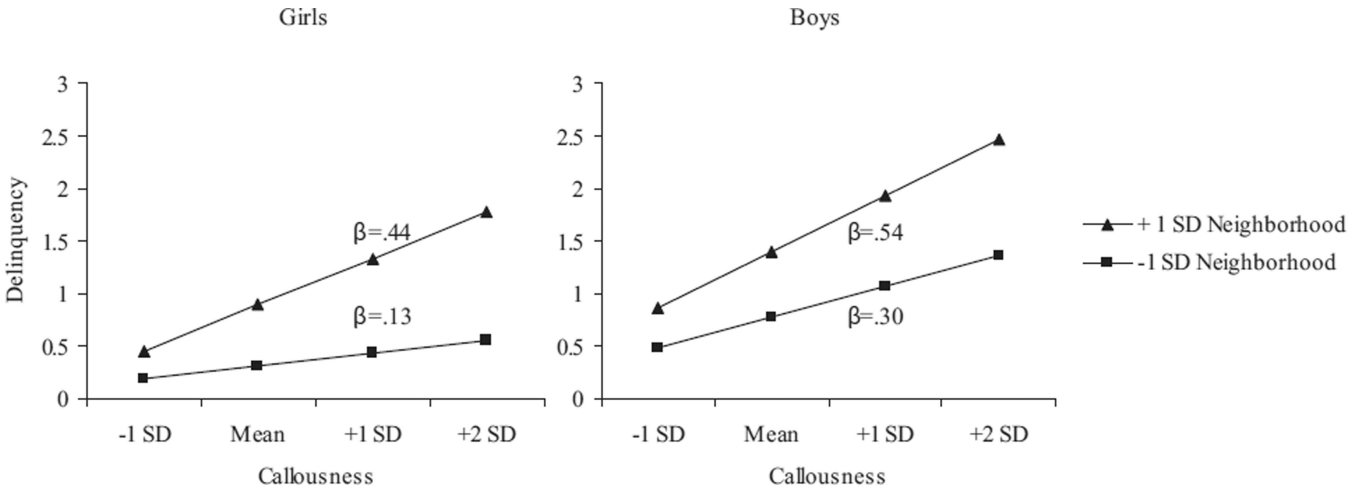

Figure 2.

The three-way interaction of callousness, neighborhood risk, and gender in predicting delinquency. This plot is based on the larger sample. High risk neighborhood = 1 standard deviation above the mean on neighborhood risk. Low risk neighborhood = 1 standard deviation below the mean on neighborhood risk.

Table 1

Prevalence of Delinquent Behaviors and Neighborhood Risk Indicators

Indicator	%
Delinquent behavior	
Verbally threatened to physically harm someone (+)	22.33
Beaten up or fought someone because they made you angry (+)	22.00
Stolen something (+)	18.04
Damaged property just for fun (like breaking windows) (+)	12.18
Disciplined at school for fighting, theft, or damaging property (+)	9.67
Carried a gun, knife, club or other weapon to school (+)	4.80
Used a weapon, force, or threats to get money or things (+)	2.91
Neighborhood risk	
My neighbors get along well with each other (−)	14.98
If someone in my neighborhood or community saw me doing something wrong, they would tell one of my parents (or adults who live with me) (−)	19.01
Adults in my community care about people my age (−)	22.32
There are enough places for kids my age to go that are alcohol and drug free (−)	29.02
Adults in my neighborhood or community help me when I need help (−)	30.84
Adults in my neighborhood or community let me know they are proud of me (−)	35.97
Adults in my neighborhood or community spend time talking with me (−)	38.72

Note. The symbols + and − refer to affirmative and negative responses, respectively, to the item. The prevalences correspond to the direction of the response (+/−) listed by each item.

Table 2

Mean Delinquency, Neighborhood Risk, Impulsivity, and Callousness Scale Scores by Gender

Scale	Boys	Girls
Delinquency	1.23 (1.64)	0.59 * (1.13)
Neighborhood Risk	1.90 (2.06)	1.89 (2.01)
Impulsivity	4.39 (1.88)	3.77 * (1.87)
Callousness	2.22 (1.67)	1.60 * (1.41)

Note. Standard deviations are in parentheses

* $p < .0001$.

Table 3

Zero-Order Correlations of Neighborhood Risk, Impulsivity, and Callousness With Delinquency

	Delinquency	
Risk factor	**Boys**	**Girls**
Neighborhood Risk	.33	.32
Impulsivity	.40	.40
Callousness	.37	.32

Note. $p < .0001$ for every correlation.

Table 4

Hierarchical Regression Analyses Predicting Delinquency From Impulsivity and Neighborhood Risk

Step and variable	β	*p*	R^2
Baseline model			
1. Race	−.47/−.46	<.0001/<.0001	.08/.09
Age	.22/.22	<.0001/<.0001	
Gender	.62/.63	<.0001/<.0001	
2. Impulsivity	.44/.43	<.0001/<.0001	.2335/.2334
Neighborhood Risk	.26/.26	<.0001/<.0001	
3. Impulsivity × Neighborhood Risk	.14/.15	<.0001/<.0001	.2444/.2445
Augmented gender differences model			
1. Same as above			
2. Same as above			
3. Impulsivity × Neighborhood Risk	.13/.13	<.0001/<.0001	.2493/.2492
Impulsivity × Gender	.16/.15	<.0001/<.0001	
Neighborhood Risk × Gender	.07/.09	<.0001/<.0001	
4. Impulsivity × Neighborhood Risk × Gender	−.03/−.05	.005/.001	.2494/.2495

Note. N = 47,782 for larger sample; N = 23,777 for smaller holdout sample. Estimates before the slash (/) are for the larger sample, and estimates after the slash are for the smaller holdout sample.

Table 5

Hierarchical Regression Analyses Predicting Delinquency From Callousness and Neighborhood Risk

Step and variable	β	*p*	R^2
Baseline model			
1. Same as Table 4, Step 1			
2. Callousness	37/.36	<.0001/<.0001	.2124/.2122
Neighborhood Risk	.29/.29	<.0001/<.0001	
3. Callousness × Neighborhood Risk	.14/.14	<.0001/<.0001	.2243/.2244
Augmented gender differences model			
1. Same as above			
2. Same as above			
3. Callousness × Neighborhood Risk	.13/.13	<.0001/<.0001	.2263/.2266
Callousness × Gender	.12/.13	<.0001/<.0001	
Neighborhood Risk × Gender	.03/.03	.01/NS	
4. Callousness × Neighborhood Risk × Gender	−.03/−.01	.01/NS	.2264/.2266

Note. N = 48,965 for larger sample; N = 24,386 for smaller holdout sample. Estimates before the slash (/) are for the larger sample, and estimates after the slash are for the smaller holdout sample. NS = nonsignificant.

Table 6

Hierarchical Regression Analyses Predicting Delinquency From Impulsivity, Callousness, and Neighborhood Risk

Step and variable	β	*p*	R^2
1. Same as Table 4, Step 1			
2. Impulsivity	.34/.34	<.0001/<.0001	.2523/.2484
Callousness	.23/.22	<.0001/<.0001	
Neighborhood Risk	.22/.22	<.0001/<.0001	
Steps 1 and 2 + Step 3a			
3a. Impulsivity × Neighborhood Risk	.13/.13	<.0001/<.0001	.2620/.2579
Steps 1 and 2 + Step 3b			
3b. Callousness × Neighborhood Risk	.15/.15	<.0001/<.0001	.2656/.2617
Steps 1 and 2 + Step 3c			
3c. Impulsivity × Neighborhood Risk	.07/.07	<.0001/<.0001	.2676/.2636
Callousness × Neighborhood Risk	.11/.11	<.0001/<.0001	

Note. N = 47,406 for larger sample; N = 23,585 for smaller holdout sample. Estimates before the slash (/) are for the larger sample, and estimates after the slash are for the smaller holdout sample.