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Youth Withdrawal Moderates the Relationships between Neighborhood Factors and Internalizing Symptoms in Adolescence

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Abstract

Adolescents higher in temperamental withdrawal are at risk for anxiety and depressive symptoms; however, not all youth higher in withdrawal exhibit internalizing symptoms, suggesting that contextual factors may influence these relationships. We examined whether youth withdrawal moderates the relationships between neighborhood processes (crime, social cohesion) and internalizing symptoms and whether findings were consistent with diathesis-stress or differential susceptibility hypotheses. Participants were 775 adolescents ($M=15.50 \pm 0.56$ years, 72% male, 76% White). Adolescents higher in withdrawal manifested higher internalizing symptoms in the context of lower neighborhood crime and lower neighborhood social cohesion than youth lower in withdrawal, supporting diathesis-stress. These findings elucidate neighborhood processes associated with internalizing symptoms, which can inform models of risk and resilience for these symptoms among children who differ in temperamental withdrawal.

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Authors' Contributions

JR contributed to the theoretical framework for choosing the study variables and writing the manuscript. JR also ran the analyses. DD edited the manuscript to ensure clarity and accuracy of the content and analyses. MR assisted in study design and coordination of the study and provided suggestions for revision of the manuscript. All authors have read and approved the final manuscript.

Conflicts of Interest

The authors report no conflicts of interest.

Keywords

temperament; neighborhood crime; neighborhood social cohesion; differential susceptibility; diathesis-stress; anxiety and depressive symptoms

Introduction

Anxiety and depressive symptoms often co-occur, are associated with additional problems in adolescence (e.g., decreased academic performance, eating disorders, externalizing problems, substance use), and may persist into adulthood (Anderson & Hope, 2008; Masten et al., 2005; Shapira & Courbasson, 2011). Changes associated with the transition to adolescence may be perceived as stressful among some youth, resulting in increased reactivity and susceptibility to anxiety and depressive symptoms (Holder & Blaustein, 2014). Because heterogeneity exists in the course and stability of youth's anxiety and depressive symptoms, it is important to identify intrapersonal attributes and contextual conditions that may increase risk for or resilience from these symptoms to inform prevention and intervention efforts (Zahn-Waxler, Klimes-Dougan, & Slaterry, 2000).

Anxiety and depressive symptoms are linked to individual differences in temperament (Degnan, Almas, & Fox, 2010; Nigg, 2006). Temperament refers to biologically based individual differences that influence one's behavioral tendencies, such as an individual's adaptability to new situations or distractibility (Thomas & Chess, 1984). One facet of temperament that is often associated with internalizing symptoms is withdrawal (Hirshfeld-Becker et al., 2008; Pérez-Edgar et al., 2010). Similar to the construct of state-dependent or situational withdrawal, which refers to one's avoidance of specific contexts (e.g., withdrawal due to peer rejection; Rubin, Coplan, & Bowker, 2009), trait or temperamental withdrawal refers to a relatively stable, enduring pattern of displaying low approach behaviors and vigilance when exposed to novel stimuli (Fox, Henderson, Marshall, Nichols, & Ghera, 2005). There are numerous reasons why temperamental withdrawal may be linked to internalizing symptoms among adolescents. Compared to youth with lower levels of temperamental withdrawal, youth with higher levels of temperamental withdrawal may avoid and/or exhibit fear and distress when exposed to unfamiliar stimuli, increasing risk for anxiety/depressive problems. Moreover, youth higher in withdrawal may experience hypervigilance toward ambiguous or threat-related stimuli even when the threat has dissipated, increasing risk for anxiety symptoms (Degnan, Almas, & Fox, 2010; Fox et al., 2005; Pérez-Edgar et al., 2010). Youth higher in withdrawal also may be uncomfortable conversing with unfamiliar peers or adults, increasing the likelihood for peer rejection, subsequent social withdrawal, and negative self-concept, which have been associated with depressive symptoms (Hirshfeld-Becker et al., 2008).

Despite these associations, not all youth with higher levels of temperamental withdrawal exhibit anxiety or depressive symptoms, suggesting that contextual factors may influence these associations. One theoretical framework for understanding associations among context, intrapersonal attributes, and symptoms is the diathesis-stress model. The diathesis-stress model indicates that some individuals possess a diathesis or constitutional

predisposition for developing psychopathology, and that when faced with a stressor, may have a greater likelihood of developing psychological symptoms relative to individuals without this diathesis (Salomon & Jin, 2013). Support for the diathesis-stress model comes from research that indicates youth with difficult temperaments evidenced greater adjustment problems in the context of higher levels of negative parenting practices (Kochanska, Kim, Barry, & Philibert, 2011; Yaman, Mesman, van IJzendoorn, & Bakermans-Kranenburg, 2010). With regard to outcomes associated with temperamental withdrawal, exposure to proximal (e.g., insensitive caregiving, peer rejection) or distal (e.g., neighborhood crime) contextual stressors was associated with higher levels of internalizing symptoms among individuals with higher temperamental withdrawal compared to individuals lower in this temperamental feature (Kliewer et al., 2004; Kochanska et al., 2011; Mezulis, Hyde, & Abramson, 2006; Sanson & Smart, 2004).

In contrast to the diathesis-stress model, the differential susceptibility hypothesis maintains that children vary in their sensitivity to the environment and the extent to which they are affected by external stimuli (Belsky & Pluess, 2009; Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2011). Consistent with the differential susceptibility hypothesis, some youth possess attributes that make them more reactive to environments, whether positive or negative (Belsky & Pluess, 2009). Thus, among youth who possess attributes that increase their sensitivity to the environment, exposure to an unfavorable environment may elicit greater impairments in adjustment, whereas exposure to supportive environments may promote enhanced adjustment relative to youth lower in sensitivity. Evidence for differential susceptibility indicates that, when exposed to more sensitive caregivers, youth with difficult temperaments manifested fewer behavior problems relative to youth with easy temperaments (Bradley & Corwyn, 2008; Stright, Gallagher, & Kelley, 2008).

Consistent with the differential susceptibility hypothesis, youth with higher levels of temperamental withdrawal may experience greater maladjustment when exposed to resource-limited environments, but enhanced adjustment in the context of resource-rich environments (Belsky & Pluess, 2009). That is, youth higher in temperamental withdrawal may have lower sensory thresholds and greater arousability when exposed to sensory stimuli, which may make them more susceptible to and affected by environmental contexts (Aron & Aron, 1997). Relative to youth lower in temperamental withdrawal, youth higher in withdrawal may experience heightened emotional reactions to sensory stimulation across contexts, which has been associated with increased cognitive processing of events (e.g., increased reflection and appraisal of experiences), which may lead to heightened learning and memory formation (Aron, Aron, & Jagiellowicz, 2012). Because youth higher in withdrawal may be more autonomically responsive to stimuli and engage in greater reflection of experiences, they may be more reactive to both positive and negative contexts. Evidence of differential susceptibility among youth higher in withdrawal indicates that these youth manifest lower internalizing symptoms when exposed to positive parenting practices, and higher internalizing symptoms when exposed to negative parenting practices relative to youth lower in withdrawal (van der Voort et al., 2014; Williams et al., 2009). Whereas some research has examined the associations between proximal factors such as parenting and internalizing symptoms among youth higher in withdrawal (e.g., van der Voort et al., 2014),

few studies have explored the association of broader contextual processes, such as the neighborhood, with internalizing symptoms among youth who differ in temperamental withdrawal.

The neighborhood is a critical factor to consider in adolescents' mental health for a number of reasons. First, during adolescence parents often give their children more autonomy, resulting in greater exposure to extrafamilial influences within the neighborhood (Steinberg & Morris, 2001). Second, neighborhoods may influence adolescents' self-efficacy, access to resources, and exposure to deviant or prosocial peers, which, in turn, may buffer or exacerbate risk for anxiety and depressive symptoms (Leventhal & Brooks-Gunn, 2000), though research is wanting. Highly cohesive neighborhoods may have numerous role models, opportunities for prosocial interactions, and greater community supervision of youth's behavior, whereas more disorganized neighborhoods may have fewer institutional resources (e.g., community centers), lower community supervision of youth behavior, and higher levels of crime (Nash & Bowen, 1999; Ross & Mirowsky, 2009).

Research to date has indicated that exposure to negative neighborhood characteristics, such as neighborhood crime, may increase feelings of fear and concern regarding witnessing or experiencing victimization, and consequently anxiety and depressive symptoms (Furr-Holden, Milam, Young, MacPherson, & Lejuez, 2010; Ross & Mirowsky, 2009). These effects may be especially pronounced among youth who exhibit higher levels of temperamental withdrawal. Nevertheless, few studies have explored whether the associations between neighborhood crime and youth internalizing symptoms differ based on youth's temperamental features, such as temperamental withdrawal. The extant literature indicates that, in the context of higher neighborhood problems, children higher in temperamental fear and/or negative affect manifest elevated internalizing symptoms compared to children lower in these temperamental features (Bush, Lengua, & Colder, 2010; Colder, Lengua, & Fite, 2006); however, no studies have explored whether youth higher in temperamental withdrawal are at risk for anxiety and depressive symptoms in the context of varying levels of neighborhood crime during adolescence. It is possible that youth higher in withdrawal may have greater physiological and emotional reactivity when faced with adversity such as neighborhood crime, which may subsequently increase these youth's stress responsivity (Compas, Connor-Smith, & Jaser, 2004; Degnan & Fox, 2007), increasing risk for anxiety and depressive symptoms. Moreover, exposure to communities higher in crime may make youth higher in withdrawal feel fearful and experience distress in ambiguous or innocuous contexts, increasing risk for internalizing symptoms. Youth higher in temperamental withdrawal may also experience heightened emotional reactivity in the context of higher levels of neighborhood crime; thus, these youth may minimize their exposure to communities that experience higher levels of crime, decreasing risk for anxiety/depressive symptoms.

In addition to the paucity of research evaluating links between neighborhood crime and internalizing symptoms among youth who differ in withdrawal, few studies have examined whether positive neighborhood characteristics, such as neighborhood social cohesion, may buffer or attenuate risk for internalizing symptoms among youth with this temperament feature. Neighborhood social cohesion can be defined by the presence of social control and

order, positive social interactions among neighbors, the availability of role models, and a sense of belonging (Forrest & Kearns, 2001; Riina, Martin, Gardner, & Brooks-Gunn, 2013). Higher levels of neighborhood social cohesion are associated with lower levels of depressive symptoms among youth (Anashensel & Sucoff, 1996). More cohesive neighborhoods may be perceived as safer, fostering a sense of security among youth; this cohesion may be particularly protective among youth higher in withdrawal, as these youth may be more sensitive to environmental input (Schmidt & Miskovic, 2013). It is possible that, among youth who withdraw from and experience higher levels of distress in novel contexts, the presence of community support may mitigate feelings of discomfort, decreasing risk for anxiety and depressive symptoms. Living in a cohesive neighborhood characterized by shared values, trust, and support networks may decrease one's stress responsivity, thus mitigating risk for internalizing problems among youth higher in temperamental withdrawal (Leventhal & Brooks-Gunn, 2000).

In addition to these gaps, there is limited previous work examining whether these neighborhood processes differentially predict internalizing symptoms based on child sex. Results of one study indicate that, in the context of lower collective efficacy and higher neighborhood disorder, girls exhibited higher levels of internalizing symptoms than boys (Browning, Soller, Gardner, & Brooks-Gunn, 2013). Contrary to the above findings, it is possible that girls may be less affected by the neighborhood context compared to boys given that parents generally monitor and place greater restrictions on girls' behaviors; as such, girls may spend more time at home and have less time in the neighborhood relative to boys (Browning, Leventhal, & Brooks-Gunn, 2005; Fagan & Wright, 2011). Boys may be just as affected by the neighborhood context as girls, but based on the available research, it is unclear whether this is the case.

There is a dearth of research, furthermore, exploring whether associations among youth temperamental withdrawal, neighborhood processes, and internalizing symptoms differ based on children's sex. Research has shown that girls tend to exhibit greater withdrawal and internalizing symptoms relative to boys during middle childhood and early adolescence (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006; Zahn-Waxler et al., 2000). Thus, among girls higher in withdrawal, exposure to higher neighborhood crime and lower neighborhood social cohesion may increase risk for internalizing symptoms relative to girls lower in withdrawal. However, because boys may spend more time out in the neighborhood relative to girls (Browning, Leventhal, & Brooks-Gunn, 2005), exposure to higher neighborhood crime and lower social cohesion may heighten fear and hypervigilance and, consequently, may be associated with internalizing symptoms among boys higher in temperamental withdrawal. In contrast, boys and girls higher in withdrawal may receive enhanced benefit from lower neighborhood crime and higher neighborhood social cohesion, potentially decreasing risk for internalizing problems relative to youth lower in withdrawal.

The Current Study

We sought to address several gaps in the literature. First, although much of the prior research on neighborhood features has considered negative neighborhood characteristics (e.g., Furr-Holden et al., 2010; Kliewer et al., 2004; Leventhal & Brooks-Gunn, 2000), we

examined whether both negative and positive neighborhood features, specifically neighborhood crime and social cohesion, were differentially associated with internalizing symptoms among youth varying in temperamental withdrawal. Second, we explored these associations during adolescence, a developmental period characterized by extensive biological and contextual changes. Third, although previous studies have examined the influence of more proximal variables such as parenting (e.g., Williams et al., 2009), we investigated the associations of broader contextual factors (i.e., neighborhood crime and social cohesion) with internalizing symptoms among youth varying in withdrawal. Fourth, we explored whether links between neighborhood crime and social cohesion on youth's anxiety and depressive problems were consistent with diathesis-stress or differential susceptibility theoretical frameworks. Fifth, we examined sex differences in the associations between neighborhood social cohesion and crime with internalizing symptoms among youth varying in withdrawal.

In line with both the diathesis-stress and differential susceptibility models, we propose that, when exposed to higher neighborhood crime or lower social cohesion, adolescents higher in withdrawal will display greater anxiety and depressive symptoms than adolescents lower in withdrawal. Consistent with the differential susceptibility hypothesis, we propose that, in the context of lower neighborhood crime or higher social cohesion, adolescents higher in withdrawal will exhibit lower levels of anxiety and depressive symptoms than youth lower in withdrawal.

Method

Participants

The current study utilizes a sample of youth initially recruited at ages 10-12 years based on the presence or absence of a lifetime diagnosis of substance use disorder (SUD) (other than alcohol use disorder) or other psychiatric disorder in the biological father. Data were obtained for 775 youth ($M = 10.95 \pm 0.88$ years; 69% male; 76% Caucasian, 21% African American, 3% multiracial). Youth were classified into one of three groups according to their biological father's lifetime history of psychiatric disorders at the initial recruitment: (a) paternal history of SUD, (b) paternal history of other psychiatric diagnosis not including SUD, or (c) no lifetime paternal history of psychiatric diagnosis. Initial recruitment occurred from 1990-2004. In the current sample, the median household income was \$27,311 (range = \$4,999 - \$123,128; $M = \$28,512$, $SD = \$13,521$). Thus, most families were from a low- to middle-class socioeconomic status (SES) based on SES indices relevant to the time period during which these data were collected.

Data for the present study were drawn from assessments occurring when participants were aged 14-16 ($n = 631$; $M = 15.50 \pm 0.56$ years; 72% male; 76% White, 22% African American, 2% multiracial). The sample includes more males than females because recruitment of females began four years after the initial project began. Recruitment sources and procedures, as well as inclusion and exclusion criteria, are described in detail elsewhere (Tarter & Vanyukov, 2001).

Procedure

The study was approved by the University of Pittsburgh Institutional Review Board. Prior to study participation, participants were provided with a detailed description of the study. The custodial parent provided informed consent and youth provided informed assent. Both the parent and youth were informed that their privacy was protected by a Certificate of Confidentiality issued to the Center for Education and Drug Abuse Research from NIDA. Adolescents completed self-report questionnaires related to temperament, neighborhood social cohesion, and anxiety and depressive symptoms. Neighborhood crime data were extracted from state Uniform Crime Reports based on municipality or neighborhood within a municipality in which the custodial parent resided in the year in which the research assessment was conducted. Upon completion of each visit, participants were financially compensated.

Measures

Paternal Diagnostic Status—For the purposes of the present study, we assigned youth into one of two groups: youth with fathers with a lifetime history of SUD or psychiatric disorder (44%) or youth with fathers without psychiatric diagnosis (56%). Diagnoses were based on an extended version of the Structured Clinical Interview for *DSM-III-R* (Spitzer, Williams, & Gibbon, 1987).

Temperamental Withdrawal—Adolescent temperamental withdrawal was assessed using the 7-item withdrawal subscale ($\alpha=.70$) of the Dimensions of Temperament Survey-Revised (DOTS-R; Windle & Lerner, 1986). Items are rated on a scale from 1 (*usually false*) to 4 (*usually true*). Sample items are “My first reaction is to reject something new or unfamiliar to me” and “On meeting a new person, I tend to move towards him or her.” Higher scores reflect lower withdrawal. The DOTS-R has shown strong reliability and moderate levels of test-retest stability (Windle, 1992), convergent validity with other temperament measures (Goldsmith, Rieser-Danner, & Briggs, 1991), and concurrent validity with personality traits (Windle, 1989).

Neighborhood Social Cohesion—Neighborhood social cohesion was assessed using the Neighborhood Cohesion Instrument (Buckner, 1988), which includes 18 items ($\alpha=.93$) rated on a scale from 1 (*strongly agree*) to 5 (*strongly disagree*). A sample item is “A feeling of fellowship runs deep between me and other people in this neighborhood.” The neighborhood social cohesion instrument has demonstrated strong factorial reliability and internal consistency (Li, Hsu, & Hsu, 2011; Wilkinson, 2007).

Neighborhood Crime—To obtain rates of neighborhood crime, the addresses of the custodial parent were geocoded to the Pittsburgh Neighborhood Maps (City of Pittsburgh GIS Division, 2006) or TIGER 2000-based StreetMap USA data (ESRI, 2002; US Census, 2002). The sample included 74 of 88 Pittsburgh neighborhoods (84%) and 77 of 130 Allegheny County municipalities (59%). The City of Pittsburgh data were collected from the Pittsburgh Bureau of Police Crime Analysis Unit, which records all reported crimes within each neighborhood yearly. Crime data for residents outside of Pittsburgh were collected from the Pennsylvania State Police Uniform Crime Reporting System, available for

municipalities that participated in the reporting system during the 1990s. This analysis examined crimes reported for 1990 through 2004, matched to the year and neighborhood/municipality in which the participants resided.

Total neighborhood crime was calculated by adding the number of Part I crimes, which include illegal acts such as murder, manslaughter, rape, robbery, theft and arson; and Part II crimes, which include illegal acts such as forgery, fraud, disorderly conduct, gambling, and prostitution (Pennsylvania Uniform Crime Reporting System, 2006). Crime rates per 1,000 people were calculated by dividing the number of reported Part I and Part II crimes by the neighborhood population (based on US Census data), and multiplying the quotient by 1,000 (Pennsylvania Uniform Crime Reporting System, 2006). Because this variable was not normally distributed, we log transformed it; the log-transformed variable was normally distributed. Average crime rate from 1990 to 2004 was 66 crimes per 1,000, which is higher than the national average crime rate of 53 crimes per 1,000 and the average Northeast US regional crime rate of 46 crimes per 1,000 people.

Anxiety/Depressive Symptoms—Youth internalizing symptoms were derived from the Mixed Anxiety and Depression subscale from the Youth Self-Report Inventory (YSR; Achenbach, 1991). This subscale includes 16 items ($\alpha=.83$) rated on a scale from 0 (*not true*) to 2 (*very true*). A sample item from the anxiety/depression scale is “I feel lonely.” The YSR has demonstrated extensive reliability and validity (Achenbach & Rescorla, 2001).

Statistical Analyses

Descriptive statistics and bivariate correlations were conducted to investigate the relationships among predictor and outcome variables using SPSS Version 21 (IBM, 2012). We also conducted independent sample *t*-tests to examine potential sex differences among study variables. When variances were unequal among boys and girls, we report the adjusted degrees of freedom. Because the *SD* of anxiety/depressive symptoms was large relative to the *M*, we used the non-parametric Mann-Whitney test for exploring sex differences. A child sex variable was created with females coded as “0” and males coded as “1.” Individuals who were identified as Caucasian were coded as “0” and individuals who were identified as ethnic minority or multiracial were coded as “1.” Given that youth were recruited based on father's diagnostic status, a father diagnostic status variable was created by coding fathers with no history of psychiatric diagnoses as “0” and fathers with a history of SUD and/or other psychiatric diagnosis as “1.”

The primary analyses were conducted using Mplus Version 7.11, which uses Full Information Maximum Likelihood (FIML) estimation to address missing data (Muthén & Muthén, 1998-2014). Because the use of other statistical methods (e.g., complete casewise analysis or listwise deletion, complete case analyses or pairwise deletion, nonresponse weighting, mean imputation) may bias a sample (Graham, 2009; Little & Rubin, 2002; Newman, 2003), we chose not to omit participants with missing data from the analyses. FIML assumes that the missing data are either missing completely at random or missing at random; given the study design and our ability to predict missing values based on the variables assessed, the requirements for missing at random were met for these data (Enders,

2001; Graham, 2009). FIML uses all available data to estimate model parameters, but does not impute values. This strategy maintains participants with missing data in the model estimation and produces smaller errors in parameter estimates and standard errors relative to other techniques for managing missing data (Enders, 2001; Graham, 2009; Newman, 2003).

We conducted regression analyses to investigate the conditional, linear effects of withdrawal and the relevant neighborhood variable (i.e., neighborhood crime or neighborhood social cohesion), and whether youth withdrawal moderated the relationship between neighborhood crime or social cohesion and anxiety/depressive symptoms. In each regression equation, Step 1 included adolescent age, sex, ethnicity, paternal diagnostic status, withdrawal, and the relevant neighborhood variable (crime or social cohesion). Step 2 included Step 1 variables and the withdrawal $\times$ neighborhood variable (social cohesion or crime) cross-product interaction term. To reduce multicollinearity, the predictor variables were z -scored ($M=0$, $SD=1$) before inclusion in the regression equations and interaction terms were produced from the standardized variables (Aiken & West, 1991).

To determine whether findings were consistent with the differential susceptibility or diathesis-stress models, post-hoc probing of significant moderation effects was conducted using the following two-step procedure: regions of significance (Dearing & Hamilton, 2006) and simple slope analyses (Aiken & West, 1991). Use of visual inspection to assess whether results are consistent with the diathesis-stress or differential susceptibility hypotheses is limited because of its subjective nature (Roisman et al., 2012). The regions of significance technique generates a range of values of the predictor variable for which the moderator is significantly associated with the dependent variable (Dearing & Hamilton, 2006). This approach produces upper and lower bounds of regions of significance, or the values of the predictor variable (neighborhood crime or social cohesion) below and above which the regression lines for the two groups, higher withdrawal ($+1$ SD from the mean of youth withdrawal) and lower withdrawal (-1 SD from the mean of youth withdrawal) significantly differ from each other on anxiety/depressive symptoms. Findings support the diathesis-stress explanation when the relationship between the moderator and the dependent variable is significant only at the low range of the neighborhood variable. Evidence for differential susceptibility occurs when the relationship between the moderator (temperamental withdrawal) and dependent variable (anxiety/depressive symptoms) is significant at both the lower and higher levels of the neighborhood variable (Roisman et al., 2012). To capture 95% of the sample, we examined interaction effects using ± 2 SD below and above the mean of the predictor variable (i.e., neighborhood crime or cohesion).

The regions of significance approach identifies predictor values for which the regression lines for high and low withdrawal are significantly different from each other; however, it does not indicate whether youth higher (or lower) in withdrawal exhibited different internalizing symptoms in the context of different levels of neighborhood crime or cohesion. This requires a test of whether the slope for the regression lines is significantly different from zero. Thus, to assess whether the relationship between different levels of withdrawal and anxiety/depressive symptoms was significantly different from zero and dependent on neighborhood crime (or cohesion), we computed simple slopes (i.e., ± 1 SD from the mean of child withdrawal) consistent with the recommendations of Aiken and West (1991) and

Roisman et al. (2012). Support for differential susceptibility may occur if the slope of one of the groups (higher or lower withdrawal) is significantly different from zero and steeper than the slope for the other group (Belsky et al., 2007). Last, we conducted ancillary analyses, specifically two three-way interactions, to examine whether associations among neighborhood social cohesion and crime with internalizing symptoms among youth varying in temperamental withdrawal differed based on children's sex.

Results

Participants who were missing any data ($n = 238$) did not differ (all $ps > .05$) from those with complete data ($n = 536$) in terms of age, $t(622) = 1.84$, Cohen's $d = .20$; neighborhood social cohesion, $t(622) = 0.78$, Cohen's $d = .09$; anxiety/depressive symptoms, $t(611) = 0.27$, Cohen's $d = .03$; paternal diagnostic status, $\chi^2(1) = 1.66$, $p = .05$, child's ethnicity, $\chi^2(1) = 0.01$, $p = .003$; temperamental withdrawal, $t(622) = 0.01$, Cohen's $d < .001$; or neighborhood crime, $t(674) = 0.02$, Cohen's $d = .001$. Participants with missing data differed from individuals without missing data in regard to children's sex, $\chi^2(1) = 4.83$, $p = .028$, $\phi = .08$, in that individuals with missing data were more likely to be male.

With regard to sex differences, girls were older, $t(357.91) = 2.30$, $p = .021$, Cohen's $d = .20$; and reported a higher level of temperamental withdrawal, $t(269.86) = 2.42$, $p = .016$, Cohen's $d = .23$, than boys. Girls ($Mdn = 4.00$) also reported a higher level of anxiety/depressive symptoms than boys ($Mdn = 2.00$), $U = 46,531.00$, $z = 4.52$, $p < .005$, $r = .18$. No additional group differences were found for study variables based on child sex (all t 's < 1.51 , all p 's $> .132$, all Cohen's d s $< .13$).

Bivariate correlations, means, standard deviations, and n 's for the study variables are presented in Table 1. Neighborhood social cohesion was negatively correlated with crime rate, although the magnitude of this correlation was small. Anxiety/depressive symptoms were negatively correlated with neighborhood crime and social cohesion. Multiple regression results indicate that there was a conditional, negative main effect for adolescent withdrawal, but not neighborhood crime, in predicting anxiety/depressive symptoms (top of Table 2). The adolescent withdrawal $\times$ neighborhood crime interaction term predicted anxiety/depressive symptoms. The lower bound of the regions of significance was -0.11 SD below the log-transformed mean of neighborhood crime, which corresponds to a raw score of 1.83. The number of participants with neighborhood crime below -0.11 SD was 440 (57% of sample). The upper bound of regions of significance was 4.63 SD above the log-transformed mean of neighborhood crime, which exceeded the range of ± 2 SD from the mean of neighborhood crime; thus, only a lower bound of regions of significance was observed. Alternatively stated, the two regression lines were significantly different from each other for all possible scores when neighborhood crime rate was fewer than 59 crimes per 1,000 people. Post hoc probing indicated that the simple slope was significantly different from zero among adolescents higher in withdrawal ($B = -0.74$, $p < .005$), but not lower in withdrawal ($B = 0.12$, $p = .634$), in predicting internalizing problems (Figure 1). Among youth higher in withdrawal, exposure to lower neighborhood crime (approximately the sample mean and below) was associated with heightened anxiety/depressive symptoms relative to youth lower in withdrawal.

With regard to neighborhood social cohesion, there was a significant conditional main effect for adolescent withdrawal and neighborhood cohesion on anxiety/depressive symptoms (bottom of Table 2). The adolescent withdrawal $\times$ neighborhood social cohesion interaction term predicted anxiety/depressive symptoms. The lower bound of regions of significance was 0.95 *SD* above the standardized mean of neighborhood social cohesion, which corresponds to a raw score of 4.12. The number of participants with neighborhood social cohesion below .95 *SD* was 520 (67% of sample). The upper bound of regions of significance was 4.10 *SD* above the mean of neighborhood social cohesion, which exceeded the range of ± 2 *SD* and consequently, only a lower bound of regions of significance was observed. Thus, the two regression lines for youth withdrawal were significantly different from each other for all neighborhood social cohesion scores equal to or below 0.95 *SD*s from the neighborhood social cohesion mean of 3.38. Relative to the social cohesion score derived from one of the normed neighborhoods characterized by mostly middle class, single-family dwellings ($M = 3.27$), 0.95 *SD* corresponds to a raw score of 4.12, which reflects higher neighborhood social cohesion. Post hoc probing indicated that the simple slope was significant among adolescents higher in withdrawal ($B = -1.40, p < .005$), but not lower in withdrawal ($B = -0.39, p = .073$) in predicting anxiety/depressive symptoms (Figure 2). Higher levels of neighborhood social cohesion (up to approximately 1 *SD* above the sample mean) were associated with lower levels of anxiety/depressive symptoms among youth higher in withdrawal compared to youth lower in withdrawal. However, higher neighborhood social cohesion was not associated with lower anxiety/depressive symptoms among youth higher in withdrawal compared to youth lower in withdrawal.

Last, two (2) three-way interactions were conducted to explore sex differences in the relationships between neighborhood factors among youth varying in withdrawal in the prediction of internalizing problems. Results indicate that the sex $\times$ withdrawal $\times$ neighborhood crime interaction did not significantly predict anxiety/depressive symptoms ($\beta = 0.02, p = .735$). Similarly, the sex $\times$ withdrawal $\times$ neighborhood social cohesion interaction did not significantly predict anxiety/depressive symptoms ($\beta = 0.05, p = .247$). Because child sex was a significant predictor of anxiety/depressive symptoms, we sought to further evaluate potential sex differences by conducting separate regression analyses among boys and girls.

Post-hoc probing of the withdrawal $\times$ neighborhood social cohesion interaction indicated that among boys, the simple slope was significant among boys higher in withdrawal ($B = -0.09, p < .005$), but not lower in withdrawal ($B = -0.29, p = .235$) in the prediction of anxiety/depressive symptoms. Similarly, among girls, post-hoc probing indicated that the simple slope was significant among girls higher in withdrawal ($B = -2.13, p < .005$), but not lower in withdrawal ($B = -0.14, p = .723$). Thus, both boys and girls higher in withdrawal exhibited lower levels of internalizing symptoms when exposed to higher neighborhood social cohesion.

Post-hoc probing of the withdrawal $\times$ neighborhood crime rate interaction indicated that the simple slope was significant among boys higher in withdrawal ($B = -0.68, p = .020$), but not lower in withdrawal ($B = 0.13, p = .620$) in predicting anxiety/depressive symptoms. Among the girls, the simple slope was not significant among girls higher ($B = -0.59, p = .$

255) or lower ($B = 0.33, p = .560$) in temperamental withdrawal. Thus, among boys higher in withdrawal, lower levels of neighborhood crime were associated with lower levels of internalizing symptoms than among boys lower in withdrawal.

Discussion

Although previous studies have explored links among various neighborhood characteristics and youth's anxiety/depressive symptoms (e.g., Cutrona, Wallace, & Wesner, 2006; Hill, Ross, & Angel, 2005), there is a dearth of studies that have examined the extent to which neighborhood processes may be associated with risk for or resilience from internalizing symptoms among youth varying in temperamental withdrawal. The results from the present study indicate that the associations of neighborhood social cohesion (among the whole sample) and neighborhood crime (among the whole sample and boys in particular) are consistent with the diathesis-stress model. That is, in the context of lower neighborhood crime, youth higher in withdrawal manifested heightened anxiety/depressive symptoms relative to youth lower in withdrawal. Findings also indicate that higher levels of neighborhood social cohesion were associated with decreased anxiety/depressive problems among youth higher in withdrawal relative to youth lower in withdrawal. Higher levels of neighborhood social cohesion, however, were not associated with lower anxiety/depressive symptoms among youth higher in withdrawal than youth lower in withdrawal.

The present study is consistent with previous research indicating that the neighborhood is an important contextual factor to consider in adolescents' emotional health, particularly with regard to anxiety and depressive symptoms (Anahensel & Sucoff, 1996; Dupéré, Leventhal, & Vitaro, 2012; Leventhal & Brooks-Gunn, 2000). Lower levels of crime were associated with higher anxiety/depressive symptoms among youth higher in withdrawal, particularly among boys. In communities higher in crime, it may be that parents fear their boys may be more likely to engage in criminal activities and delinquency relative to girls and thus may try to prevent boys from being out in the neighborhood, mitigating risk for internalizing symptoms (Fagan & Wright, 2011). It is also possible that the current sample was underpowered to detect an association of neighborhood crime with internalizing symptoms among girls given the smaller proportion of girls relative to boys. If this is the case, the findings for the whole sample help to explain the relationship.

It can be postulated that, in neighborhoods characterized by lower crime, families may compete for social, academic, or other forms of prestige, increasing stress among youth (Lund & Dearing, 2012). Consequently, among youth higher in withdrawal who are likely to exhibit heightened physiological arousal, high familial expectations may amplify their physiological arousal, resulting in elevated anxiety/depressive symptoms. Yet, among youth higher in withdrawal, higher crime neighborhoods were associated with lower levels of anxiety and depressive symptoms compared to youth lower in withdrawal. In higher crime communities, families may fear for their children's safety and consequently engage in behaviors that could decrease their children's exposure to witnessing or experiencing criminal activity (e.g., monitoring, keeping children indoors; Kimbro & Schachter, 2011). Although youth higher in withdrawal may in fact experience greater anxiety in communities with elevated levels of crime, parental behaviors may shield these youth from the deleterious

effects of witnessing crime, thereby decreasing their risk for internalizing symptoms (Kliewer et al., 2004). It could also be that temperamental withdrawal serves a protective role for adolescents in higher crime neighborhoods. Among those who are sensitive to threat, exposure to neighborhood crime may lead youth to remove themselves from the larger community to more innocuous contexts, thus decreasing their stress responsivity and mitigating risk for internalizing symptoms.

In regard to findings related to neighborhood social cohesion, both boys and girls higher in withdrawal exhibited a reduction in internalizing symptoms in the context of higher compared to lower social cohesion; however, internalizing symptom levels were nevertheless greater among youth higher than lower in withdrawal. Support for the differential susceptibility hypothesis would require youth higher in withdrawal to exhibit attenuated internalizing symptoms relative to youth lower in withdrawal in the context of higher levels of neighborhood cohesion. There are several possible explanations for the finding of decreased internalizing symptoms in the context of higher vs. lower neighborhood cohesion. Compared to neighborhoods lower in social cohesion, neighborhoods higher in social cohesion may have higher social equity, higher collective efficacy, and increased social control, which may buffer against the development of youth internalizing symptoms (Hill et al., 2005; Ross & Mirowsky, 2009). More cohesive neighborhoods may be perceived as safer, thus fostering a sense of security among youth; this aspect of the neighborhood context may be particularly protective among youth higher in withdrawal, as these youth may be more affected by environmental stimuli (Aron & Aron, 1997). Furthermore, because youth higher in withdrawal may experience fear and heightened physiological arousal (Degnan & Almas, 2007), communities with greater social cohesion that presumably have lower levels of danger and greater community support, may decrease these youth's physiological stress responsivity and distress, decreasing risk for internalizing symptoms (Dupéré et al., 2012; Hill et al., 2005).

There are limitations of the current study, the first of which is that the study is cross-sectional; thus, the direction of effects and nature of the relationships among variables (e.g., risk factors, correlates, sequelae) is unclear. As such, one could modify the direction of effects among the variables without affecting model fit. Future studies should examine alternative roles for the variables included in the present study, as well as explore whether associations among neighborhood crime or cohesion, temperamental withdrawal, and internalizing symptoms are present across developmental periods using a prospective design. Another limitation is that the sample is predominantly Caucasian and middle- to low-income; thus, future work should examine the generalizability of study findings to ethnic minority groups and communities that are more diverse in terms of SES. Further, temperament, neighborhood social cohesion, and symptom data were obtained via self-report. Future research should incorporate multiple reporters (e.g., caregivers, teachers) and assessment procedures (e.g., interviews) to capture adolescents' behavior across contexts and to minimize single informant and mono-method biases (De Los Reyes et al., 2015). Differential sex findings, such as the significant association of neighborhood crime with psychological symptoms among youth higher in withdrawal among boys but not girls, may be due to a lack of statistical power to detect an effect among girls, given the smaller proportion of female children in the sample. Therefore, future research should investigate

these relationships among samples that include more proportionate numbers of girls and boys to determine whether the findings generalize to both sexes or are truly sex specific. Further, future work should explore other temperamental features (e.g., negative affect) that may influence associations between neighborhood factors and youth's anxiety/depressive symptoms.

Despite these limitations, the present study has several strengths. First, the current study examined associations among both positive and negative neighborhood processes on youth varying in withdrawal in the prediction of youth anxiety/depressive symptoms, something no other studies to date have investigated. Understanding neighborhood characteristics associated with youth anxiety/depressive symptoms can inform etiological models for these symptoms. Second, associations of neighborhood factors among youth varying in withdrawal in the prediction of internalizing symptoms during adolescence were explored. Adolescence is a developmentally sensitive time period whereby the neighborhood context may be associated with risk or resilience for psychopathology (Leventhal & Brooks Gunn, 2000), making this study particularly relevant for informing health risk prevention efforts. Third, rather than employing subjective self-report assessments of perception of crime in the neighborhood, we utilized standard police report data, thus providing an objective measure of actual crime rate in the individual participant's neighborhood. A fourth strength was the utilization of regions of significance testing to explore whether findings were consistent with diathesis-stress or differential susceptibility frameworks; this knowledge can inform our understanding of whether youth varying in withdrawal are at risk for anxiety/depressive symptoms when exposed to only negative neighborhood stressors, or whether these youth are, in fact, more sensitive to both positive and negative neighborhood factors, which may promote risk or resilience for anxiety/depressive symptoms. Last, potential sex differences were explored in the relationships among neighborhood processes on youth varying in withdrawal in the prediction of internalizing symptoms, which can help to elucidate whether different neighborhood characteristics are differentially associated with anxiety/depressive symptoms based on children's sex.

Conclusion

Much previous work has examined associations among proximal factors (e.g., parenting) among youth varying in temperamental withdrawal in the prediction of anxiety/depressive symptoms, yet few studies have explored whether positive and/or negative neighborhood factors are differentially associated with internalizing symptoms among youth varying in temperamental withdrawal. The present study builds on previous research by examining links between neighborhood characteristics, specifically neighborhood crime and social cohesion, among youth with varying levels of temperamental withdrawal in the prediction of internalizing symptoms during adolescence. The results indicate that the associations of neighborhood crime and neighborhood social cohesion among youth higher in withdrawal were more consistent with the diathesis-stress model. In the context of lower neighborhood crime, youth higher in withdrawal manifested heightened anxiety/depressive symptoms relative to youth lower in withdrawal. In the context of higher neighborhood social cohesion, youth higher in withdrawal exhibited decreased anxiety/depressive problems relative to youth lower in withdrawal. Future work should explore associations among neighborhood

crime and social cohesion among youth varying in other temperamental features such as negative affectivity in the prediction of not only anxiety and depressive symptoms, but also externalizing behaviors. Future research should, moreover, explore the mechanisms through which youth higher in withdrawal may experience an attenuation of symptoms in higher crime communities, such as whether lower exposure to community victimization is associated with fewer symptoms. Finally, future studies should investigate how other neighborhood processes (e.g., collective efficacy, informal social control) promote risk or resilience among youth higher in withdrawal not only during adolescence, but also across developmental periods, to elucidate contextual processes that attenuate or exacerbate internalizing problems.

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Figure 1.

Relationship between neighborhood crime and anxiety/depressive symptoms among youth with high withdrawal (1 *SD* above mean) and low withdrawal (1 *SD* below mean). The lower bound of regions of significance is $-.11$.

Figure 2. Relationship between neighborhood social cohesion and anxiety/depressive symptoms among youth with high withdrawal (1 *SD* above mean) and low withdrawal (1 *SD* below mean). The lower bound of regions of significance is .95.

Table 1

Bivariate correlations, means, SDs, and n's for study variables

Variable	1	2	3	4	5	6
1. Adolescent Age	-					
2. Adolescent Withdrawal	.03	-				
3. Neighborhood Cohesion	.01	.17**	-			
4. Neighborhood Crime	-.04	-.08**	-.09*	-		
5. Log-Transformed Neighborhood Crime	-.07	-.11**	-.12**	.87**	-	
6. Adolescent Anxiety/ Depressive Symptoms	-.01	-.16**	-.24**	-.05	-.05	-
<i>M</i>	15.50	2.85	3.38	42.42	1.86	3.71
<i>SD</i>	0.56	0.50	0.78	74.89	.32	4.16
<i>n</i>	625	625	625	609	609	614

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

Table 2

Summary of hierarchical regression analyses predicting anxiety/depressive symptoms from withdrawal and neighborhood factors

Step and Variable	<i>B</i>	<i>SE B</i>	β	<i>R</i> ²	<i>f</i> ²
Neighborhood Crime					
Step 1				.07	.07
Sex	1.70	.37	.18**		
Age	-.23	.30	-.03		
Ethnicity	-.29	.44	-.03		
Father Diagnostic Status	-.76	.34	-.09		
Neighborhood Crime	-.13	.20	-.03		
Withdrawal	-.56	.17	-.13**		
Step 2				.08	.09
Sex	1.68	.37	.18**		
Age	-.25	.29	-.03		
Ethnicity	-.05	.45	-.01		
Father Diagnostic Status	-.79	.34	-.10		
Neighborhood Crime	-.30	.20	-.07		
Withdrawal	-.55	.17	-.13*		
Withdrawal $\times$ Neighborhood Crime	.46	.18	.11*		
Neighborhood Cohesion					
Step 1				.11	.12
Sex	1.66	.36	.18**		
Age	-.24	.29	-.03		
Ethnicity	-.54	.38	-.06		
Father Diagnostic Status	-.67	.33	-.08*		
Neighborhood Cohesion	-.87	.16	-.21**		
Withdrawal	-.43	.17	-.10*		
Step 2				.13	.15
Sex	1.66	.35	.18**		
Age	-.18	.29	-.02		
Ethnicity	-.48	.38	-.05		
Father Diagnostic Status	-.66	.33	-.08*		
Neighborhood Cohesion	-.86	.16	-.21**		
Withdrawal	-.37	.17	-.09*		
Withdrawal $\times$ Neighborhood Cohesion	.50	.14	.14**		

^a For each regression equation, the R^2 was not significant, both $ps > .05$.

* $p < .05$

**
 $p < .01$.

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