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Temperament in context: Infant temperament moderates the relationship between perceived neighborhood quality and behavior problems

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Abstract

Hypotheses that positive affect and fear in infancy moderate later relationships between neighborhood quality and behavior problems were examined in a sample of children from the National Longitudinal Survey of Youth. Results suggested that poor neighborhood quality was associated with antisocial behavior at age 6 for children who in infancy were characterized by either high positive affect *and* low fear or by low positive affect *and* high fear. Depression/anxiety increased from age 6 to age 12 for children in poor quality neighborhoods who were characterized in infancy by low positive affect. A combination of low fear and high positive affect in infancy appeared to be protective, as it was associated with decreases in depression/anxiety during childhood. These findings suggest the utility of examining multiple dimensions of temperament and of integrating multiple levels of influence into moderational models to understand and prevent the development of childhood symptomatology.

Keywords

Neighborhood quality; Infant temperament; Behavior problems; Positive affect; Fear

1. Introduction

Neighborhood characteristics have been viewed as important influences on children's psychological adjustment (Bronfenbrenner, 1986; Jessor, 1993). Existing research suggests that children growing up in disadvantaged communities characterized by low socioeconomic status, residential instability, and violence are at increased risk for both internalizing and externalizing symptomatology (Aneshensel & Sucoff, 1996; Garbarino & Kostelny, 1996; Jencks & Meyer, 1990; Martinez & Richters, 1993; McLeod & Edwards, 1995; McLeod &

Shanahan, 1993; Sampson, Morenoff, & Earls, 1999). In a comprehensive review, Leventhal and Brooks-Gunn (2000) suggested that poor quality neighborhoods weaken collective efficacy, and disrupt parenting and social support, which have a detrimental impact on child outcomes.

Several theoretical perspectives, such as goodness-of-fit and transactional models, suggest that child temperament can exacerbate or buffer the impact of contextual influences on the development of problem behavior (Sameroff, 1995; Thomas, Chess, & Birch, 1968). Indeed, considerable research has examined how child temperament might moderate the impact of contextual influences on child outcomes. That is, temperament has been shown to affect the direction and/or strength of the relation between context and outcome. For example, effects of parenting (Bates, Petit, Dodge, & Ridge, 1998; Colder, Lochman, & Wells, 1997; Lengua, Wolchik, Sandler, & West, 2000), stress (Coplan, Bowker, & Cooper, 2003) and cumulative risk (Lengua, 2002) on child adjustment have been found to be moderated by child temperament.

Although prior research has examined context \times temperament interactions, very few studies have examined how temperament might moderate the impact of macro-level contextual variables. In fact, only one published study has done so. Lynam et al. (2000) found that impulsivity moderated the effects of neighborhood socioeconomic status on delinquency in a sample of boys. Specifically, boys from economically disadvantaged neighborhoods were at increased risk for delinquency, and this was particularly true of impulsive boys. These findings were not replicated longitudinally, perhaps because of the smaller sample size utilized ($N = 80$) in the longitudinal analysis, and thus limited power.

The goal of the current study was to further examine the role of individual differences as a moderator of neighborhood influences. Temperament represents the constitutional basis for affective arousal, expression, and regulation components of personality (Goldsmith et al., 1987), and we focus on temperament because it is among the earliest emerging correlates of adjustment, and because prior research has shown that it moderates the impact of a variety of contextual influences.

In the current study, research on temperament \times context interactions is extended in several important ways. First, we consider the interaction between temperament and neighborhood context, which has been done in only one published study. Second, temperament researchers recognize that behavior (both normal and problem behavior) arises, in part, from interplay among multiple temperament characteristics (e.g. Campos, Campos, & Barrett, 1989; Eisenberg & Fabes, 1992; Rothbart, 1989), and this implies that multiple aspects of temperament together may moderate the influence of neighborhood context. We focus on positive (positive affect) and negative (fear) reactivity, and examine if various combinations of high and low positive and negative reactivity buffer or exacerbate the influence of a risky neighborhood context by testing 2- and 3-way interaction terms. Positive affect in infancy is associated with rapid approach tendencies (Rothbart, 1988), suggesting that positive affect partly represents an affective component of approach. This is consistent with psychobiological models in which neural systems related to positive affect are closely tied to approach behavior (Depue & Iacono, 1989; Gray, 1975; Panksepp, 1986).

On the other hand, infant fear predicts low levels of childhood impulsivity, activity, and aggression and high levels of inhibition (Reznick, Gibbons, Johnson, & McDonough, 1989; Rothbart, Derryberry, & Hershey, 2000), suggesting that fear serves an important inhibitory function. That is, fear helps modulate approach tendencies, which is a notable feature of Gray's (1987) psychobiological model of individual differences because it suggests that consideration of both positive and negative reactivity is important for understanding problem behavior. We expected infants characterized by high positive affect in combination with low fear to be vulnerable to the effects of a risky neighborhood on the development of externalizing behavior problems. Such infants would have a tendency for approach behavior that could become manifested in externalizing behavior problems in a risky context where there is little monitoring of residents' behavior, and increased exposure to antisocial models. Infants characterized by low positive affect and high fear were expected to be vulnerable to the impact of a risky neighborhood on the development of internalizing symptoms. Such infants were expected to have a tendency toward inhibited behavior that can be manifested as internalizing problems such as anxiety and depression. Moreover, low positive affect is a risk factor for depression (Clark & Watson, 1991). Thus, infants characterized by high fear/low positive affect may be more susceptible to developing internalizing problems in response to stressful and threatening environments where victimization and violence are common. It should be noted that others have speculated that children with strong predispositions for problem behavior are likely to develop problem behaviors regardless of the neighborhood, whereas children with low predispositions would be more sensitive to the risks associated with a poor neighborhood (e.g., Wikstrom & Sampson, 2003). In either case temperament is construed as a moderator of neighborhood risk. However, we lean toward the expectation that a high-risk temperament and a disadvantaged neighborhood operate synergistically to increase the likelihood of problem behavior.

In sum, we hypothesized that living in a neighborhood perceived to be dangerous and disorganized would be associated with both internalizing and externalizing problems. Moreover, we expected temperament to moderate these associations. Infants characterized by high positive affect and low fear, and those characterized by low positive affect and high fear were expected to have difficulty regulating their behavior and emotions. Living in a risky neighborhood might weaken collective efficacy and disrupt parenting and social support making it particularly likely that these children would adapt to the demands of their environment with problem behavior. We examined these hypotheses by testing interactions between infant temperament characteristic and neighborhood quality using a longitudinal sample.

2. Method

2.1. Participants

The 316 children in this study were drawn from the National Longitudinal Survey of Youth (NLSY). The original sample of the NLSY included 12,686 men and women who were between the ages of 14 and 22 when first interviewed in 1979. Importantly for the purposes of this research, detailed information has also been collected on any children born to the NLSY females since 1979 (for a fuller description of the NLSY sample, see Baker, Keck,

Mott, & Quinlan, 1993). Thus, the children in the current sample were born to mothers who are part of the original NLSY cohort.

Beginning in 1986 and biennially thereafter, mothers were interviewed and provided a range of information on the intellectual and emotional growth of their children, including information about perceived neighborhood danger and child behavior problems. In addition, in the first year of these interviews, mothers also provided their perceptions of children's temperament. We selected the 1986 cohort because divergent trajectories of problem behavior emerge from early childhood onward (Achenbach, Howell, Quay, & Conners, 1991; Colder, Mott, & Berman, 2002; Loeber & Stouthamer-Loeber, 1998), suggesting greater variability in behavior problems in later childhood. The 1986 cohort allowed us to examine whether infant temperament was associated with behavior problems in 1992 when the children were 6 years old, and with change in behavior problems from 1992 (6 years old) to 1998 (12 years old).

Infant temperament information was available for children under age 1 year. However, some temperament characteristics assessed in early infancy (prior to age 3 months) such as fear and distress proneness exhibit low stability, and other characteristics such as smiling and laughter are not apparent until around 2 months of age (Rothbart & Bates, 1998). Fear, positive emotionality, and activity level show high stability during infancy and early childhood after 3 months of age (Lemery, Goldsmith, Klinnert, & Mrazek, 1999). In addition, examination of the content of our temperament items suggested that responses to these items might not be applicable for older infants. Accordingly, we selected 4–9 month olds for inclusion in our sample (average age = 6.5 months, $SD = 1.7$; $N = 316$). The study sample was 57% male and 43% female. The Racial/Ethnic breakdown of the group was 29% African American/Black, 18% Hispanic, and 53% non-Hispanic/non-African American/Black. The median net family income of the children's families in 1987 was \$18,000 and ranged from \$0 to \$100,000.

There was some attrition over time, resulting in varying sample sizes in the regression models. Eighty-four participants did not have problem behavior data in 1992, which led to a sample size of 232 for the age 6 models. Of the 84 participants that did not provide problem behavior data in 1992, 19 provided problem behavior data in 1998. Accordingly, the longitudinal models included a sample size 251. Comparisons between participants present in 1986 and those absent in 1992 or 1998 suggested no differences in infant fear [$F(1, 315) = 1.82, p = .28$], positive affect [$F(1, 315) = 1.82, p = .28$], age [$F(1, 315) = .09, p = .77$], sex [$\chi^2(1, N = 316) = .12, p = .72$], or family income [$F(1, 273) = .39, p = .53$]. However, race/ethnicity [$\chi^2(2, N = 316) = 32.16, p < .01$] was associated with missing data, such that non-Hispanics/non-African Americans/Blacks were more likely to have missing data.

2.2. Procedure

The measures used in the current study are based on maternal reports. Personal interviewers administered the questionnaires while visiting the NLSY mothers in their homes. Mothers with a preference for Spanish responded to a Spanish translated version of the interview. The mothers received \$20 for themselves, and \$5 for a child, for completing the interviews. The Center for Human Resource Research (CHRR) at The Ohio State University managed

the NLSY surveys and provided user services. The National Opinion Research Center (NORC) at the University of Chicago conducted the data collection for the NLSY. CHRR staff were present at training sessions in which NORC interviewers were instructed in the content and administration of the NLSY questionnaires. On several occasions, CHRR personnel also accompanied interviewers on actual surveys to monitor how the interviews were conducted. This collaboration has produced highly valid and reliable data on the life course experiences of a diverse sample of American mothers and children (Center for Human Resources Research, 1992).

2.3. Measures

2.3.1. Temperament—A set of temperament scales was developed for the NLSY based on measures from a variety of sources, but primarily from the Infant Behavior Questionnaire (IBQ; Baker & Mott, 1989; Rothbart, 1981). Maternal reports of temperament were obtained in 1986. A reduced number of IBQ items were used in the NLSY to assess fear and positive affect. The large-scale multifaceted nature of the NLSY precluded administration of the complete instrument. Fear and positive affect were each assessed with 3 items. Mothers used a five-point scale (1 = almost never and 5 = almost always) to respond to each item. The original IBQ has been found to be a valid measure of temperament (Rothbart et al., 2000), and the shortened versions used were good approximations of the full scales. Mother reports of fear and positive affect on the full IBQ were significantly correlated with home observations of infant fear and smiling at 9 months, r 's = .38 and .50 respectively (Rothbart, 1986), demonstrating the validity of these scales.

The fear items assessed strong emotional reactivity to potentially threatening situations (e.g., when the infant sees a stranger, sees an unfamiliar dog or cat, or visits the doctor or nurse). Positive affect items assessed smiling (when with parent, alone, and in the bath). Confirmatory factor analysis of these 6 temperament items supported a 2-factor solution, $\chi^2(8, N = 316) = 12.48, p = .13, RMSEA = .04, CFI = .97$. All items loaded significantly (all p 's < .01) on their respective factor. Accordingly, the mean of the items was computed to form fear and positive affect scales. Unstandardized Cronbach's alphas were .63 and .43 for positive affect and fear, respectively. The number of items influences internal consistency, and the small number of items on each scale likely attenuated these alphas. Fear was uncorrelated with positive affect ($r = -.01, p > .10$). However, age was modestly associated with fear ($r = .18, p < .01$) and the correlation with positive affect approached significance, ($r = .12, p < .06$), such that older infants were rated to be high in fear and positive affect relative to younger infants. To control for these age effects, temperament scores were standardized within 6 age groups (4, 5, 6, 7, 8, and 9 month olds).

2.3.2. Symptomatology—Items assessing externalizing and internalizing symptoms were taken from the Child Behavior Checklist (CBCL, Achenbach & Edelbrock, 1991). The items have been used extensively and have been linked to a variety of sociodemographic indicators, including maternal employment (Belsky & Eggebeen, 1991), child latchkey status (Vandell & Ramanan, 1991), childcare utilization (Baydar & Brooks-Gunn, 1991), teenage parenting (Morrison, Moore, & Meyers, 1992), and marital disruption (Hawkins &

Eggebeen, 1991). More detailed information on the behavior problem items can be found in Baker et al. (1993).

Parents reported on the frequency with which their child engaged in each behavior using a 3-point scale (1 = never to 3 = often) when the children were 6 and 12 years old. Four items taken from the externalizing scale of the CBCL were used for the current measure of antisocial behavior (e.g., cheating/lying, bullying, not feeling sorry for misbehavior, and breaking things). Four items taken from the anxious/depressed subscale of the CBCL were used for the current measure of internalizing symptoms (e.g., too fearful, feels worthless or inferior, unhappy/sad, unloved).

A confirmatory factor analysis of these 16 behavior problem items (8 items from each age period) supported a 4-factor solution, $\chi^2(90, N = 216) = 113.64, p = .04, RMSEA = .03, CFI = .97$. All items loaded significantly (p 's < .01) on their respective factors. Accordingly, means of the items were computed to form antisocial behavior and depression/anxiety scale scores at age 6 and 12. Unstandardized Cronbach's alphas were .61 and .65 for antisocial behavior and were .68 and .77 for anxiety/depression at ages 6 and 12, respectively. As expected, high levels of behavior problems at age 6 were associated with high levels of behavior problems at age 12 (r 's = .54 and .53, p 's < .05, for antisocial behavior and depression/anxiety, respectively). Colder et al. (2002) found that children with high scores on these scales were more likely to be in treatment for emotional or behavioral problems, suggesting criterion validity for this measure.

2.3.3. Poor neighborhood quality—Parents reported on the quality of their neighborhood in 1992 and 1998 using 7 items with a 3-point response scale (1 = not at all a problem to 3 = big problem). The items assessed structural aspects of the neighborhood (crime, unemployment, abandoned buildings, adequate police protection) and social cohesion (residence respect rules, supervise children, care about what goes on). A principal components analysis at both assessment periods was performed, and the first eigenvalue (3.85 and 3.90) accounted for 55% and 56% of the variance and second eigenvalue (.75 to .79) accounted for <12% of the variance. The one factor solution was retained at both assessments. All standardized factor loadings were greater than .55, and communalities ranged from .32 to .71. Accordingly, means of the items were computed to form poor neighborhood quality scale scores for both assessment periods, and these scale scores were standardized for analysis. Unstandardized Cronbach's alphas were .86 and .87 in 1992 and 1998, respectively.

3. Results

Our goal was to examine whether infant positive affect and fear moderated the relation between neighborhood quality and externalizing and internalizing behavior problems later in childhood. This was accomplished using regression models and testing 3-way interaction terms (positive affect \times fear \times neighborhood quality). Separate regression models were conducted for internalizing and externalizing behavior problems, and maternal report of family income was included as a predictor so that we could examine the influence of neighborhood quality above and beyond family income.

First, we tested our moderational hypotheses predicting child problem behavior at age 6 years (1992). Predictors in the age 6 models included infant temperament, family income in 1992, neighborhood quality in 1992, child sex, and the interaction terms of interest (fear \times positive affect; fear \times neighborhood quality; positive affect \times neighborhood quality; and fear \times positive affect \times neighborhood quality). Second, we tested a longitudinal model in which age 6 and age 12 problem behavior were the dependent measures, and time was a within-participant predictor that represented change in behavior problems. Random effects regression was used for this longitudinal model because the data were nested (repeated measures nested within children). The longitudinal model included a random intercept, and neighborhood quality and family income were considered time-varying predictors. Time-varying predictors are predictors that vary from one assessment to another. In this case we included neighborhood quality scores from 1992 and 1998, and family income from 1992 and 1997 (family income was not assessed in 1998). When significant interactions were detected, we conditioned the regression model at high and low levels of the moderator (1 *SD* above and below the sample mean) to probe the nature of the interaction, as recommend by Aiken and West (1991).

3.1. Predicting age 6 problem behavior

As shown in Table 1, there was a statistically significant 2-way fear \times positive affect interaction term predicting antisocial behavior at age 6, but this was qualified by a significant 3-way interaction term. Fig. 1 shows the relation between neighborhood quality and antisocial behavior conditioned on high and low values of fear and positive affect. Recall that our predictor variables were standardized, so +1 and -1 represent 1 *SD* above and below the sample mean. Poor neighborhood quality was positively associated with antisocial behavior for two temperament combinations, children characterized in infancy by *high positive affect and low fear*, and children characterized by *low positive affect and high fear*. There was a modest negative relation between poor neighborhood quality and antisocial behavior at *high levels of fear and positive affect*, and at *low levels of fear and positive affect*. It is striking that temperament had a very modest association with antisocial behavior in very poor quality neighborhoods. That is, levels of antisocial behavior were similar regardless of infant temperament characteristics when the quality of the neighborhood was very poor (1 *SD* above the mean). When considering depression/anxiety, none of the interaction terms (2- or 3-way interaction terms) were statistically significant. Moreover, none of the first-order effects were statistically significant.

3.2. Predicting change in behavior problems

Our longitudinal model predicting change in antisocial behavior suggested a statistically significant time \times neighborhood quality interaction (see Table 2). This interaction suggests that neighborhood quality was associated with change in antisocial behavior. The effect of time conditioned on high and low levels of poor neighborhood quality is shown in Fig. 2. Antisocial behavior increased for children residing in poor quality neighborhoods, and it declined for those residing in high quality neighborhoods.

The fear \times positive affect \times neighborhood quality interaction term predicting antisocial behavior also approached significance ($p = .07$), and the nature of this interaction was

similar to that found in our age 6 model. That is, poor neighborhood quality was positively associated with antisocial behavior for children characterized in infancy by *low levels of fear and high levels of positive affect*, and for children characterized by *high levels of fear and low levels of positive affect*.

When predicting change in depression/anxiety, the time \times positive affect \times neighborhood quality interaction term approached significance ($p = .08$), suggesting that the association between poor neighborhood quality and change in depression/anxiety symptoms depended on levels of infant positive affect. As shown in Fig. 3, depression/anxiety symptoms increased from age 6 to 12 when infant positive affect was low and poor neighborhood quality was high. High positive affect in infancy and high quality neighborhood were associated with no change in depression/anxiety symptoms. Thus, low levels of positive affect increased vulnerability to the effects of poor neighborhood quality.

There was also a statistically significant time \times fear \times positive affect interaction term predicting change in depression/anxiety. This suggests that change in children's internalizing problem behavior depended on combinations of fear and positive affect. A combination of *high levels of positive affect along with high levels of fear* in infancy was associated with an increase in depression/anxiety problems, whereas *high levels of positive affect and low levels of fear* were associated with a decline in depression/anxiety problems (see Fig. 4).

4. Discussion

Previous research has found that poor neighborhood quality is associated with both externalizing and internalizing problem behavior in childhood (Leventhal & Brooks-Gunn, 2000). Living in dangerous and disorganized environments is associated with increased engagement in dangerous or criminal behaviors and increased exposure to stressors and subsequent internalizing problems (Gorman-Smith & Tolan, 1998; Ingoldsby & Shaw, 2002). The lack of social organization in less cohesive neighborhoods may also reduce children's opportunities for positive interaction and support, which may in turn increase the likelihood of developing problems (Sampson et al., 1999).

The present study found that whether poor neighborhood quality was associated with an increase in childhood behavior problems depended on temperament characteristics. Poor neighborhood quality was associated with increasing levels of antisocial behavior at age 6 for children characterized in infancy by *low fear and high positive affect*. Quay (1993) has argued that low levels of fear produce impairment in learning from punishment, which is an important mechanism of socialization. Low levels of fear in infancy may presage difficulties in socialization (Kochanska, 1995, 1997), placing children at risk for negative neighborhood influences. These difficulties may be exacerbated by elevated positive affect, which may be an affective precursor to strong approach tendencies and extraversion (Rothbart & Bates, 1998). High positive affect may be particularly problematic when not balanced with inhibitory aspects of fear (Fowles, 1994; Gray, 1987). Thus, high levels of positive affect along with low levels of fear may increase risk for a variety of neighborhood influences such as deviant peer affiliations, victimization, antisocial adult role models, poor adult

supervision, etc. This is consistent with findings in Lynam et al. (2000) in which living in a low SES neighborhood was associated with externalizing problems, particularly for children who were characterized by behavioral disinhibition.

Children characterized by *high levels of fear and low levels of positive affect* were also vulnerable to the effects of poor neighborhood quality on antisocial behavior at age 6. Although this temperament risk pattern was not hypothesized, maladaptive social information processing may explain these findings (Dodge & Crick, 1990). In a poor quality neighborhood, these temperament characteristics may lead to a social information processing style (i.e., encoding cues with a threatening connotation, hostile attribution biases, low self-efficacy) that supports the use of antisocial behavior in order to defend oneself against perceived threat or danger (e.g., high-anxious antisocial behavior and/or reactively aggressive behavior, Dodge, 1991).

Findings also suggest that temperament differences are most evident in good quality neighborhoods when compared to poor quality neighborhoods. In good quality neighborhoods there are likely fewer risk factors than in poor quality neighborhoods (e.g., higher SES, lower crime rates, 2-parent households, etc.). It may be that the effect of temperament on problem behavior is more apparent in good quality neighborhoods than in poor quality neighborhoods, because temperament effects are muted by these other important proximal risk factors in poor quality neighborhoods (Bronfenbrenner & Ceci, 1994).

There was no evidence for a relation between poor neighborhood quality and internalizing problems at age 6. Moreover, infant temperament did not moderate this relation. This is contrary to our hypotheses, as we expected temperament to moderate neighborhood influences for both externalizing and internalizing behavior. It is possible that the impact of neighborhood characteristics on internalizing symptoms is not observable in children until later in childhood.

When we examined change in problem behavior from age 6 to 12, we found that poor neighborhood quality was associated with increases in antisocial behavior. Prior research has suggested that externalizing behavior typically declines during early childhood (e.g., Cummings, Ianotti, & Zahn-Waxler, 1989; Shaw, Gilliom, Ingoldsby, & Nagin, 2003; Tremblay et al., 1996), and that these declines are associated with improved self-control and verbal skills (Loukas, Zucker, Fitzgerald, & Krull, 2003). Our findings suggest that even though children may be developing self-control and verbal skills that are expected to result in reductions in antisocial behavior, a risky environment seems to negate this buffering affect.

Although temperament did not moderate the impact of neighborhood quality on change in antisocial behavior, it did so for internalizing problems. A dangerous and disorganized neighborhood was associated with increases in depression/anxiety symptoms, but this was only true for children characterized in infancy by low positive affect. Low levels of infant positive affect may represent a diathesis for emotional distress that is activated in a risky environment. Poor quality neighborhoods likely provide limited opportunities for rewarding

social interactions, and parents may be less likely to encourage socializing outside the home, reducing positive opportunities, which may lead to decreased self-esteem, social withdrawal, and depression particularly for children characterized by low levels of positive affect. On the other hand, a good quality neighborhood may be particularly important for children low in positive affect, because good quality neighborhoods provide opportunities for positive social interactions, which helps to elicit positive affect from these children.

There was also evidence that certain combinations of infant fear and positive affect were associated with increases of internalizing symptoms independent of neighborhood quality. A combination of *low levels of fear and high levels of positive affect* was protective in that this temperament constellation was associated with declines in internalizing symptoms. Such children are unlikely to react to stress and cues for potential punishment (low fear) with emotional distress, and his/her approach tendencies (high positive affect) are likely to buffer the development of potential depressive symptoms (Fowles, 1994). In contrast, a combination of *high fear and high positive affect* was associated with increases in internalizing problems. High positive affect indicates strong approach tendencies (Rothbart, Ahadi, Hersey, & Fisher, 2001), which may place children in contexts that are aversive or threatening, and high levels of fear would lead to strong negative reactions to these situations (e.g., emotional distress). In sum, whether positive affect increases or decreases risk for internalizing problems seems to depend on levels of fear. When combined with low fear, positive affect is protective against internalizing symptoms, but when combined with high fear, positive affect exacerbates risk.

Overall, the findings of the current study highlight the importance of considering multiple levels of influence on the development of children's problem behavior. Most researchers agree that temperament or context alone is not sufficient for the development of adjustment problems, but rather the complex interactions among temperament, interpersonal, and contextual variables account for such problems (e.g., Lerner, 1984; Rothbart & Bates, 1998; Wachs, 2000). The present study is one of the few that examines the interplay among predictors across levels of influence using a theoretically based approach, and this is an important direction for future temperament research.

Our findings have implications for prevention and intervention. Much prior research has established that characteristics such as temperament and environmental characteristics such as neighborhood quality predict children's adjustment. The current study adds to this body of knowledge by providing evidence that, for some children, the effects of neighborhood variables are exacerbated by his/her temperamental characteristics. Findings suggest that interactions between individual and community level variables are important to consider in the development of interventions. Researchers and clinicians who focus on disadvantaged environments should consider the individual characteristics of the children within the environments that they target, while those interested in individual child characteristics may need to evaluate the qualities of children's contexts along with a constellation of temperament characteristics in order to fully assess areas for intervention. It may be beneficial to target intervention programs at children with particularly vulnerable temperament constellations. Further, policy makers may need to be cognizant of the fact that improving the quality of neighborhoods will result in more positive child outcomes.

Community interventions that are likely to have the most impact on child outcomes will include improving safety as well as cohesion among residents.

Although the current study makes important contributions, some of its limitations should be noted. First, our findings are subject to reporter bias because we relied solely on maternal reports, which may have inflated the observed relations. For example maternal depression is associated with child behavior problems (Dawson et al., 2003) and with poor neighborhood quality (McLoyd, 1990), which suggests that some mothers may have a negative bias in their perception of her child and context. Although it is unlikely that such a bias could explain some of the complex interactions observed in this study (e.g., that a combination of high positive affect and low fear are associated with antisocial behavior), it is important for future studies to replicate the current findings using multiple methods of assessment for temperament, problem behavior, and neighborhood characteristics. It should be noted that there has been some controversy about the validity of parent reports of temperament. In their review, Rothbart and Bates (1998) concluded that the evidence to date supports the use of parent-report measures of temperament. It seems that parents have a valuable perspective because they see a wide range of their children's behavior. We agree with this position and suggest that measures in addition to (not instead of) parent-report measures should be incorporated into future studies.

Second, although many approaches conceptualize temperament as a stable individual difference, temperament is likely to change over time (Goldsmith et al., 1987; Rothbart & Bates, 1998). Our findings are best viewed as an examination of early individual differences that may set the stage for a variety of intermediate processes (e.g., parent–child transactions, child–peer relationships, social information processing, etc.) that impinge on the development of temperament, which for some children culminates in behavior problems. It is unclear how our findings would look if temperament were assessed later in life. Examining the time-varying nature of temperament and symptomatology across contexts is an important direction for future research.

Third, we used a limited number of items to assess temperament, behavior problems, and neighborhood quality, which in some cases resulted in low reliabilities. It will be important for future research to expand on what has been done in this study to assess these constructs using multiple measures (e.g., census data and community surveys to assess neighborhoods, parent reports and laboratory assessments of temperament). Fourth, caution should be taken when interpreting findings associated with the positive affect scale, as it is not clear how closely this scale is tied to the approach system. Finally, factors other than temperament and neighborhood characteristics most certainly influence the development of problem behavior including family functioning, peer relationships, neuropsychological functioning, etc. Likewise, these unmeasured variables may confound or influence the selection of neighborhood, as well as the effect of neighborhood on child behavior. It will be important for future research to include other contexts and risk factors when examining how temperament may moderate risk for problem behavior.

These limitations notwithstanding, the current paper demonstrates the utility of examining multiple temperament dimensions as moderators of neighborhood influences on child

problem behavior. Integrating multiple levels of influence in this way shows great promise in furthering our understanding of childhood adjustment. Future research should further examine how temperament may potentiate or buffer the impact of a variety of contextual influences on adjustment using moderational models.

References

- Achenbach, TM.; Edelbrock, CS. Manual for the child behavior checklist/4–18 and 1991 profile. Burlington: University of Vermont, Department of Psychiatry; 1991.
- Achenbach TM, Howell CT, Quay HC, Conners CK. National survey of problems and competencies among four to sixteen year-olds: Parents' reports for normative and clinical samples. *Monographs of the Society for Research in Child Development*. 1991; 56 (1, Serial No. 225).
- Aiken, LS.; West, SG. Testing and interpreting interactions in multiple regression. Thousand Oaks, CA: Sage; 1991.
- Aneshensel CS, Succi CA. The neighborhood context of adolescent mental health. *Journal of Health and Social Behavior*. 1996; 37:293–310. [PubMed: 8997886]
- Baker, PC.; Keck, CK.; Mott, FL.; Quinlan, SV. NLSY child handbook. Columbus, OH: Center for Human Resource Research, The Ohio State University; 1993.
- Baker, PC.; Mott, FL. NLSY Child handbook, 1989: A guide and resource document for the national longitudinal survey of youth 1986 child data. Columbus, OH: Center for Human Resource Research, The Ohio State University; 1989.
- Bates JE, Pettit GS, Dodge KA, Ridge B. Interaction of temperamental resistance to control and restrictive parenting in the development of externalizing behavior. *Developmental Psychology*. 1998; 34:982–995. [PubMed: 9779744]
- Baydar N, Brooks-Gunn J. Effects of maternal employment and child-care arrangements on preschoolers' cognitive and behavioral outcomes: Evidence from the children of the national longitudinal survey of youth. *Developmental Psychology*. 1991; 27:932–945.
- Belsky J, Eggebeen DJ. Early and extensive maternal employment and young children's socioemotional development: Children of the national longitudinal survey of youth. *Journal of Marriage and the Family*. 1991; 53:1083–1110.
- Bronfenbrenner U. Ecology of the family as a context for human development. *Development and Psychopathology*. 1986; 22:723–742.
- Bronfenbrenner U, Ceci SJ. Nature–nurture reconceptualized in developmental perspective: A bioecological model. *Psychology Review*. 1994; 101:568–586.
- Campos JJ, Campos RG, Barrett KC. Emergent themes in the study of emotional development and emotion regulation. *Developmental Psychology*. 1989; 25:394–402.
- Center for Human Resources Research. NLS handbook, 1992. Columbus, OH: Center for Human Resource Research, The Ohio State University; 1992.
- Clark LA, Watson D. Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology*. 1991; 100:316–336. [PubMed: 1918611]
- Coplan RJ, Bowker A, Cooper SM. Parenting daily hassles, child temperament and social adjustment in preschool. *Early Childhood Quarterly*. 2003; 18:376–395.
- Colder CR, Lochman JE, Wells KC. The moderating effects of children's fear and activity level on relations between parenting practices and childhood symptomatology. *Journal of Abnormal Child Psychology*. 1997; 25:251–263. [PubMed: 9212377]
- Colder CR, Mott JA, Berman AS. The interactive effect of infant activity level and fear on growth trajectories of early childhood symptomatology. *Development and Psychopathology*. 2002; 14:1–23. [PubMed: 11893087]
- Cummings EM, Ianotti RJ, Zahn-Waxler C. The development of psychopathology in females and males: Current progress and future challenges. *Development and Psychopathology*. 1989; 60:887–895.

- Dawson G, Ashman SB, Panagiotides H, Hessel D, Self J, Yamada E, et al. Preschool outcomes of children of depressed mothers: Role of maternal behavior, contextual risk, and children's brain activity. *Child Development*. 2003; 74:1158–1175. [PubMed: 12938711]
- Depue RA, Iacono WG. Neurobehavioral aspects of affective disorders. *Annual Review of Psychology*. 1989; 40:457–492.
- Dodge, KA. The structure and function of reactive and proactive aggression. In: Pepler, DJ.; Rubin, KH., editors. *The development and treatment of childhood aggression*. Hillsdale, NJ: Erlbaum; 1991. p. 201-218.
- Dodge KA, Crick NR. Social information processing bases of aggressive behavior in children. *Personality and Social Psychology Bulletin*. 1990; 16:8–22.
- Eisenberg, N.; Fabes, R. Emotion, regulation, and the development of social competence. In: Clark, MS., editor. *Emotion and social behavior: Review of personality and social psychology*. Vol. 14. Thousand Oaks, CA: Sage; 1992. p. 119-150.
- Fowles, DC. A motivational theory of psychopathology. In: Spaulding, WD., editor. *Integrative views of motivation, cognition, and emotion*. Nebraska symposium on motivation. Vol. 41. Lincoln, NE: University of Nebraska Press; 1994. p. 181-238.
- Garbarino J, Kostelny K. The effects of political violence on Palestinian children's behavior problems: A risk accumulation model. *Child Development*. 1996; 67:33–45. [PubMed: 8605832]
- Goldsmith HH, Buss AH, Plomin R, Rothbart MK, Thomas A, Chess S, et al. What is temperament? Four approaches. *Child Development*. 1987; 58:505–529. [PubMed: 3829791]
- Gorman-Smith D, Tolan P. The role of exposure to community violence and developmental problems among inner-city youth. *Development and Psychopathology*. 1998; 10:101–116. [PubMed: 9524810]
- Gray, JA. *Elements of a two process theory of learning*. New York: Academic Press; 1975.
- Gray, JA. *The psychology of fear and stress*. 2nd. ed.. Cambridge: Cambridge University Press; 1987.
- Hawkins AJ, Eggebeen DJ. Are fathers fungible? Patterns of co-resident adult men in maritally disrupted families and children's well-being. *Journal of Marriage and the Family*. 1991; 53:958–972.
- Ingoldsby EM, Shaw DS. Neighborhood contextual factors and early-starting antisocial pathways. *Clinical Child and Family Psychology Review*. 2002; 5:21–55. [PubMed: 11993544]
- Jencks, C.; Meyer, SE. The social consequences of growing up in a poor neighborhood: A review. In: McGeary, M.; Lynn, L., editors. *Concentrated urban poverty in America*. Washington, DC: National Academy; 1990. p. 111-186.
- Jessor R. Successful adolescent development among youth in high risk settings. *American Psychologist*. 1993; 48:117–126. [PubMed: 8442567]
- Kochanska G. Children's temperament, mother's discipline, and security of attachment: Multiple pathways to emerging internalization. *Child Development*. 1995; 66:597–615.
- Kochanska G. Multiple pathways to conscience for children with different temperaments: From toddlerhood to age 5. *Developmental Psychology*. 1997; 33:228–240. [PubMed: 9147832]
- Lemery KS, Goldsmith HH, Klinnert MD, Mrazek DA. Developmental models of infant and childhood temperament. *Developmental Psychology*. 1999; 35:189–204. [PubMed: 9923474]
- Lengua LJ. The contribution of emotionality and self-regulation to the understanding of children's response to multiple risk. *Child Development*. 2002; 73:144–161. [PubMed: 14717249]
- Lengua LJ, Wolchik SA, Sandler IN, West SG. The additive and interactive effects of parenting and temperament in predicting problems of children of divorce. *Journal of Clinical Child Psychology*. 2000; 29:232–244. [PubMed: 10802832]
- Lerner JV. The import of temperament for psychosocial functioning: Tests of a goodness of fit model. *Merrill-Palmer Quarterly*. 1984; 3:177–188.
- Leventhal T, Brooks-Gunn J. The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin*. 2000; 126:309–337. [PubMed: 10748645]

- Loeber R, Stouthamer-Loeber M. Development of juvenile aggression and violence: Some common misconceptions and controversies. *American Psychologist*. 1998; 53:242–259. [PubMed: 9491750]
- Loukas A, Zucker RA, Fitzgerald HE, Krull JL. Developmental trajectories disruptive behavior problems among sons of alcoholics: Effects of parent psychopathology, family conflict, and child undercontrol. *Journal of Abnormal Psychology*. 2003; 112:119–131. [PubMed: 12653420]
- Lynam DR, Caspi A, Moffitt TE, Wikstroem PO, Loeber R, Novak S. The interaction between impulsivity and neighborhood context on offending: The effects of impulsivity are stronger in poorer neighborhoods. *Journal of Abnormal Psychology*. 2000; 109:563–574. [PubMed: 11195980]
- Martinez P, Richters JE. The NIMH community violence project: II. Children's distress symptoms associated with violence exposure. *Psychiatry, Interpersonal and Biological Processes*. 1993; 56:22–35.
- McLeod JD, Edwards K. Contextual determinants of children's responses to poverty. *Social Forces*. 1995; 73:1487–1516.
- McLeod JD, Shanahan MJ. Poverty, parenting, and children's mental health. *American Sociological Review*. 1993; 58:351–366.
- McLoyd VC. The impact of economic hardship on Black families and children: Psychological distress, parenting, and socioemotional development. *Child Development*. 1990; 61:311–346. [PubMed: 2188806]
- Morrison, DR.; Moore, KA.; Meyers, DE. Presented at NICHD Conference on Outcomes of Early Childbearing: An Appraisal of Recent Evidence. Bethesda, MD: National Institutes of Health; 1992 May. Maternal age at first birth and children's behavior and cognitive development.
- Panksepp J. The neurochemistry of behavior. *Annual Review of Psychology*. 1986; 37:77–107.
- Quay HC. The psychobiology of undersocialized aggressive conduct disorder: A theoretical perspective. *Development and Psychopathology*. 1993; 5:165–180.
- Reznick, JS.; Gibbons, JL.; Johnson, MO.; McDonough, PM. Behavioral inhibition in a normative sample. In: Reznick, JS., editor. *Perspectives on behavioral inhibition*. The John D. and Catherine T. MacArthur Foundation Series on mental health and development. Chicago, IL, USA: University of Chicago Press; 1989. p. 25-49.
- Rothbart MK. Measurement of temperament in infancy. *Child Development*. 1981; 52:569–578.
- Rothbart MK. Longitudinal observation of infant temperament. *Developmental Psychology*. 1986; 22:356–365.
- Rothbart MK. Temperament and the development of inhibited approach. *Child Development*. 1988; 59:1241–1250. [PubMed: 3168640]
- Rothbart, MK. Temperament in childhood: A framework. In: Kohnstamm, GA.; Bates, JE., editors. *Temperament in childhood*. Chichester, England UK: John Wiley & Sons; 1989. p. 59-73.
- Rothbart MK, Ahadi SA, Hersey KL, Fisher P. Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development*. 2001; 72:1394–1408. [PubMed: 11699677]
- Rothbart, MK.; Bates, JE. Temperament. In: Damon, W.; Eisenberg, N., editors. *Handbook of child psychology: vol. 3. Social, emotional, and personality development*. 5th ed.. New York: John Wiley & Sons; 1998. p. 1-77.
- Rothbart, MK.; Derryberry, D.; Hershey, K. Stability of temperament in childhood: Laboratory infant assessment to parent report at seven years. In: Molfese, VJ.; Molfese, DL., editors. *Temperament and personality development across the life span*. Mahwah, NJ: Erlbaum Associates; 2000. p. 85-120.
- Sameroff, AJ. General systems theories and developmental psychopathology. In: Cicchetti, D.; Cohen, DJ., editors. *Developmental psychopathology: Theory and methods*. Vol. 1. New York: John Wiley & Sons; 1995. p. 659-695.
- Sampson RJ, Morenoff JD, Earls F. Beyond social capital: Spatial dynamics of collective efficacy for children. *American Sociological Review*. 1999; 64:633–660.
- Shaw DS, Gilliom M, Ingoldsby, Nagin DS. Trajectories of leading to school age conduct problems. *Developmental Psychology*. 2003; 39:189–200. [PubMed: 12661881]

- Thomas, A.; Chess, S.; Birch, HG. Temperament and behavior disorders in children. New York: New York University Press; 1968.
- Tremblay, RE.; Boulerice, B.; Harden, PW.; McDuff, P.; Perusse, D.; Pihl, RO., et al. Do children in Canada become more aggressive as they approach adolescence?. In: Human Resources Development Canada and Statistics Canada. , editor. Growing up in Canada: National longitudinal survey of children and youth. Ottawa: Statistics Canada; 1996. p. 127-137.
- Vandell DL, Ramanan J. Children of the national longitudinal survey of youth: Choices in after-school care and child development. *Developmental Psychology*. 1991; 27:636–643.
- Wachs, TD. Necessary but not sufficient: The respective roles of single and multiple influences on individual development. Washington, DC: American Psychological Association; 2000.
- Wikstrom, PH.; Sampson, RJ. Social mechanisms of community influences on crime and pathways to criminality. In: Lahey, BB.; Moffit, TE.; Caspi, A., editors. Causes of conduct disorder and juvenile delinquency. New York: Guilford Press; 2003. p. 118-148.

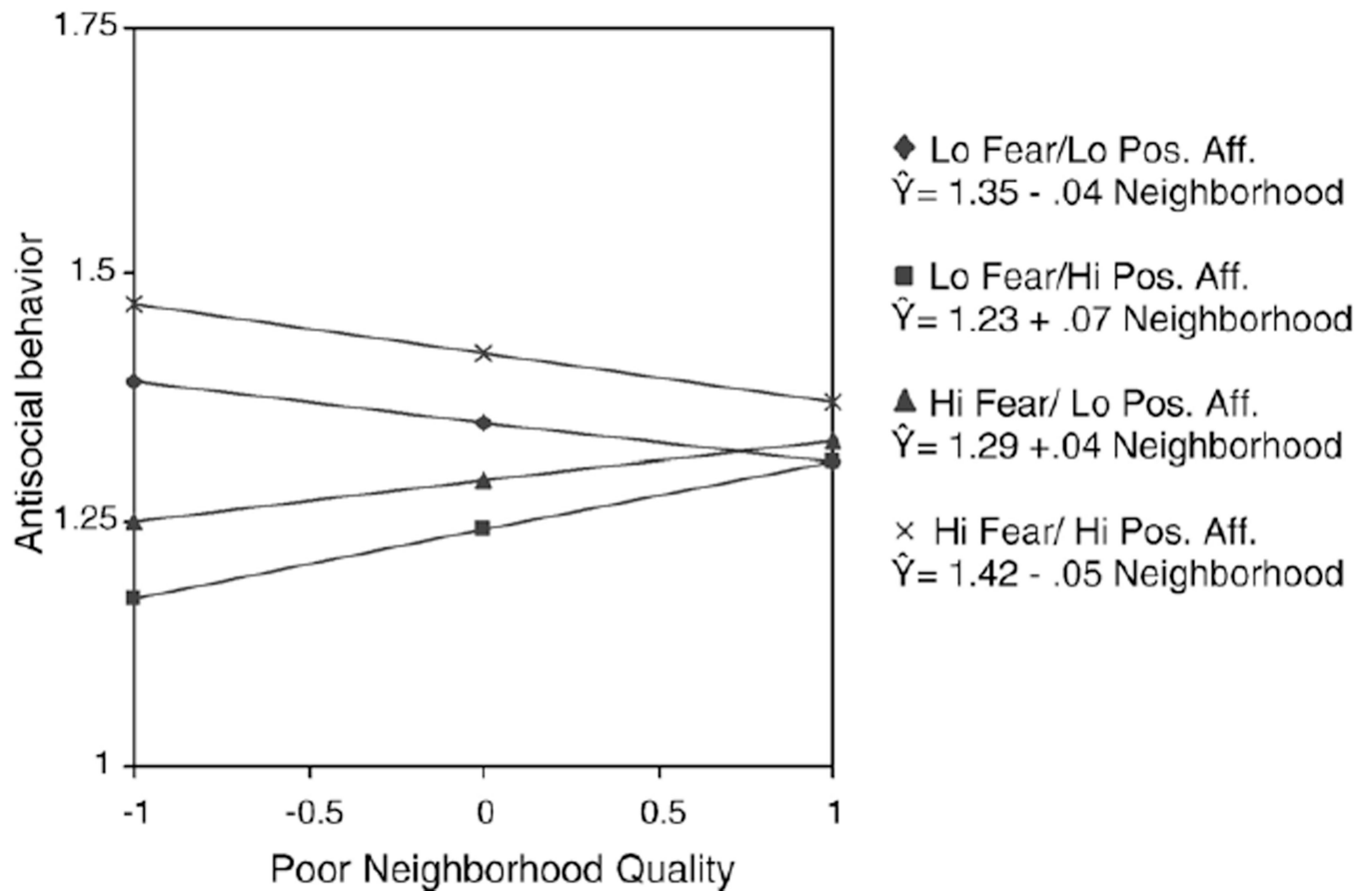


Fig. 1.
The relation between poor neighborhood quality and antisocial behavior at age 6 by levels of infant temperament.

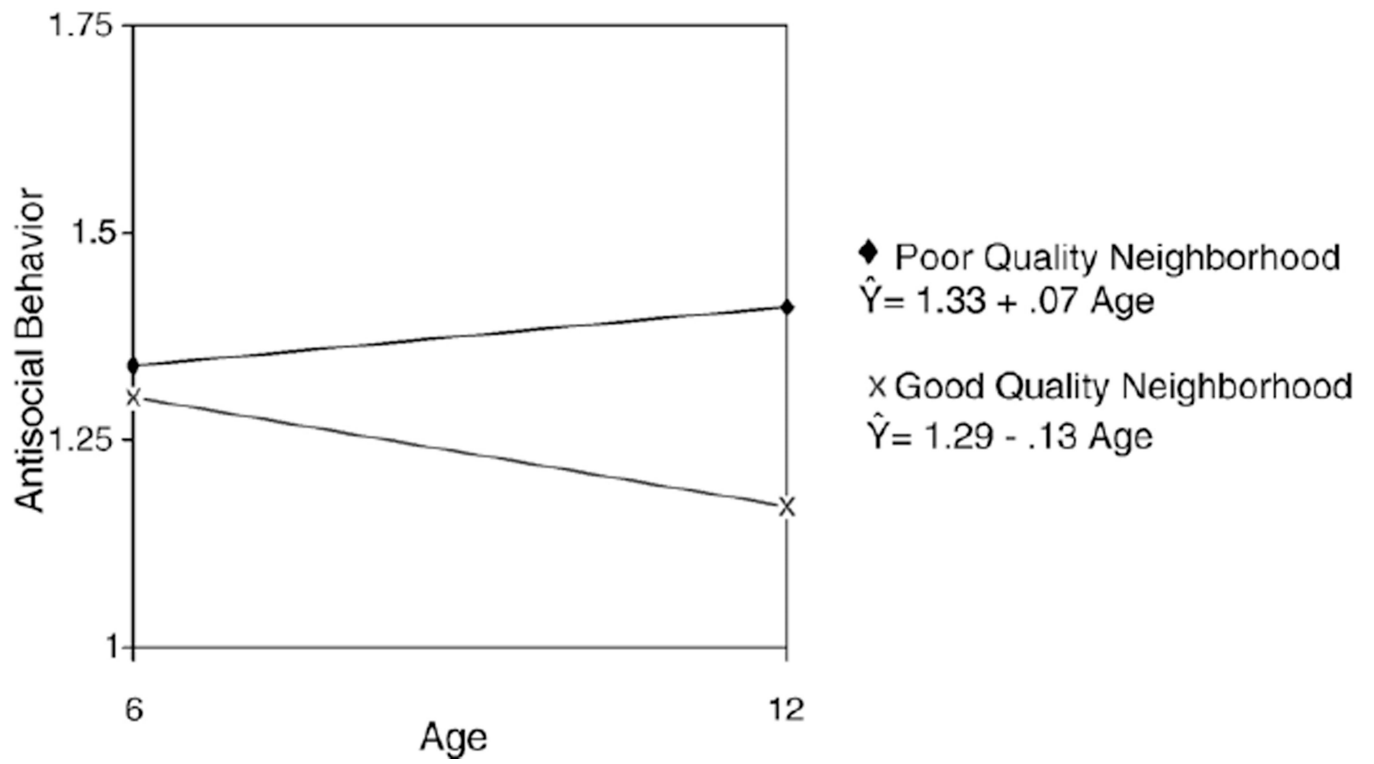


Fig. 2. Change in antisocial behavior from age 6 to age 12 by levels of neighborhood quality.

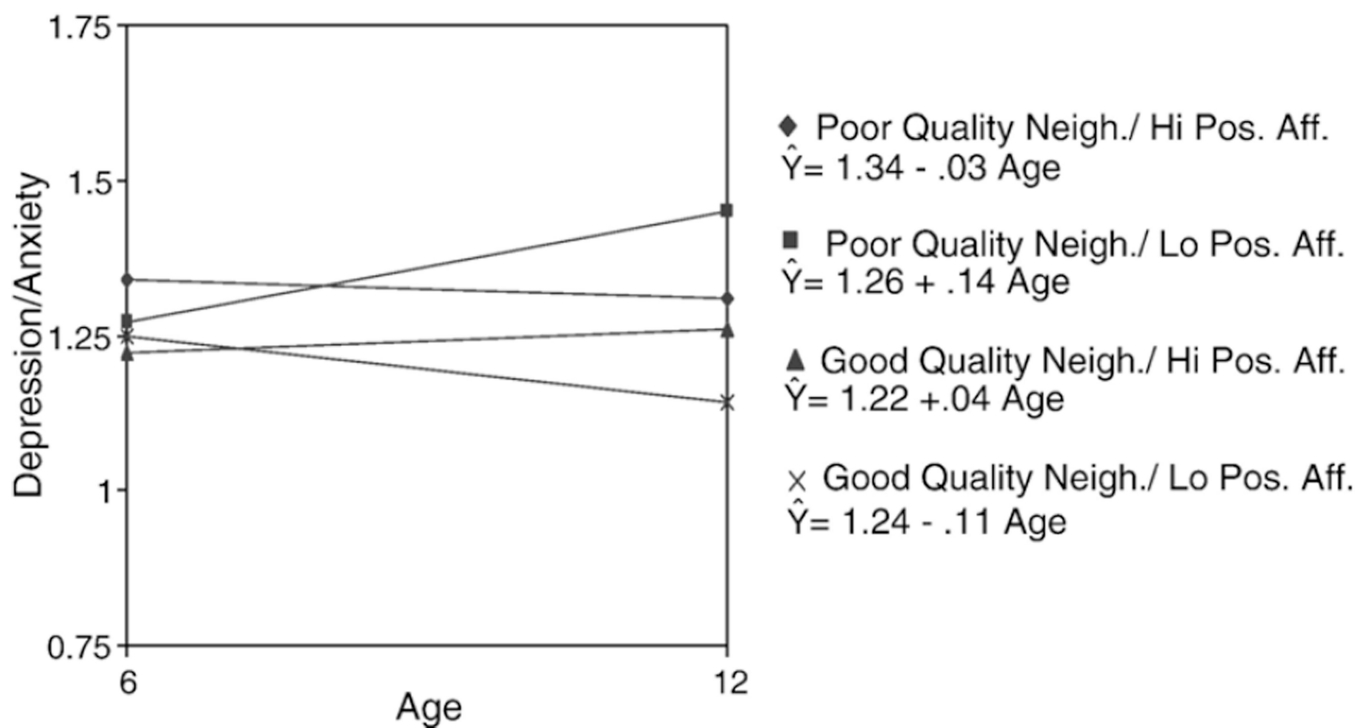


Fig. 3. Change in depression/anxiety from age 6 to age 12 by levels of infant positive affect and neighborhood quality.

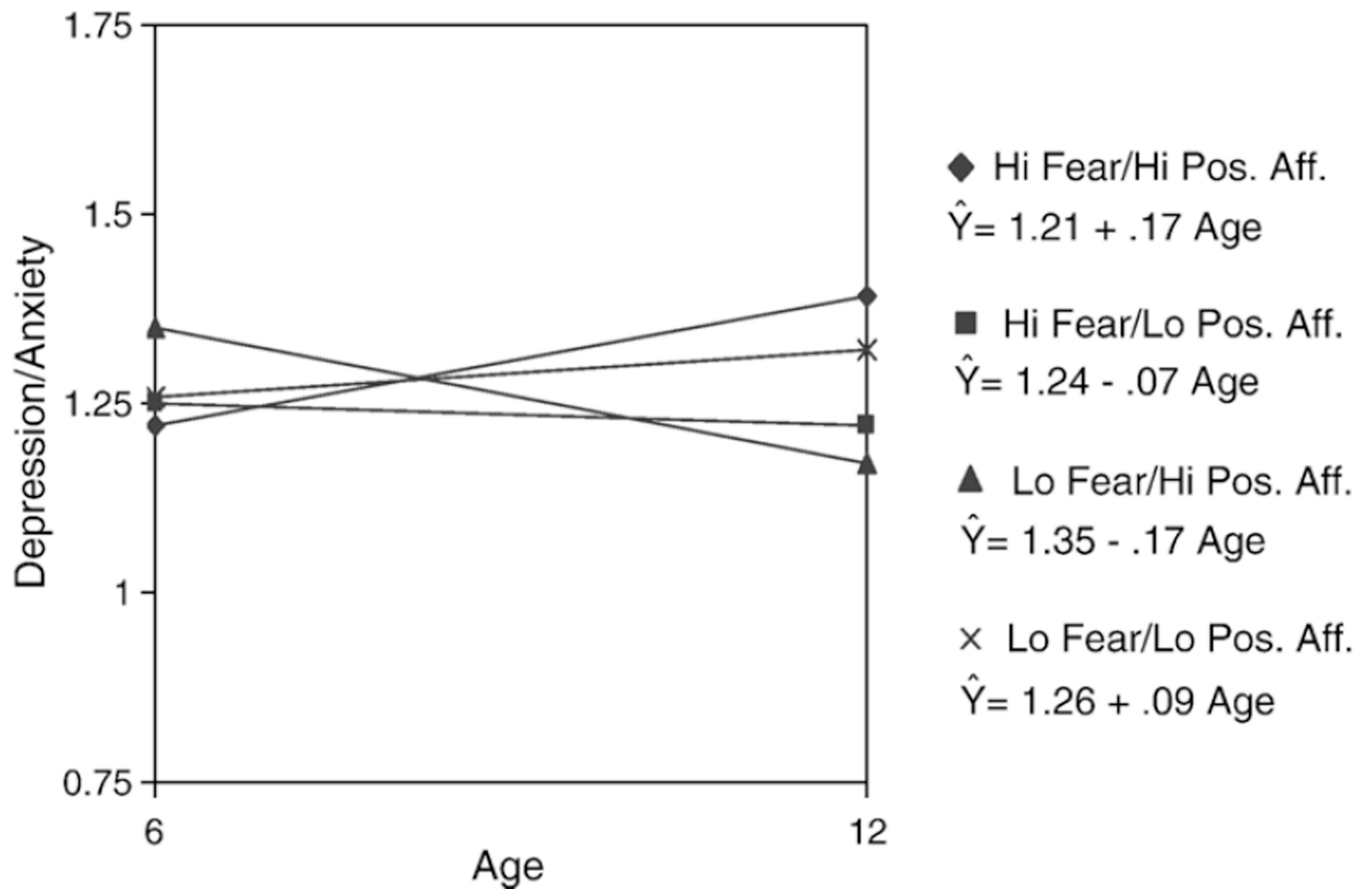


Fig. 4.
 Change in depression/anxiety from age 6 to age 12 by levels of infant temperament.

Table 1

Summary of regression analyses predicting problem behaviors at age 6 years

	Anxiety/depression (<i>N</i> = 232)		Antisocial behavior (<i>N</i> = 232)	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Intercept	1.28 *	.02	1.33 *	.03
Family income	-.03	.02	-.06 *	.02
Sex	-.01	.02	-.02	.02
Fear	-.03	.02	.03	.02
Positive affect	-.01	.02	.01	.03
Poor neighborhood quality	.03	.02	.01	.02
Fear × Positive affect	-.02	.03	.06 *	.03
Fear × Poor neighborhood quality	-.01	.02	-.01	.02
Positive affect × Poor neighborhood quality	.04	.02	.01	.02
Fear × Positive affect × Poor neighborhood quality	-.01	.02	-.05 *	.02

Note. *B* = unstandardized regression coefficient. *SE* = standard error.

* $p < .05$.

Table 2

Summary of regression analyses predicting change in behavior problems from age 6 to 12 years

	Anxiety/depression (<i>N</i> = 251)		Antisocial behavior (<i>N</i> = 251)	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Intercept	1.27 *	.03	1.32 *	.03
Family income	-.05 **	.02	-.03	.02
Sex	-.02	.02	-.02	.02
Time	.01	.06	-.03	.06
Fear	-.04	.03	.02	.03
Positive affect	.01	.03	-.01	.03
Poor neighborhood quality	.04	.02	.02	.02
Time × Fear	.04	.05	.06	.05
Time × Positive affect	-.01	.05	.01	.05
Time × Poor neighborhood quality	.04	.05	.10 *	.05
Fear × Positive affect	-.03	.02	.03	.02
Fear × Poor neighborhood quality	-.01	.02	-.03	.02
Positive affect × Poor neighborhood quality	.03	.02	-.01	.02
Time × Fear × Positive affect	.12 *	.04	.01	.05
Time × Fear × Poor neighborhood quality	-.04	.05	-.04	.05
Time × Positive affect × Poor neighborhood quality	-.08 **	.05	-.02	.05
Fear × Positive affect × Poor neighborhood quality	-.01	.02	-.03 **	.02
Time × Fear × Positive affect × Poor neighborhood quality	-.06	.04	.01	.05

Note. *B* = unstandardized regression coefficient. *SE* = standard error.

* $p < .05$.

** $p < .10$.