Cumulative Risk, Negative Emotionality, and Emotion Regulation as Predictors of Social Competence in Transition to School: A Mediated Moderation Model

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Abstract

The goals of this study were to examine the additive and interactive effects of cumulative risk and child negative emotionality on children’s social competence in the transition from preschool to school and to test whether these associations were mediated by child emotion regulation within a sample of 310 low-income, ethnically diverse boys. Multiple informants and methods were used to measure contextual risk factors and negative emotionality at the ages of 1.5 and two, emotion dysregulation at the age of 3.5, and social competence in the home at the age of five and in school at the age of six. Results indicated that the relation between cumulative risk and emotion dysregulation was amplified for children with higher levels of negative emotionality. In turn, emotion dysregulation predicted lower social competence across both the home and the school contexts. This study represents an early effort to develop an integrative model of social competence by considering joint contributions of contextual risk, negative emotionality, and emotion regulation.

Keywords: cumulative risk; negative emotionality; emotion regulation; social competence

Introduction

Children of low-income families are more likely to be exposed to multiple ecological stressors that compromise their socioemotional development than their middle-income counterparts (Evans, 2003; Raver, 2004). Research suggests that the accumulation of sociodemographic and psychosocial adversity can lead to negative psychosocial outcomes for children, with greater numbers of risk factors showing either linear or multiplicative increases in problem behavior relative to having no or only one risk factor present (Rutter, 1979; Sameroff, Gutman, & Peck, 2003; Shaw, Vondra, Hommerding, Keenan, & Dunn, 1994; Shaw, Winslow, Owens, & Hood, 1998). However, not all children who are exposed to multiple risks are maladjusted.
A bioecological theory posits that development is a joint function of contextual factors and child-level factors, as well as their interaction (Bronfenbrenner, 1979). Thus, the relation between cumulative risk and child outcome may be better understood by also considering the effects of cumulative risk within the context of individual differences in child attributes. One such child factor is negative emotionality, which may affect how children respond to the stressors in their family and community ecology (Belsky, 2005).

Additionally, it has been proposed that early risks contribute to children’s adjustment, in part, through their effects on the child’s emotion regulation abilities (Blair, 2002; Raver, 2004). However, few studies have examined the mediating role of emotion regulation in relating contextual and individual risk factors and their interaction to child functioning. Of particular interest in this study was elucidating pathways to children’s social competence or the ability to engage effectively in social interactions (Rose-Krasnor, 1997). Although children’s social competence is most often assessed in peer relations, it may be important to examine it across contexts characterized by different structures and relationships. Therefore, in this study, social competence was defined broadly to encompass children’s social abilities displayed in a familiar context with a sibling in the home as well as their social behavior in a more structured setting with peers at school. The present study tested a mediated moderation model in which the additive and interactive effects of contextual and individual risk factors in early toddlerhood were expected to be associated with children’s social competence in the transition to school, and emotion regulation during the preschool period was hypothesized to mediate these relations (Figure 1).

### Cumulative Risk

A variety of contextual risk factors have shown to predict adverse outcomes for children. Sociodemographic and psychosocial risk factors such as poverty (e.g., Evans, 2003), ethnic minority status (e.g., Spencer, 1990), single-parent household (e.g., Clarke-Stewart, Vandell, McCartney, Owen, & Booth, 2000), residential overcrowding (e.g., Evans, Saegart, & Harrid, 2001), neighborhood dangerousness (e.g., Bush, Lengua, & Colder, 2010), maternal depression (e.g., Gross, Shaw, Burwell, & Nagin, 2009), and marital conflict (e.g., Ingoldsby, Shaw, Owens, & Winslow, 1999) each have shown to be negatively associated with children’s adjustment. Many of these stressors, however, tend to be overrepresented in low-income families (Raver, 2004). Moreover, it has been consistently found that the number of contextual risk factors experienced by a child is linked to different indicators of child functioning (Evans, 2003), with such effects documented from early childhood (Shaw et al., 1994, 1998) through middle childhood.
childhood and adolescence (Loeber, 1990; Rutter, 1979). Thus, it is important to consider multiple risk factors that often co-occur to better understand the effects of the environment on children. A useful way to model multiple risk factors simultaneously is through a cumulative risk model.

Cumulative risk is a count of risk factors present in an individual’s environment. Each risk factor is typically dichotomized (0/1) based on a conceptual or a statistical criteria and then summed to generate a risk index (Rutter, 1979). Although there are drawbacks to this approach, including the assignment of equal weight to all risk factors and the loss of variability in risk factors that can be continuously scaled, using a scale based on dichotomous ratings has proven to be a parsimonious heuristic that consistently predicts child outcomes equally well or better than most individual factors examined in isolation (e.g., Sameroff et al., 2003).

An increase in cumulative risk has shown to be negatively related to children’s social competence (Foster, Lambert, Abbott-Shim, McCarty, & Franze, 2005; Lengua, Honorado, & Bush, 2007). For example, in a cross-sectional study of Head Start preschoolers, an index of social risks (e.g., violence and criminality, and parent depression) was associated with lower prosocial skills and higher disruptive behavior reported by teachers and parents (Foster et al., 2005). In another study of a middle-income preschool sample, a cumulative risk index constructed from 11 demographic and psychosocial factors predicted lower social skills rated by mothers 6 months later (Lengua et al., 2007).

**Child Temperament**

Children’s abilities to cope with different levels of cumulative adversity would be expected to be influenced by child temperament. Independently, different aspects of temperament have often been linked to both child prosocial and problem behavior (Rothbart & Bates, 2006). Of particular relevance to this study was the dimension of negative emotionality, which refers to variations in the child’s irritability, unsoothability, and intense negative reactions (Rothbart, Ahadi, & Hershey, 1994). Children with high negative emotionality may react to stressful situations in intense, negative ways that may interfere with their engagement in successful social interactions. For example, emotion lability, a measure of negative reactivity, mood swings, and the intensity of emotions, has shown to be negatively associated with teacher ratings of children’s social skills and peer ratings of child likeability (Spritz, Sandberg, Maher, & Zajdel, 2010).

In addition to having direct effects on social competence, negative emotionality may moderate the effects of cumulative risk on children’s social functioning. Researchers have posited that contextual factors and child-level factors interact with each other and contribute to a child’s outcome (Bronfenbrenner, 1979; Sameroff, 2000). For example, a high-risk environment may be particularly detrimental for children with high levels of negative emotionality who tend to react to stressors more negatively than those with mellower temperament (Belsky, 2005). Unfortunately, few studies have tested the moderating contribution of negative emotionality on associations between cumulative risk and child outcomes (Sameroff et al., 2003). Notable exceptions include studies using school-age samples by Lengua and colleagues (Bush et al., 2010; Lengua, 2002). Their findings, however, either did not find an interaction between negative emotionality (or irritability in Bush et al., 2010) and social adversity (Lengua, 2002), or found an interaction in an unexpected direction (Bush et al., 2010) in predicting children’s
social competence (i.e., neighborhood adversity only increased risk for low social competence among children low on irritability). However, the associations between neighborhood risk and negative social outcomes were amplified for children who were highly fearful or impulsive (Bush et al., 2010), supporting the role of child temperament as a moderator of environmental influences. The few studies noted above, while critical, are limited by use of cross-sectional designs, low-risk samples, and/or sole reliance on parent reports. Furthermore, very little is known about the additive and interactive effects of cumulative risk and child negative emotionality on children’s social competence in early childhood.

Emotion Regulation

As reviewed, cumulative risk and child negative emotionality have shown to be directly and/or interactively linked to variations in children’s social competence. However, a question remains as to what mechanisms underlie these associations. Several researchers have theorized that early contextual and child-level risks contribute to child outcomes such as social competence partly through their effects on children’s emotion regulation (Blair, 2002; Raver, 2004). Emotion regulation has been defined as the process of monitoring and modulating emotional reactions to accomplish goals (Eisenberg & Spinrad, 2004) and has shown to develop rapidly during the preschool period with the growth of effortful control (Rothbart & Bates, 2006). In empirical studies, measurement of emotion regulation often involves examining children’s voluntary attempts to control negative reactions in a stressful situation (e.g., delay of gratification).

Although emotion regulation has been highlighted as a potential mediator of the effects of contextual risk factors and individual characteristics (e.g., negative emotionality) on children’s social competence, few studies have examined these relations simultaneously. However, largely in separate literatures, supporting evidence for the relation between early contextual and child risks and emotion regulation and the relation between emotion regulation and social competence have been documented. With respect to contextual risk, it has been proposed that multiple physical and psychosocial stressors faced by children in poverty affect emotion regulation through their influence on the structure and function of the brain regions that underlie regulatory abilities (Blair, 2002). Indeed, children of low-income families have been found to perform worse on delay of gratification tasks compared with their middle-income peers (e.g., Evans, 2003).

Child negative emotionality may also be an early marker of poor emotion regulation (Kopp, 1989). Whereas individual differences in negative emotionality emerge in the first year of life relative to emotion regulation abilities that become markedly more evolved during the preschool years (Rothbart & Bates, 2006), infants and young toddlers high on negative emotionality may have more difficulty acquiring regulatory skills because emotional arousal hinders higher order cognitive processes required for learning (Blair, 2002). Additionally, negative emotionality may moderate the effect of cumulative risk on children’s emotion regulation by the same rationale detailed in the previous section (e.g., Bronfenbrenner, 1979). For example, children high in reactivity (a construct that overlaps with negative emotionality) were most likely to develop disturbances in emotion regulation in a risky environment such as negative parenting and inter-parental conflict (Morris, Silk, Steinberg, Myers, & Robinson, 2007). However, past research on environmental effects on children’s emotion regulation has
been focused more on proximal factors (e.g., parenting) and less on other familial and contextual factors.

Finally, a large body of research supports the role of emotion regulation in predicting children’s social competence (Lengua et al., 2007; Spritz et al., 2010). For example, boys who showed sustained focus on the delayed reward during a delay of gratification task at the age of 3.5 were more likely to be rated as uncooperative by their first-grade teachers (Gilliom et al., 2002) and be rejected by peers at the ages of nine and 10 (Trentacosta & Shaw, 2009). In sum, although it has been suggested that the effects of cumulative risk and negative emotionality on children’s social competence may in part be mediated by their emotion regulation abilities, these associations have not been investigated simultaneously in the same study.

**Social Competence Across Contexts**

Although many previous studies have investigated social competence in a single setting (typically the school context), it may be important to examine it in multiple contexts and relationships. In addition to assessing social competence at school, of particular interest in this study was examining children’s social behavior with a sibling in a familiar, less-structured environment (i.e., home). Although the sibling context has been highlighted as an early training ground for developing social understanding and prosocial skills (e.g., Howe, 1991), it has rarely been used to observe children’s social competence. Instead, most studies involving a sibling have focused on the quality of the sibling relationship rather than the target child’s behavior in such a context. However, as sibling relationships often involve the expression of intense emotions, especially in early childhood, and have been associated with the quality of peer interactions (Ingoldsby, Shaw, & Garcia, 2001) and other outcomes (e.g., antisocial behavior; Criss & Shaw, 2005), sibling interactions may provide an apt context from which to observe children’s developing social skills before formal school entry.

Additionally, children’s social functioning in the early elementary years has shown to forecast their socioemotional adjustment in later middle childhood (Van Lier & Koot, 2010) and adolescence (Burt, Obradović, Long, & Masten, 2008) and to predict long-term outcomes such as drug use in early adulthood (Reinherz, Giaconia, Hauf, Wasserman, & Paradis, 2000). Thus, the study of developmental pathways leading to children’s social competence at early school age merited investigation.

**The Present Study**

The goal of this study was to examine the additive and interactive effects of cumulative risk and negative emotionality on children’s social competence in the transition from preschool to school entry, highlighting emotion regulation as a potential mediator of these relations. To achieve this aim, a mediated moderation model was tested (Figure 1). Mediated moderation occurs when the interaction between independent variables (cumulative risk × negative emotionality) affects a mediator (emotion regulation), which then affects a dependent variable (social competence). By examining mediation and moderation simultaneously, a mediated moderation model can help identify processes that underlie the relation between a predictor and an outcome, and also provide information about the generalizability of these processes across subpopulations (Baron & Kenny, 1986).
It was hypothesized that cumulative risk (assessed at the ages of 1.5–2) would predict emotion dysregulation in preschool (assessed at the age of 3.5) and that this association would be moderated by earlier levels of negative emotionality (assessed at the age of 1.5). Specifically, consistent with several theories that highlight the interaction between child characteristics and contextual factors (e.g., Sameroff, 2000), the relation between cumulative risk and emotion dysregulation was expected to be stronger for children with higher vs. lower levels of negative emotionality. Emotion dysregulation, in turn, was anticipated to predict lower levels of social competence at home (assessed at the age of five) and in school (assessed at the age of six).

Multi-method and multi-informant data were used within a prospective longitudinal study of boys from low-income families. Although the sample was restricted to boys because of the larger study’s original focus on overt antisocial behavior, for which boys reliably show higher levels beginning around the age of four (Keenan & Shaw, 1997), boys also have been found to develop less-advanced regulatory behavior (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006). Additionally, as detailed above, poverty and its co-occurring stressors have demonstrated a negative impact on children’s development (e.g., Raver, 2004). Therefore, the focus of this study on low-income boys provided an opportunity to examine developmental pathways to social competence among at-risk children.

Method

Participants and Procedures

Participants were 310 boys who were part of the Pitt Mother and Child Project, an ongoing longitudinal study on child vulnerability and resiliency in low-income families (Shaw, Gilliom, Ingoldsby, & Nagin, 2003). The families were recruited from Women, Infant, and Children Nutritional Clinics in the metropolitan Pittsburgh area when the boys were between 6 to 17 months of age. At the initial assessment, the sample was primarily European American (51 percent) and African-American (39 percent). In terms of family constellations, 64 percent of the families were either married or living together, 28 percent were single, 7 percent were divorced or separated, and 1 percent was other. Mothers ranged in age from 17 to 43 years ($M = 27.83$, $SD = 5.33$). Two thirds of mothers in the sample had education of 12 years or less. The mean per capita income was $241 per month ($2892 per year), and the mean Hollingshead’s (1975) score was 24.8, indicative of a working-class sample.

The Pitt Mother and Child Project involved regular laboratory and home visits, as well as reports of child behavior by teachers once children reached school age. For the purposes of this study, data from assessments at the ages of 1.5, 2, 3.5, 5, and 6 were used. Only procedures relevant to this study are described. At the ages of 1.5 and two, mothers completed questionnaires on child and family characteristics. At the age of 3.5, children engaged in a videotaped delay of gratification task. At the age of five, the closest-age sibling of the target child was invited to participate in an hour-long sibling interaction task. At the age of six, teachers contributed ratings of boys’ social skills. Participants received compensation for their time. Retention rates were generally high, with some data available on 92–97 percent of the sample at each time point. However, due to issues such as uncodeable videotapes or use of teacher reports, the percentages of data available for analysis were 85 percent at the age of 3.5, 70 percent at the age of
five, and 65 percent at the age of six. Families who had missing data did not differ from the rest of the sample in demographic qualities or other study variables.

Measures

Cumulative Risk. The cumulative risk index was generated from 10 indicators of demographic and psychosocial risk that have been used often in previous studies (e.g., Lengua et al., 2007; Rutter, 1979): (1) teen parent status, (2) maternal education, (3) family income, (4) ethnic minority status, (5) single parenthood, (6) household overcrowding, (7) neighborhood dangerousness, (8) maternal depression, (9) household-member legal conviction, and (10) relationship conflict. Each indicator was dichotomized (0 = no risk; 1 = at risk) based on theoretical or statistical criteria as detailed in Table 1. The relatively high proportion of children living below the federal poverty line (i.e., income-to-needs ratio <1) reflects the characteristic of our sample. However, children varied in the number of other ecological risk factors that they experienced (Table 1). The total cumulative risk score was computed by summing the 10 dichotomized risk indicators. Sixteen percent of the sample reported no risk factors; 22 percent reported one risk factor; 19 percent reported two risk factors; 18 percent reported three risk factors; 14 percent reported four risk factors; 7 percent reported five risk factors; 2 percent reported six risk factors; and 1 percent reported seven risk factors. Consistent with recent studies, the cumulative risk index was treated as a continuous variable in subsequent analyses ($M = 2.29, SD = 1.69$, skewness $= .49$, kurtosis $= -.41$).

Negative Emotionality. Child negative emotionality was assessed at the age of 1.5 with the difficultness factor of the infant characteristics questionnaire (Bates, Freeland, & Lounsbury, 1979) on which mothers rated their child’s temperament on a 7-point scale. The 7-item difficultness factor (α = .81) measured the frequency and intensity of fussy, irritable child behavior.

Emotion Regulation. The child’s ability to regulate emotions in a frustrating situation was assessed at the age of 3.5 using a delay of gratification procedure called the cookie task. This is a commonly used task to measure regulatory skills and negative affect by requiring the child to wait for a reward while in an environment lacking stimulation. The boy was placed in a room cleared of toys with his mother who completed a questionnaire. The mother was asked to hold a transparent bag with a cookie inside it in view but out of reach of her child during the task, the cookie selection being chosen as the preferred one from a variety of cookies presented to the mother. The child was allowed to have the cookie after 3 min.

For every 10-s intervals, regulatory strategies and child affect were rated based on coding systems developed by Grolnick, Bridges, and Connell (1996) and Cole, Zahn-Waxler, and Smith (1994), respectively (see Gilliom et al., 2002 for details). In this study, focus on delay object, peak intensity of anger, and total time angry were used as they were thought to reflect the child’s failure to regulate negative affect and behavior, and have shown associations with poor social competence in early school age in the current sample (Gilliom et al., 2002). The focus on delay object code represented the child’s behavior that had an intention to end the waiting, such as trying to retrieve the cookie through persuasion, whining, or crying or tantruming. The affect codes focused on the child’s display of anger, both its intensity rated on a 0–3 scale (peak
### Table 1. Cumulative Risk Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Criteria and source</th>
<th>Percent at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teen parent</td>
<td>Under 18 years of age at first child’s birth(^a)</td>
<td>16.2</td>
</tr>
<tr>
<td>Low education</td>
<td>Mother did not complete high school(^a)</td>
<td>12.7</td>
</tr>
<tr>
<td>Poverty</td>
<td>Family income below the poverty line based on the 1991 US Census Bureau(^a)</td>
<td>67.5</td>
</tr>
<tr>
<td></td>
<td>Poverty Thresholds(^a)</td>
<td></td>
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<tr>
<td>Minority status</td>
<td>Child ethnicity is African-American(^a)</td>
<td>39.2</td>
</tr>
<tr>
<td>Single parent</td>
<td>Single adult in the home(^a)</td>
<td>36.0</td>
</tr>
<tr>
<td>Overcrowding</td>
<td>Fewer rooms than people (excluding bathrooms and hallways)(^a)</td>
<td>14.3</td>
</tr>
<tr>
<td>Neighborhood dangerousness</td>
<td>One (SD) or above the sample mean of 25.98 ((SD = 8.70)) on 17-item Neighborhood questionnaire on which primary caregivers rated the extent (1 = no problem; 3 = big problem) to which activities such as prostitution, vandalism, and illicit drug use were problematic in their neighborhoods ((\alpha = .94))(^b)</td>
<td>20.1</td>
</tr>
<tr>
<td>Maternal depression</td>
<td>Sixteen or higher score on the Beck depression inventory completed by mothers at the age of 1.5 ((\alpha = .83)) and 2 ((\alpha = .83)). The mean score of two time points was used to determine risk status ((r = .67, p &lt; .01))(^c)</td>
<td>10.8</td>
</tr>
<tr>
<td>Criminality</td>
<td>At least one household resident with a criminal conviction since the child’s birth(^a)</td>
<td>10.2</td>
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<tr>
<td>Relationship conflict</td>
<td>One (SD) or below the sample mean of 100.80 ((SD = 28.50)) on 15-item Marital Adjustment Test completed by mothers at the age of 1.5 ((\alpha = .77)) and 2 ((\alpha = .80)). The mean score of two time points was used to determine risk status ((r = .66, p &lt; .01))(^d)</td>
<td>15.9</td>
</tr>
</tbody>
</table>

**Notes:** \(^a\) Age 1.5 demographic questionnaire. \(^b\) Neighborhood questionnaire (Pittsburgh Youth Study, 1991). \(^c\) Beck depression inventory (Beck, Steer, & Garbin, 1988). \(^d\) Marital adjustment test (Locke & Wallace, 1959).
intensity of anger) and duration in seconds (total time angry). Inter-rater reliabilities based on 30 tapes were: 89–96 percent agreement for emotion regulation strategies (κ = .64–.79) and 88 percent agreement for affect displays (κ = .76).

The three codes were used to measure a latent factor of emotion dysregulation (i.e., higher score = more dysregulated). To address a possible concern that these codes may have measured children’s disruptive behavior in general rather than their regulatory abilities, the associations between the emotion regulation variables and the externalizing score from the child behavior checklist 2–3 (Achenbach, 1992) completed by mothers at the age of 3.5 were examined. The correlations were modest (rs from .12 to .18), suggesting that emotion regulation and disruptive behavior are related yet distinct constructs.

Social Competence at Home. The child’s social competence at home was assessed based on observations from a sibling interaction task during the home visit at the age of five. The target child and his sibling were videotaped for 1 h during which the dyad played with up to three sets of interactive toys (e.g., play set of action figures and materials from the 1995 popular children’s movie, ‘The Lion King’). The dyad was given a choice to switch sets of toys every 20 min, but to do so, they both had to agree to change before the examiner could introduce the next toy. The task itself was developed by Volling and Belsky (1992), with the current coding system adapted from the authors’ original coding manual (see Garcia, Shaw, Winslow, & Yaggi, 2000 for details). For the purposes of this study, global ratings of the target child’s negative reactivity, controlling behavior, and likability were used to measure a latent factor of social competence in the context of sibling interaction. Because inter-rater reliability at the 80 percent level was not established for global ratings (percent agreement was 72 percent), a consensus procedure was used in which the coding team watched approximately 20 min of each tape to obtain the team’s consensus on the original coder’s ratings.

The ratings were made on 4-point scales. Negative reactivity reflected how much the target child negatively reacted or overreacted when provoked by the sibling (e.g., a child reacting negatively to seemingly innocent sibling behavior would obtain a high score). Controlling behavior included the target child’s attempts to control regardless of his success (e.g., grabbing toys and shouting ‘don’t do that!’). Likability rating was a measure of how annoying or likable the target child is to others. A wide range of child behavior may influence this rating (e.g., prosocial behaviors and sneakiness). Negative reactivity and controlling behavior codes were reversed so that all three codes were in the same direction with higher score reflecting higher levels of social competence.

It should also be noted that only the data from children whose sibling was between 1 year younger and 4 years older were included in the analysis (N = 182). The restriction in age range was chosen so that the siblings would more likely be playmates rather than caretakers, which occurred with much older or much younger siblings. The cut points for this decision were based on analysis using the sibling conflict variable from the current analysis, in which it was shown that target children with siblings younger than the age of four or older than the age of nine differed significantly in the amount of conflict they showed with the target child in comparison to target children with siblings at the ages of 4–9 (Garcia et al., 2000). Of the current sample, 28 were 1 year younger, 49 were 1 year older, 48 were 2 years older, 40 were 3 years older, and 17 were 4 years older than the target child. Ninety-seven (54 percent) of the siblings were boys.
Age difference and sex of the sibling were not significantly related to the three codes used in this study.

**Social Competence in School.** Children’s social competence in school was assessed with teachers’ report on the social skills ratings scale (Gresham & Elliot, 1990), a 30-item measure of the child’s ability to conform to social standards in academic and interpersonal contexts. Teachers rated each item on a 3-point scale based on the frequency with which it occurs for the target child. The social skills ratings scale comprised three factors that address different aspects of social skills: cooperation ($\alpha = .92$), which measures the ability to comply with rules, assertion ($\alpha = .85$), which measures the ability to assert needs in a socially acceptable manner, and self-control ($\alpha = .91$), which measures the ability to control emotion and behavior in challenging situations. These factors were used to construct a latent variable of social competence in school.

**Results**

**Analysis Overview**

Following preliminary analyses (Table 2), substantive research questions were addressed using structural equation models. In structural equation models, complex relationships between constructs can be examined simultaneously. For example, a dependent variable can also be an independent variable within the same model (Kline, 2005), which was particularly advantageous for testing mediation in our model wherein emotion regulation served both as a dependent variable of early predictors and an independent variable of later social competence. structural equation models also allows for the use of latent variables that leads to high-model specificity, such as parceling measurement error from overall model error. For all models in this study, Mplus 5.21 with the full-information maximum likelihood estimation was used (Muthén & Muthén, 2007). The full-information maximum likelihood accommodates missing data using all available data for each parameter and has shown to be a superior method by many criteria compared with other missing data methods (Enders & Bandalos, 2001). Model fit was tested with multiple indices. Good-fitting models are traditionally indicated by non-significant chi-squares. However, for larger samples, the chi-square ratio ($\chi^2/df$) provides a better assessment of the chi-square by correcting for sample size with its values between 1 and 3, suggesting acceptable fit. Additionally, root mean square error of approximation (RMSEA) values below .05 and the comparative fit index (CFI) value above .90 indicate good model fit (McDonald & Ho, 2002).

**Social Competence at Home.** Figure 2 presents the model for social competence at home during a sibling interaction. This model demonstrated acceptable model fit: $\chi^2 (20) = 32.89, p < .05, \chi^2/df = 1.64, CFI = .97, RMSEA = .05$. Both the main effect of negative emotionality ($\beta = .15, p < .05$) and the interactive effect of cumulative risk $\times$ negative emotionality ($\beta = .13, p < .05$), measured at the ages of 1.5–2, significantly predicted emotion dysregulation at the age of 3.5, which, in turn, was significantly associated with social competence at home at the age of five ($\beta = -.22, p < .05$). The indirect effects were tested using the PRODCLIN (distribution of the product confidence limits for indirect effects) program (MacKinnon, Fritz, Williams, & Lockwood, 2007),
Table 2. Descriptive Statistics and Correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>2</th>
<th>3</th>
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<th>8</th>
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<th>11</th>
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</thead>
<tbody>
<tr>
<td>Predictors (age 1.5–2; N = 310)</td>
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</tr>
<tr>
<td>1. Cumulative risk</td>
<td>2.29</td>
<td>1.69</td>
<td>.07</td>
<td>.04</td>
<td>.12</td>
<td>.06</td>
<td>-.16*</td>
<td>.08</td>
<td>.07</td>
<td>-.15*</td>
<td>-.11</td>
<td>-.22**</td>
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<tr>
<td>2. Negative emotionality</td>
<td>23.31</td>
<td>6.49</td>
<td>—</td>
<td>.05</td>
<td>.11</td>
<td>.17**</td>
<td>-.11</td>
<td>-.02</td>
<td>-.04</td>
<td>-.03</td>
<td>.03</td>
<td>-.02</td>
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<td>Mediator—Emotion dysregulation (age 3.5, N = 264)</td>
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<tr>
<td>3. Focus on delay</td>
<td>4.25</td>
<td>4.32</td>
<td>—</td>
<td>.63**</td>
<td>.66**</td>
<td>-.16*</td>
<td>-.07</td>
<td>-.17*</td>
<td>-.23**</td>
<td>-.09</td>
<td>-.31**</td>
<td></td>
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<tr>
<td>4. Peak anger</td>
<td>.88</td>
<td>.91</td>
<td>—</td>
<td>.61**</td>
<td>-.18*</td>
<td>-.12</td>
<td>-.13</td>
<td>-.18*</td>
<td>-.05</td>
<td>-.22**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Total time angry</td>
<td>15.52</td>
<td>31.92</td>
<td>—</td>
<td>-.14</td>
<td>-.02</td>
<td>-.12</td>
<td>-.12</td>
<td>-.09</td>
<td>-.28**</td>
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<tr>
<td>Outcome—social competence at home (age 5, N = 182)</td>
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<tr>
<td>6. Negative reactivity (R.)</td>
<td>2.80</td>
<td>.86</td>
<td>—</td>
<td>.41**</td>
<td>.42**</td>
<td>-.05</td>
<td>.03</td>
<td>.13</td>
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<tr>
<td>7. Controlling behavior (R.)</td>
<td>2.58</td>
<td>.72</td>
<td>—</td>
<td>.31**</td>
<td>-.13</td>
<td>-.01</td>
<td>.07</td>
<td></td>
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<tr>
<td>8. Likability</td>
<td>2.75</td>
<td>.89</td>
<td></td>
<td>.03</td>
<td>.04</td>
<td>.14</td>
<td></td>
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<td>Outcome—social competence in school (age 6, N = 200)</td>
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<tr>
<td>9. Cooperation</td>
<td>13.18</td>
<td>4.88</td>
<td></td>
<td>.52**</td>
<td>.60**</td>
<td></td>
<td></td>
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<tr>
<td>10. Assertion</td>
<td>10.55</td>
<td>4.14</td>
<td>—</td>
<td>.54**</td>
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<td></td>
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<tr>
<td>11. Self-control</td>
<td>13.17</td>
<td>4.54</td>
<td></td>
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Note: (R.) = reversed.
* p < .05, ** p < .01.
which calculates asymmetric confidence limits of the mediated effect based on the distribution of the product of the two random variables. Compared with other methods assuming the normal distribution of the mediated effects, asymmetric confidence interval method tends to yield more accurate estimates because it takes into account the non-normal distribution of the mediated effects (MacKinnon et al., 2007). The indirect effect of negative emotionality on social competence at home through emotion regulation was significant with lower and upper 95 percent confidence intervals of $–.008189$ and $–.000043$. The indirect effect of cumulative risk × negative emotionality on social competence at home through emotion regulation was also significant with lower and upper 95 percent confidence intervals of $–.004291$ and $–.000003$.

Next, the significant interaction between cumulative risk and negative emotionality was probed using simple slopes procedure as outlined by Aiken and West (1991). As shown in Figure 3, cumulative risk was strongly associated with emotion dysregulation for boys with high levels of negative emotionality ($b = .51$, $p < .001$). Conversely, for boys with low levels of negative emotionality, cumulative risk was not significantly associated with variations in emotion dysregulation ($b = –.13$, NS.). Overall, the results indicate that the negative effect of cumulative risk on child emotion
dysregulation was stronger for children with high levels of negative emotionality. Emotion dysregulation, in turn, was negatively related to children’s social competence at home.

**Social Competence in School.** A separate model was estimated to examine predictors of children’s social competence in school (Figure 4). This model demonstrated acceptable model fit: $\chi^2 (20) = 29.44, p > .05$, $\chi^2/df = 1.47$, $CFI = .98$, $RMSEA = .04$. As in the model for social competence at home, both the main effect of negative emotionality ($\beta = .15, p < .05$) and the interactive effect of cumulative risk $\times$ negative emotionality ($\beta = .13, p < .05$), assessed in early toddlerhood, were significant in predicting emotion dysregulation in preschool, indicating that relations between cumulative risk and emotion dysregulation were exacerbated for boys with high levels of negative emotionality (Figure 3). Emotion dysregulation, in turn, predicted variability in boys’

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**Figure 3.** Interaction between Cumulative Risk and Negative Emotionality Predicting Emotion Dysregulation.

*Note:* NE = negative emotionality.

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social competence in school at early school age ($\beta = -0.34, p < 0.001$). Using the PRODCLIN program, the indirect effect of negative emotionality on social competence in school through emotion regulation was significant with lower and upper 95 percent confidence intervals of $-0.062123$ and $-0.004006$. The indirect effect of cumulative risk $\times$ negative emotionality on social competence in school through emotion regulation was also significant with lower and upper 95 percent confidence intervals of $-0.032041$ and $-0.000885$.

In addition, there were some significant direct effects (i.e., not mediated by emotion regulation). Specifically, increases in cumulative risk directly predicted lower levels of social competence in school ($\beta = -0.22, p < 0.01$). The interactive effect of cumulative risk $\times$ negative emotionality in early toddlerhood was also significantly associated with children’s social competence in school without mediation through emotion dysregulation in preschool ($\beta = 0.16, p < 0.05$). This interaction was probed, again by computing simple slopes (Aiken & West, 1991), and is presented in Figure 5. Unexpectedly, cumulative risk was more negatively associated with social competence in school for boys with low levels of negative emotionality. As cumulative risk increased, children’s social competence in school decreased ($b = -0.78, p < 0.01$).

Figure 4. Model for Social Competence in School.
Note: Standardized coefficients are presented. NE = negative emotionality. For all factor loadings, $p < .001$. * $p < .05$, ** $p < .01$, *** $p < .001$. 

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Conversely, the slope for boys with low levels of negative emotionality was non-significant ($b = -1.14$, NS). This interaction effect became non-significant when the mediator, emotion dysregulation, was not included as a mediator in the model ($b = 1.10$, NS).

**Discussion**

The goals of this study were to examine the additive and interactive effects of cumulative risk and child negative emotionality on children’s social competence in the transition from preschool to school and to test whether these associations were mediated by child emotion regulation skills within a sample of low-income boys. As hypothesized, increases in the number of risk factors children encountered as toddlers were predictive of less-advanced emerging emotion regulation abilities in preschool.
only for boys who had high levels of negative emotionality. Emotion dysregulation, in turn, predicted lower social competence both at home before school entry and in the first grade. Additionally, some direct effects of early risks on children’s social competence were found such as a negative association between cumulative risk and social competence in school.

**An Integrative Model of Social Competence**

The present study represents an early effort to integrate previous findings on the relations of cumulative risk, negative emotionality, emotion regulation, and social competence. By testing a mediated moderation model, this study provided evidence that the interaction between ecological risk and child temperament affects children’s social competence partly through the mediating role of emotion regulation. Our findings expand prior studies that have focused on direct associations between cumulative risk and socioemotional functioning (e.g., Evans, 2003) by suggesting that these relations may be qualified by variations in child-level factors such as temperament.

However, these results are inconsistent with the few studies that have examined interactive effects of contextual and individual factors on child outcomes. For example, using a middle-class school-age sample, Lengua (2002) has demonstrated a non-significant interactive effect between multiple risks and negative emotionality in predicting children’s adjustment. The discrepancy in findings may be due to differences in the sample’s risk status, as the current study used a higher risk sample compared with other studies. Additionally, the construct of negative emotionality has been measured differently across studies. Specifically, in addition to anger and irritability, negative emotionality may also include fear and/or worry (e.g., Lengua, 2002). Moreover, different results across studies may be reflecting different developmental periods covered. It may be possible that the interaction between the child and the context is more pronounced in early childhood when children are more dependent upon their environment and are rapidly developing multiple abilities across domains of functioning.

Furthermore, there is a chance that the significant interaction between cumulative risk and negative emotionality in this study emerged as a result of integrating emotion regulation in the model, as no study to date has tested moderation and mediation simultaneously to understand early pathways to children’s social competence. The fact that the interactive effect became non-significant when emotion regulation was removed from the model further provides support for this speculation. It would be important to corroborate whether the mediated moderation model proposed in this study would be found across different populations.

**Social Competence Across Context**

A unique feature of this study was the examination of children’s social competence across contexts, both in the home during a sibling interaction at the age of five and in school by teacher report at the age of six. Some differences emerged between the two models. A stronger association between emotion regulation and social competence was observed in the school context ($p < .001$) than in the home context ($p < .05$). This finding is intriguing given the fact that there was a larger time gap between the measurement of emotion regulation (the age of 3.5) and the social competence in school (the age of six) vs. in the home (the age of five). The child’s ability to regulate negative emotions (e.g., anger) may become particularly important for successful
adjustment in school where there are clearer structure and expectations and less room to tailor the environment to individual child’s needs than in the home.

Another interesting contrast between the models of social competence across contexts is that cumulative risk was directly related to boys’ social competence only in school. It has been suggested that children sometimes encounter a mismatch between the expectations for behavior at home and at school, and that this mismatch may be more pronounced for low-income children whose families may have different standards of behavior than their classroom teachers (Miller & Olson, 2000). Thus, in this study, teachers may have perceived certain behaviors of children who had lived in a higher risk environment as less socially adaptive even if similar behaviors were not observed as problematic in the home. Alternatively, this finding could be a result of using different methods of measuring children’s social competence in the home (observation) and at school (questionnaire). Because different methods are subject to different sources of measurement error, the finding regarding social competence across contexts should be taken with caution, as it may partly reflect how the construct was measured. Another source of variability in the findings may be the 1-year differences in the time of assessment of children’s social competence.

Additionally, the interaction between cumulative risk and negative emotionality showed a significant yet unexpected association with children’s social competence in school when emotion dysregulation was included as a mediator in the model. The fact that this interaction effect appeared only when the mediator was present is consistent with suppression effects observed in inconsistent mediation models, where the sign of the direct effect is the opposite to the sign of the mediated effect (MacKinnon, Krull, & Lockwood, 2000). The inconsistent mediation suggests that there might be an alternative mechanism for the interaction effect between cumulative risk and negative emotionality on children’s social competence in school. Some possibilities that would need to be explored in the future include (1) one or more resilience factors that covary with cumulative risk that may work for (as opposed to against) children when they interact with teachers and friends at school, and (2) other mediators not considered in this study through which the interaction would work in the opposite direction.

Contributions, Limitations, and Future Directions

This study contributes to the field in several ways. Firstly, as noted previously, this study tested an integrative model examining potential mechanisms through which early contextual and child-level risk factors become associated with children’s social competence in the transition from preschool to school. The proposed model explained 7 percent and 18 percent of the variability in boys’ social competence at home and in school, respectively. These effect sizes are comparable with previous studies that have examined early predictors of social competence using multiple methods, informants, and time points (e.g., Gilliom et al., 2002). Although effect sizes were modest, the findings, if replicated, may provide valuable information for early identification and prevention.

Secondly, although the sibling context has not typically been used as a setting in which to assess social competence, exploring functioning within this context allowed for a comparison of how contextual and child-level factors relate to measures of social competence in different settings and relationships. The findings suggest that risk factors may differentially affect social functioning depending on the context being
examined. Further studies are necessary to examine how environmental risk might differentially affect measures of social competence in various contexts.

Thirdly, the findings suggest that emotion regulation may be a promising target for early prevention of social maladjustment. Indeed, prevention programs that target children’s emotion regulation skills have shown to be associated with improvements in children’s social competence (Denham & Burton, 2003). Interventions aimed at children who show early difficulties in negative emotionality and emotion regulation could help to prevent poor social outcomes.

There are also a few limitations to note. Firstly, the sample consisted of predominantly African-American and European-American boys from low-income families living in urban settings. The extent to which the findings from this work would generalize to other samples, particularly girls or children from different racial/ethnic backgrounds, or living in non-urban communities (e.g., rural and suburban), or from higher income households, might be limited.

Secondly, one could argue that the association between child negative emotionality and emotion dysregulation in this study may reflect continuity over time and across methods in anger, as two of three indicators of emotion dysregulation reflect the child’s failure to regulate anger. Although emotional expressiveness and strategy use are inevitably related to each other, future research may benefit from a clearer distinction between them.

Thirdly, this study did not examine other potential mediators by which early contextual and child-level risks become associated with social competence. For example, in addition to mechanisms through child characteristics, early risk factors may influence child outcomes through parenting (e.g., Lengua et al., 2007).

In summary, the findings suggest that the association between cumulative risk and emotion dysregulation is moderated by negative emotionality, with a stronger relationship between these constructs for children demonstrating higher levels of negative emotionality. Further, children’s emotion dysregulation may lead to lower social competence across both the home and the school contexts. This study provides an initial step toward a better understanding of the development of children’s social competence by integrating contributions of contextual risk, child temperament, and emotion regulation.

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**Notes**

1. European American and African-American boys did not significantly differ in their socioemotional competencies in this study, consistent with a previous finding (Supplee, Skuban, Shaw, & Prout, 2009).

2. If mothers were not married, they were asked to report on their most intimate adult relationship, including a live-in or dating partner. If the mother was not in a romantic relationship, she could choose to report on a significant adult in her life who helps with childcare (e.g., grandmother), excluding items on sexual relationships. This strategy was sensitive to the fact that 36 percent of mothers are single parents, allowing for the inclusion of important information on their close relationships.

3. To test whether earlier vs. concurrent risk status might relate to child outcomes differently, additional analyses were conducted using cumulative risk computed at the age of five. The results indicated that levels of contextual adversity that the families experienced were moderately stable ($r = .73$, $p < .01$) with 70 percent of families staying within plus or minus 1 on the cumulative risk index between 1.5–2 years and 5 years. Additionally, associations between cumulative risk measured at two time points (i.e., the ages of 1.5–2 vs. the age of five) and other study variables were not statistically different using a Fisher Z test.