Multiple Risks, Emotion Regulation Skill, and Cortisol in Low-Income African American Youth: A Prospective Study

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Associations between multiple risks, emotion regulation skill, and basal cortisol levels were examined in a community sample of 69 African American youth (mean age = 11.30 years; 49% male) living in an urban setting. Multiple risks were assessed at Time 1 and consisted of 10 demographic and psychosocial risk factors including parent, child, and observer reports. Parents rated the child’s emotion regulation skill at Time 2, 6 months later. Three saliva samples were collected one morning in the week following the Time 2 interview and assayed for cortisol, a stress hormone. Regression results indicated that multiple risks at Time 1 were associated with depressed cortisol levels at Time 2, but that patterns of association differed across levels of emotion regulation skill and sex. Youth with good emotion regulation skills showed no differences in cortisol across low and high levels of risk. In contrast, females with poor emotion regulation skill showed strong negative associations between multiple risks and basal cortisol levels. Hypocortisolism is a response of some youth to multiple risks, but protective factors can attenuate this association.

Keywords: emotion regulation; multiple risks; cortisol; stress

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African American youth are at a greater risk for experiencing life stressors and the resulting negative effects of such stressors in comparison to other racial and ethnic groups. Smith (1985) suggested that racial minority status is a stressor because of increased exposure to prejudice, discrimination, and hostility as compared to individuals with majority status. Sellers, Copeland-Linder, Martin, and Lewis (2006) reported that racial discrimination was associated with higher levels of perceived stress and depressive symptomatology and lower levels of psychological well-being in their study of African American adolescents. Furthermore, several research groups have demonstrated that African American adolescents report more stressful events than Caucasians (Choi, Meininger, & Roberts, 2006; Dornbusch, Mont-Reynaud, Ritter, Chen, & Steinberg, 1991; Weist, Freedman, Paskewitz, Proescher, & Flaherty, 1995). In addition to facing greater levels of stress than Caucasians as a result of their minority status, research suggests that African Americans experience more negative outcomes in response to these and other stressors. When examining ethnic differences in social stress, mental distress, and resources, Choi et al. (2006) found that ethnic minority adolescents, specifically African Americans, Asian Americans, and Hispanic Americans, reported higher levels of social stress and mental distress compared with Caucasians. McCabe, Clark, and Barnett’s (1999) research indicated that stress, and family stress in particular, was generally related to social skill deficits, acting out, and shy or anxious behaviors in their sample of African American young adolescents. In addition to impacts on psychological functioning, stress also has been related to health problems and disease states, particularly cardiovascular disease. Jackson, Treiber, Turner, Davis, and Strong (1999) examined adolescents with a family history of hypertension and found that African Americans and Caucasians responded differently to the same stressors. Specifically, African American youth evidenced greater physiological reactivity.

African American youth living in under-resourced urban settings face additional factors that make healthy development a challenge and place them at risk for negative outcomes. Specific risk factors in these settings include demographic and psychosocial characteristics such as low socioeconomic status (SES), single-parent family status, marital conflict, maternal depression, neighborhood disadvantage, low parental education, and exposure to community violence (e.g., Compas & Williams, 1990; Conger, Ge, Elder, & Lorenz, 1994; Dodge, Pettit, & Bates, 1994; Myers, Taylor, Alvy, & Arrington, 1992). Researchers have linked these factors to negative outcomes including lower academic achievement, substance use, externalizing behaviors, and internalizing problems (Ackerman, Schoff, Levinson, Youngstrom, & Izard, 1999; Duncan, Brooks-Gunn, & Klebanov, 1994; Griffin, Botvin, Scheier, Diaz, & Miller, 2000; Margolin & Gordis, 2000).
MULTIPLE RISKS AND YOUTH ADJUSTMENT

Typically, it is not one risk factor in and of itself that increases the probability of adjustment difficulties for a child, as these risks are seldom found in isolation. Rather, risk factors tend to cluster together and exert their negative effects at once. In addition to risk factors co-occurring, they often are additive: Each exposure to a new risk may increase the child’s vulnerability exponentially. Researchers have found that more severe developmental problems are likely to occur when multiple demographic and psychosocial risks are present in the child’s environment (Garmezy, 1993; Rutter, 2000; Sampson & Laub, 1994). Stressors, particularly when they are cumulative, negatively affect youths’ adjustment. There is now a large and diverse body of literature that has documented the behavioral, emotional, academic, and relational costs associated with youths’ exposure to cumulative stressors (Evans & English, 2002; Lengua, 2002; Liaw & Brooks-Gunn, 1994; Sameroff, Seifer, Zax, & Barocas, 1987; Yoshikawa, 1994). Exposure to stress, particularly when it is cumulative, is associated with aggressive behavior, depressive and anxious symptoms, poor academic performance, and disruptions in social relationships. For example, in a cross-sectional study of 101 primarily African American and Caucasian third to fifth graders, multiple risks were associated with low self-regulation and higher levels of negative emotionality (Lengua, 2002). Lengua (2002) conceptualized multiple risks as the effects of multiple demographic, psychosocial, and environmental risk factors on child adjustment. She included 11 such risks in her analyses. Such a model assumes that children’s developmental outcomes are better predicted by examining combinations of risk factors rather than looking at individual factors in isolation. Furthermore, Evans and English (2002) examined the effects of multiple risks within a sample of low-income, rural Caucasian children aged 8 to 10 years and found that some of the negative associations between poverty and socioemotional development may result from exposure to multiple stressors.

Several research groups have shown that, regardless of racial and ethnic background, youth who live in neighborhoods with fewer resources and greater risks are more likely to exhibit negative outcomes than youth from neighborhoods with more resources and fewer risks (e.g., Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993; Leventhal & Brooks-Gunn, 2003; Zalot, Jones, Forehand, & Brody, 2007). It is the nature of the environment in which these youth reside that presents greater risks to be overcome than youth living in more advantaged neighborhoods. Unfortunately, in many urban areas, African American youth are disproportionately represented in the poorest neighborhoods (Duncan et al., 1994).
PHYSIOLOGICAL COSTS ASSOCIATED WITH RISK

One cost associated with stress in youth that has been less well investigated concerns the physiological toll that cumulative stressors place on youth. This toll is best understood when considering the concepts of allostasis and allostatic load. Allostasis refers to the physiologic mediators, such as hormones of the hypothalamic-pituitary-adrenal (HPA) axis, catecholamines, and cytokines, which promote adaptation to stressors by maintaining a balance in the systems responsible for homeostasis (McEwen, 2005). Allostatic load, in turn, is representative of the wear and tear resulting from the cumulative effects of multiple physiological systems, for example our immune system or cardiovascular system, working in a way that ensures that our body will maintain or return to a state of equilibrium after responding to stress (Evans, 2003). Researchers have linked singular risk factors to deleterious physiological responses in youth. For example, Johnston-Brooks, Lewis, Evans, and Whalen (1998) examined the mediating effect of cardiovascular reactivity on the relationship between household density and number of days of school missed due to illness in an economically advantaged sample of 81 sixth grade males, 77% of whom were Caucasian. The researchers found that increased cardiovascular reactivity accounted for the link between increased household density and more days missed from school due to illness (Johnston-Brooks et al., 1998). Few studies, however, have examined the physiological effects of multiple demographic, psychosocial, and environmental risks in youth (Evans, 2003; Evans & English, 2002; Evans, Kim, Ting, Tesher, & Shannis, 2007) and those that have focused almost exclusively on Caucasian youth. Evans (2003) found that a sample of predominately Caucasian children who experienced multiple risks displayed elevated cardiovascular and neuroendocrine levels, increased deposition of body fat, and a higher summary index of total allostatic load, as well as greater learned helplessness on an achievement task. Furthermore, Evans et al. (2007) examined this same sample of predominately Caucasian youth longitudinally and found that the relations held when controlling for levels of allostatic load 3 to 4 years prior. While it is unknown whether youth in low-income urban and rural environments face significantly different types of stressors, too little information is available to allow for generalization of these studies’ findings to all adolescents living in low resourced environments. Furthermore, African American youth face significantly different stressors than those which Caucasian youth encounter, regardless of their socioeconomic status. It is necessary to further explore the association between exposure to multiple risks and physiological response in African American youth, particularly those living in low-resourced communities, in order to get a more complete understanding of this process.
Because poverty is stressful, Blair, Granger, and Razza (2005) proposed that it is necessary to examine the physiological responses to stress in children who are reared in low-income homes. They suggested that such studies would improve our understanding of the developmental processes and outcomes of children raised in economically disadvantaged environments. Cortisol is an important physiological marker of the stress response. This hormone is released in response to activity within the HPA axis, which is sensitive to both psychological and physical stress (Vitaro & Brendgen, 2005). It helps to both mediate our initial stress response as well as to terminate the stress response, specifically our sympathetic response, by providing negative feedback inhibition on the pituitary and hypothalamus (de Kolet & Reul, 1987; Munck, Guyre, & Holbrook, 1984). Following normal rhythms, cortisol levels are highest approximately 30 minutes after waking, which is followed by a sharp decline in levels over the next 1 or 2 hours, with a more gradual decline over the remainder of the day and evening (Watamura, Donzella, Alwin, & Gunnar, 2003). These normal changes in cortisol levels in the absence of a stressor are referred to as basal cortisol levels. Under normal developmental circumstances, cortisol levels increase in amount depending on the body’s response to the stressor.

Research continues to reveal associations between cortisol levels and psychosocial risks and psychological problems in youth (Goodyer, Herbert, Tamplin, & Altham, 2000; Lupien, King, Meaney, & McEwen, 2001). However, there have been inconsistent findings regarding stress-induced variability of cortisol. Some earlier studies have found elevated basal cortisol levels in relation to stress while more recent studies have found the opposite relation. Higher basal cortisol levels are associated with internalizing behavior problems such as depression (Goodyer et al., 2000). Studies by Goodyer’s lab have found elevated levels of cortisol in clinically depressed adolescents at morning (Goodyer et al., 2000), daytime (Goodyer, Herbert, Moor, & Altham, 1991), and evening collection times (Goodyer, Park, & Herbert, 2001). Recently, literature has increasingly begun to report on the relationship between “hypocortisolism” and individuals who have experienced severe acute and chronic stress (see Heim, Ehlert, & Hellhammer, 2000). Hypocortisolism refers to individuals who have a decreased level of basal cortisol, flatter than expected daytime cortisol production, and a blunted cortisol reaction to stress (Heim et al., 2000). This decrease in cortisol is more generally associated with externalizing behavior problems (Granger et al., 1998), including violent behavior, adolescent aggression, and conduct disorder (Brewer-Smyth, Burgess, & Shults, 2004; Granger et al., 1998; Oosterlaan, Geurts, Knol, & Sergeant, 2005). These relationships are evidenced in samples of normally developing youth as well as at-risk and clinical samples (Shirtcliff, Granger, Booth, & Johnson, 2005).
Cortisol levels have been linked to physiological problems. Disturbance in the activity of the HPA axis is associated with increased risk for a variety of health problems including obesity, sleep disturbances, cardiovascular disease, and memory impairment (Lasikiewicz, Hendrickx, Talbot, & Dye, 2008; Lundberg, 2005; Rosmond, Dallman, & Bjorntorp, 1998). According to the Centers for Disease Control and Prevention (CDC, 2005), African Americans are at higher risk for many of these physical health problems relative to other ethnic groups. Thus, cortisol responses in African Americans are particularly important to examine.

Of particular interest are basal cortisol levels. Gunnar and Vazquez (2001) reported on several studies that found lower basal cortisol levels in groups of children who experienced adversity than in the comparison groups. Given that adversity is associated with lower basal cortisol levels, one might theorize that groups who face higher levels of stress, such as those lower in SES or minorities, would experience lower basal cortisol levels. However, few studies have examined the relationship between sex, race, SES, and other demographic characteristics. One study found an inverse relationship between SES and morning cortisol levels in youth between the ages of 6 and 10 years, but the relationship was nonsignificant by the time youth reached adolescence (Lupien et al., 2001). Other studies have shown that low early morning cortisol levels, along with a less marked slope in the daily rhythm, are associated with lower SES and provided evidence of less successful development and a decreased well-being (Brandtstädter, Baltes-Gotz, Kirschbaum, & Hellhammer, 1991). DeSantis et al. (2007) found that diurnal cortisol slopes were flatter among Hispanic and African American adolescents between 16 and 18 years of age. More specifically, African American males showed flatter slopes than females (DeSantis et al., 2007). These findings show that more work is needed to help explain the origins of low basal cortisol levels.

A major limitation of the cortisol research discussed above is that all but three (Brewer-Smyth et al., 2004; DeSantis et al., 2007; Shirtcliff et al., 2005) of the cited studies failed to mention the ethnicity of their sample. Furthermore, only Brewer-Smyth et al. (2004) and DeSantis et al. (2007) included African American participants in their study.

EMOTION REGULATION AS A PROTECTIVE FACTOR

Although the literature is replete with research documenting the toll cumulative stress takes on children and adolescents, not all youth experience these costs to the same degree. When faced with difficult circumstances, some children are able to overcome the risks facing them and are successful;
this is referred to as resilience. Resilience occurs when a child experiences a number of protective factors that buffer the effects of the risk factors (Luthar, 2003). Protective factors within the child, the family, and the broader social environment (e.g., neighborhood, school) reduce the likelihood that youth exposed to stressors will be negatively impacted. One key protective factor that has emerged in a number of studies is the child’s capacity for emotion regulation (e.g., Buckner, Mezzacappa, & Beardslee, 2003; Kliewer et al., 2004; Silk, Shaw, Forbes, Lane, & Kovacs, 2006). Emotion regulation skill may be a particularly important protective factor because it predicts distal emotional and behavioral adjustment (Cunningham, Kliewer, & Garner, in press; Eisenberg et al., 2001; Shields & Cicchetti, 2001). Furthermore, emotion regulation can be taught (Suveg, Kendall, Comer, & Robin, 2006), which makes understanding its relation to youth cortisol levels particularly salient.

Buckner et al. (2003) examined the influence of self-regulatory skills on resilience in a multiethnic sample of youth aged 8 to 17 years from very low-income families and found that, after controlling for negative life events and chronic strains, youth classified as resilient exhibited greater self-regulatory skills (i.e., executive functioning and emotion regulation) and self-esteem than nonresilient youth. Emotion regulation was one of the few factors that differentiated resilient from nonresilient youth. Moreover, Kliewer et al. (2004), in a study of African American families, indicated that youth’s emotion regulation skill, in addition to felt acceptance from the caregiver, observed quality of the caregiver-child interaction, and caregiver’s emotion regulation skill, were protective for children exposed to community violence. Lengua (2002) found evidence in her multiethnic sample that youth with high levels of self-regulation were less vulnerable to multiple risks. Most recently, when examining the link between maternal depression and youth internalizing problems in a multiethnic population, Silk et al. (2006) identified positive affect generation as an emotion regulation skill that served as a protective factor for youth at risk for depression.

**SEX DIFFERENCES IN THE RELATION BETWEEN STRESSORS, EMOTION REGULATION, AND ADJUSTMENT**

Little research has focused on how child sex may moderate the associations between stressors, emotion regulation, and adjustment. In a recent study of self-regulation and conduct problems among 277 low-income African American youth, Zalot et al. (2007) found that for females, but not males, living in environments with the most stressors exacerbated links between self-regulation and conduct problems. Although there are conceptual distinctions
between emotion regulation and self-regulation, both concepts reflect a youth’s capacity to exert control over his or her responses. In another study of African American youth that focused on physiological responses to stress but did not assess emotion regulation, Kliewer, Wilson, and Plybon (2002) found that environmental (neighborhood) stress was associated with physiological reactivity (increases in blood pressure) to a stress task in adolescent females but not males. Taken together, these studies suggest that females may be more vulnerable than males to environmental stressors and that capacities to regulate one’s behavior may matter more for females than for males.

THE PRESENT STUDY

The purpose of the present study was to examine prospective associations among multiple risks and basal cortisol responses among African American youth living in under-resourced, high-violence communities. Given past research on the physiological responses of youth exposed to multiple stressors, we expected an inverse relationship between multiple risks and basal cortisol levels. A second purpose of the study was to examine emotion regulation skill as a moderator of associations between multiple risks and basal cortisol levels. We expected that emotion regulation skill would attenuate the relation between multiple risks and cortisol, such that a weaker association would be present for youth high in emotion regulation skill. Finally, sex differences in the patterns of associations between multiple risks, emotion regulation skill, and cortisol were explored. Based on prior research (Kliwer et al., 2002; Zalot et al., 2007) we anticipated that emotion regulation would be more protective for females versus males.

METHOD

PARTICIPANTS

Participants included 69 urban African American youth (49% male) and maternal caregivers who completed both phases of a short-term prospective study. Youth ranged in age from 8 to 13 years (M = 11.30, SD = 1.26). The majority of caregivers (88.4%) were the child’s biological mother; 4.3% were adopted parents, 4.3% were grandmothers, and the remainder had other connections to the youth (e.g., stepmother). Socioeconomic status was low, with 53% of the sample reporting weekly household incomes of $200 or less. This was particularly striking because household size ranged
from 2 to 11 ($M = 4.90, SD = 1.93$). About a quarter (26.1%) of the caregivers had not completed high school, 55.1% had completed high school or had earned a general education degree, and 18.7% had some education beyond high school. More than half (51.5%) of the caregivers had never married, 20.6% were married or cohabitating at the time of the study, 13.2% were separated, 11.6% were divorced, and 1.5% were widowed.

PROCEDURES

Participants were recruited through community agencies and events, and by canvassing qualifying neighborhoods via flyers posted door-to-door. To be eligible, participants had to have lived in their neighborhood for at least 6 months, be the legal guardian of at least one 9 to 13 year old child, and be willing to participate in both phases of the project. Participants were recruited from the areas of the city highest in violence. Eligible respondents were then scheduled for interviews, which were conducted in a university lab. Transportation to the interview and child care was provided to minimize barriers to participation. On arrival, a trained research assistant reviewed the consent form with the child and their maternal caregiver and answered any questions. After providing written consent, the caregiver and child were taken to separate rooms where they were interviewed privately by trained graduate and undergraduate assistants. Additional assent was provided by the child before proceeding. All questions were read aloud and visual aids were used. Tests of interviewer effects revealed no meaningful differences across interviewer race or sex. At the mid-point during both the Time 1 and Time 2 interviews, the caregiver and child were brought together to complete an interaction task and an additional discussion task at Time 1. The interaction tasks were videotaped, and the discussion task was audiotaped, videotaped, and transcribed. A third research assistant, most often a graduate student or the principal investigator, provided instruction for this part of the protocol. Time 1 interviews lasted approximately 3 hours; Time 2 interviews lasted about 2.5 hours. Participants received $40 for completing each interview.

MEASURES

Multiple risks. A multiple risks index adapted from Lengua (2002) was developed and computed in order to assess the number of risk factors that exist in the lives of the participants. In the present study, 10 demographic and psychosocial risk factors were considered and combined to form a
multiple risks index. These risk factors were caregiver education, household income, marital status, adolescent parenthood, major life stressors, everyday hassles experienced by the child, maternal depressive symptoms, family history of problems, observer-rated family interaction, and neighborhood risk, including safety and violence exposure. The four demographic risk factors included the following: (a) less than a high school education of the child’s caregiver, (b) presence of poverty based on the overall household income in accordance with the 2001-2002 Federal Health and Human Services Poverty Guidelines, (c) single parent status of the primary caregiver, and (d) adolescent parent status (≤ 18) at the time of the child’s birth. Those caregivers who were grandmothers to the participants were considered outliers and were removed.

The six psychosocial risk factors considered included major negative life events, daily hassles, maternal depression, family history of problems, family interaction, and neighborhood quality. Major negative life events were determined based on the mothers’ reports of major life events that occurred within the past year; these were considered a risk factor if the number reported was greater than or equal to 1 SD above the sample mean. Daily hassles of the child were computed using child reports from the Adolescent Resource Challenges Scale (Ewart, 1993), which assesses frequency and impact of hassles; scores at or above 40 were considered at risk. Maternal depressive symptoms during the previous 3 months were determined using the caregivers’ reports on the Brief Symptom Inventory (Derogatis & Melisaratos, 1983). A score at or above 1.5 SD from the sample mean reflected risk. Family history of problems was calculated using the parent report of (a) her own psychiatric history, (b) her own time in jail, (c) the father’s time in jail, (d) financial stressors, and (e) domestic violence. Each problem that was present was coded 1, whereas the absence of the problem was coded 0. Families with four or more of these problems were considered to be at high risk. Family interaction was scored based on the average of two separate interaction tasks completed by the mother and child. Raters coded the overall interaction quality on a scale from 1 (worse) to 5 (optimal). After being coded, the interactions were regarded as risk if the combined scores from the two tasks fell below 1.5 SD of the sample mean. The inter-rater reliability for the interaction quality codes ranged from .78 to .98. The quality of the neighborhood was determined based on the mother’s overall rating of satisfaction and safety of the neighborhood environment, the child’s report of victimization by community violence, and the child’s reports of witnessing community violence. These variables were combined and families scoring 1 SD above the sample mean were considered to be at risk. The use of cut-off scores for the factors comprising the multiple risks
index is consistent with prior studies utilizing cumulative risk indices (Evans, 2003; Evans et al., 2007; Lengua, 2002).

Emotion regulation skill. At Time 2, caregivers completed the 8-item emotion regulation subscale from the emotion regulation checklist (Shields & Cicchetti, 1995). The subscale includes items that indicate situationally appropriate displays of emotion, empathy, and emotional awareness in the child (e.g., “Responds positively to neutral or friendly overtures by peers” and “Can say when s/he is feeling sad, angry, fearful, or afraid”). Items are rated on a 4-point Likert-type scale from 1 (never true) to 4 (almost always true). Cronbach’s alpha was .62.

Basal cortisol. During the week following the laboratory session at Time 2, youth provided three samples of saliva on one morning. Sample 1 was provided immediately on waking, sample 2 was provided 30 minutes later, and sample 3 was provided 30 minutes after sample 2. Children placed a cotton swab in their mouth and chewed for about a minute. After chewing, the child spit the swab into the salivette tube. The tubes were placed into a ziplock bag (provided by our lab) and put into the freezer. Youth were instructed not to consume caffeinated beverages or eat during the 1 hour collection period. Detailed instructions as well as a reminder card for the children to put next to their bed were provided to the families before leaving the laboratory. Each family practiced the procedure and repeated the instructions to the research assistant prior to being driven home. Within a few days of providing the samples, a member of our research team (typically the first author) collected the samples from the home.

All samples were assayed at Virginia Commonwealth University’s General Clinical Research Center for salivary cortisol using an enzyme immunoassay specifically designed for saliva analysis. The salivary cortisol determination was made through a commercially available high sensitivity competitive amino assay (Salimetrics, State College Pennsylvania). The assay used 25 μL of saliva which has a lower sensitivity of .007 μg/dL. Method accuracy was determined by spike recovery, and linearity determined by serial dilution of 105% to 95%. Samples were averaged for analyses in the current study.

RESULTS

DESCRIPTIVE INFORMATION

Table 1 presents descriptive information on the study variables. As seen in Table 1, a high proportion of the sample had three or more risk factors.
Consistent with prior research, we did not expect a normal distribution with regard to risk factors. Relative to studies of normally developing youth and to the norms provided by Salimetrics, the company from whom we purchased our testing kits, cortisol levels were low (Personal communication with Douglas Granger; Gunnar & Vazquez, 2001; Heim et al., 2000). For example, in the Gunnar and Vazquez (2001) study, young children reared in orphanages in Romania had morning cortisol levels that averaged about .39; in our sample the average was .26. Our data is consistent with research showing suppressed cortisol in youth under chronically stressful situations (Flinn & England, 1995; Granger et al., 1998).

We also conducted $t$ tests to determine if multiple risks, emotion regulation skill, or basal cortisol differed by child sex. There were no sex differences on these variables, $t(51) < 1$.

### REGRESSION ANALYSES

To evaluate the hypotheses that multiple risks would be associated with lower basal cortisol levels and that emotion regulation skill would attenuate this relation, a hierarchical linear regression analysis was run. Child sex was included as an additional exploratory moderator. The predictor variables

<table>
<thead>
<tr>
<th>Multiple risk factors</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>Proportion With Risk Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>na</td>
<td></td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>na</td>
<td></td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>Single parent status</td>
<td>na</td>
<td></td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>Adolescent parenthood</td>
<td>na</td>
<td></td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>Major life stressors</td>
<td>2.57</td>
<td>1.75</td>
<td>0-7</td>
<td>0.14</td>
</tr>
<tr>
<td>Daily hassles</td>
<td>19.44</td>
<td>14.25</td>
<td>0-54</td>
<td>0.15</td>
</tr>
<tr>
<td>Maternal depression</td>
<td>3.99</td>
<td>4.72</td>
<td>0-21</td>
<td>0.09</td>
</tr>
<tr>
<td>Family history of problems</td>
<td>2.64</td>
<td>1.21</td>
<td>0-5</td>
<td>0.29</td>
</tr>
<tr>
<td>Family interaction</td>
<td>2.98</td>
<td>0.88</td>
<td>1.5-5</td>
<td>0.09</td>
</tr>
<tr>
<td>Neighborhood environment</td>
<td>0.11</td>
<td>2.25</td>
<td>−3.97 to 7.63</td>
<td>0.12</td>
</tr>
<tr>
<td>Total risk score</td>
<td>2.83</td>
<td>1.35</td>
<td>0-7</td>
<td>0.58$^a$</td>
</tr>
<tr>
<td>Emotion regulation</td>
<td>25.03</td>
<td>3.45</td>
<td>11-32</td>
<td></td>
</tr>
<tr>
<td>Average basal cortisol</td>
<td>0.26</td>
<td>0.16</td>
<td>0.04-0.91</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ Proportion of the sample with $\geq$ 3 risk factors.

NOTE: na = not applicable.
were centered and interaction terms were formed from the centered variables, per Aiken and West (1991). Multiple risks, emotion regulation skill, and sex were entered on Step 1; 2-way interaction terms (e.g., risk \times \text{regulation skill}, risk \times \text{sex}, regulation skill \times \text{sex}) were entered on Step 2; and the 3-way interaction term was entered on the final step. Multivariate outliers were assessed using Cook’s D Distance Measure (Cook & Weisberg, 1982) and five outliers were removed from the model.

The overall model explained 19% of the variation in basal cortisol levels, adjusted $R^2 = .19$, $F(7, 45) = 2.72, p < .02$. Results are presented in Table 2. As seen in the table, all 2-way interactions were significant, and there was a 3-way interaction between multiple risks, emotion regulation skill, and sex. There was a significant increase in the amount of variance explained from step 1 to step 3, indicating that the interaction among predictor variables was especially important. A plot of the interaction revealed that multiple risks were associated with lower levels of basal cortisol, but only for females with poor emotion regulation skills. Analyses of simple slopes using the recommendations of Aiken and West (1991) revealed that the slope describing the relation between multiple risks and average basal cortisol for females with low emotion regulation skill was significant, $t = 3.95, p < .001$. The slope describing the relation between multiple risks and average basal cortisol for males with low emotion regulation skill ($t = 1.96$),

### TABLE 2

| Regression Analysis Predicting Basal Cortisol Levels From Multiple Risk, Emotion Regulation Skill, and Sex |
|-----------------------------------------------------|-----------------------------------------------------|----------------------------------|----------------------------------|
| Final Step                                          | $R^2$                                               | Adjusted $R^2$                   | Change                          |
| Step 1                                              | .243                                               | .059                             | .01                             |
| Multiple risk                                       | −.07                                               | .03                              | −.64**                          |
| Emotion regulation                                  | .01                                                | .01                              | .26                             |
| Sex                                                 | −.01                                               | .04                              | −.05                            |
| Step 2                                              | .415                                               | .172                             | .065                            | .113                            |
| Risk \times regulation                              | .03                                                | .01                              | .65**                           |
| Risk \times sex                                     | .10                                                | .03                              | .67**                           |
| Regulation \times sex                               | −.04                                               | .02                              | −.54**                          |
| Step 3                                              | .545                                               | .298                             | .188                            | .125**                          |
| Risk \times regulation \times Sex                  | −.04                                               | .01                              | −.60**                          |

NOTE: $B =$ unstandardized regression coefficient; $\beta =$ standardized regression coefficient. $F(7, 45) = 2.72, p < .05$. **$p < .01.$
and the slopes for males and females describing the relation between multiple risks and basal cortisol at high levels of emotion regulation skill ($t < .10$) were not significantly different from zero (see Figure 1 for a depiction of the slopes for females).

**DISCUSSION**

Analyses from the present study revealed that early adolescent African American youth living in an urban environment who experienced multiple risks showed depressed levels of basal cortisol 6 months later. This association was qualified by an interaction of emotion regulation and sex: African American youth with high levels of caregiver-rated emotion regulation skill did not show adverse effects of multiple risks on cortisol. In contrast, females, but not males, with low levels of emotion regulation skill showed strong inverse associations between multiple risks and basal cortisol.

The inverse association of multiple risks and basal cortisol is consistent with a number of other studies that have documented hypocortisolism.
(Gunnar & Vazquez, 2001; Heim et al., 2000) and suggests that this response to chronic stress is common in a subset of youth. The fact that the association between multiple risks and low basal cortisol was not present in either males or females with good emotion regulation skills is consistent with work by Lengua (2002) focused on behavioral correlates of multiple risks. Our data and that of others (cf. Evans et al., 2007) suggest that the biological consequences of multiple risks are not inevitable. Rather, protective factors in the individual, the family, or the broader social environment have the potential to attenuate the costs associated with exposure to chronic stress. Emotion regulation skill may be a particularly important protective factor because it predicts distal emotional and behavioral adjustment (Cunningham et al., in press; Eisenberg, et al., 2001; Shields & Cicchetti, 2001) and can be taught (Suveg et al., 2006). In fact, emotion regulation skill is a key component of many prevention and intervention programs designed to reduce adjustment problems in youth.

Our work extends that of Lengua (2002) and Evans et al. (2007) by focusing on stressors experienced by African American youth living in an urban area. Our data suggest that individuals working with urban African American youth need to attend to the multiple risks in these children’s lives, and to pay particular attention to emotion regulation skills and other protective factors that might attenuate risk. Given the role of stress in the adjustment of African Americans, individuals working with African Americans should be trained to recognize and assess cumulative risk. Dominant approaches to considering multiple risks do not address historical factors such as discrimination, prejudice, and hostility that are very common experiences among African Americans. Researchers should work to integrate these stressors into measures of multiple risks.

Interestingly, the pattern of protection afforded by emotion regulation skill in females is what Luthar, Cicchetti, and Becker (2000) termed a “protective-stabilizing” effect. Protective-stabilizing effects refer to situations in which the presence of the protective factor is associated with stability in adjustment despite increasing risk. Notably, we expected that emotion regulation skill would attenuate the association between multiple risks and basal cortisol. The observed results for females were stronger than we anticipated. One practical implication of this finding is the importance of identifying modifiable protective factors that can be enhanced, particularly for African American youth who have experienced or are experiencing cumulative stressors. Buckner et al.’s (2003) study of resilience highlights the importance of emotion regulation skill in particular, as a factor that differentiated poor youth with good versus problematic adjustment. Organizations serving African American youth might consider routinely
screening youth for risk and protective factors and targeting youth for intervention who appear to have the most risk factors and fewest resources.

Sex was included in exploratory analyses in the present study. It is interesting to speculate why poor emotion regulation skills contributed to poor physiological outcomes in the context of multiple risks for females but not males. The youth in the study were in the age range of 9 to 13 years. It could be the case that hormonal changes associated with puberty heightened vulnerability to stressors in females, and thus the absence of protective factors had a greater impact on physiological markers of stress response in females compared to males. It also may be the case that other stressors in addition to puberty not assessed in our data set, in concert with the multiple risks we did assess, resulted in a “piling up” of stressors that require a number of protective factors to counteract. Zalot et al.’s (2007) work in concert with our findings suggest that researchers should continue to examine how sex interacts with risk and protective factors, as the pathways to adjustment may be quite different for males and females.

STUDY STRENGTHS AND LIMITATIONS

Strengths of the study included a prospective design, collection of data from parents, youth, and observers, and focus on an understudied area. However, the correlational nature of the data precludes causal interpretations. Furthermore, it is possible that because of the correlational nature of the data, fluctuations in basal cortisol levels are due to phenomena other than risks. Other limitations are that the internal consistency of the emotion regulation measure was low. Although this is a widely used measure of emotion regulation, the low alpha suggests that this measure should be augmented with other indicators of emotion regulation skill in future work. Furthermore, although the multiple risks index was computed from a variety of sources, the index did not take youths’ appraisals into account. Thus, some youth with high scores on the multiple risks index may not have perceived themselves to be under significant stress. Finally, our results are generalizable only to African Americans in poor, chronically violent communities.

IMPLICATIONS FOR RESEARCH AND PRACTICE

In addition to the suggestions noted earlier, more research is needed on the physiological costs—indexed by multiple biological systems—of youth who experience chronic stress. Unfortunately, urban African American youth are disproportionately represented in this group. One direction for
future research is to include physiological indicators in prevention and intervention studies with African American youth, such as the Strong African American Families Program developed by Gene Brody. Randomized clinical trials designed to change coping processes or family interaction patterns would provide robust tests of the extent to which the association of multiple risks on physiological adjustment can be attenuated by changing protective factors.

In terms of application of the findings, one implication is to not assume that although risk and protective factors may be equivalent for males and females, the patterns of association may differ across sex. It is important to understand both the absolute levels of risk and protection present, and the way these factors interact. These data also suggest that emotion regulation is a construct that should be targeted in prevention and intervention trials.

REFERENCES


