

# Emotion Dysregulation as a Mechanism Linking Stress Exposure to Adolescent Aggressive Behavior

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**Abstract** Exposure to stress is associated with a wide range of internalizing and externalizing problems in adolescents, including aggressive behavior. Extant research examining mechanisms underlying the associations between stress and youth aggression has consistently identified social information processing pathways that are disrupted by exposure to violence and increase risk of aggressive behavior. In the current study, we use longitudinal data to examine emotion dysregulation as a potential mechanism linking a broader range of stressful experiences to aggressive behavior in a diverse sample of early adolescents ( $N=1065$ ). Specifically, we examined the longitudinal associations of peer victimization and stressful life events with emotion dysregulation and aggressive behavior. Structural equation modeling was used to create latent constructs of emotion dysregulation and aggression. Both stressful life events and peer victimization predicted

subsequent increases in emotion dysregulation over a 4-month period. These increases in emotion dysregulation, in turn, were associated with increases in aggression over the subsequent 3 months. Longitudinal mediation models showed that emotion dysregulation mediated the relationship of both peer victimization ( $z=2.35$ ,  $p=0.019$ ) and stressful life events ( $z=2.32$ ,  $p=0.020$ ) with aggressive behavior. Increasing the use of adaptive emotion regulation strategies is an important target for interventions aimed at preventing the onset of adolescent aggressive behavior.

**Keywords** Stress · Peer victimization · Aggression · Emotion regulation · Adolescence

Children who are exposed to stressful life events and chronic stressors are at increased risk of a wide range of mental health problems, including anxiety, depression, and externalizing behaviors (Adrian and Hammen 1993; Grant et al. 2003; Rudolph and Hammen 1999; Shih et al. 2006; Deater-Deckard, et al. 1998; Attar, et al. 1994). The mechanisms linking stress to the onset of psychopathology have only recently begun to be the focus of empirical research despite calls for greater research attention to this topic (Grant, et al. 2004). Understanding these mechanisms is important to inform the development of evidence-based interventions to mitigate the effects of stress exposure on child and adolescent mental health outcomes. The current study examined the role of emotion dysregulation as a mechanism linking stress exposure to aggressive behavior among adolescents.

An extensive literature has documented that youths who are the targets of peer victimization, peer rejection and peer aggression—developmentally salient stressors for children and adolescents (Prinstein and La Greca 2004; Prinstein, et al. 2005)—are more likely to develop aggressive behavior

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than children who are not victimized (Coie, et al. 1992; Lansford et al. 2010; Dodge et al. 2003; Prinstein and La Greca 2004; Miller-Johnson, et al. 2002). Mechanisms linking such exposure to both concurrent and future aggressive behavior have been examined primarily within a social-information processing framework (Dodge, et al. 1990; Dodge, et al. 2003). Exposure to aggression and victimization, including peer social rejection and physical abuse, has been shown to disrupt various aspects of social information processing, including sensitivity to hostile cues and the likelihood of making hostile attributions to ambiguous behavior (Dodge et al. 2003; 1990; Guerra, et al. 2003; Weiss et al. 1992). Numerous prospective studies have shown that these social information processing deficits mediate the effects of peer social rejection and physical abuse in childhood on subsequent aggressive behavior problems in children (Dodge et al. 2003; 1990; Lansford, et al. 2010; Dodge, et al. 1995; Weiss et al. 1992).

Overall, this literature suggests that specific aspects of social information processing are disrupted following exposure to aggression and victimization and lead to the development of aggressive behavior in children and adolescents. Such mechanisms have been studied primarily in relation to being the target of aggressive behavior, rather than as a consequence of stress exposure more broadly (Dodge et al. 2003; 1990; Weiss et al. 1992; Guerra et al. 2003). As such, the extent to which other mechanisms underlie the relationship between stressful life events and chronic stressors—including peer victimization—and youth aggressive behavior has rarely been examined. One potentially important mechanism is emotion dysregulation. Emotion regulation is defined as “the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, to accomplish one’s goals” (Thompson 1994, p. 27). Emotion regulation involves a number of component processes, including emotional awareness and understanding, cognitive reactivity to emotional experiences, and the ability to adaptively express and modulate emotions (Denham 1998; Thompson 1994; Eisenberg, et al. 1994; Eisenberg and Spinard 2004; Gross 1998). These aspects of emotion regulation have been found to covary, such that they form a unitary latent factor in adolescents (McLaughlin, et al. 2011).

Recent work suggests that exposure to stressful life events and peer victimization is associated prospectively with increases in emotion dysregulation in adolescents (McLaughlin and Hatzenbuehler 2009; McLaughlin, et al. 2009). Consistent with previous work (Southam-Gerow and Kendall 2000; Silk, et al. 2003; Abela, et al. 2002; Broderick and Korteland 2004), these disruptions in emotion dysregulation have been shown to predict the subsequent onset of a wide range of psychopathological symptoms in adolescents, including anxiety, depression,

and externalizing behaviors (McLaughlin et al. 2011). Critically, emotion regulation deficits have been found to mediate the relationship of both peer victimization and stressful life events with subsequent increases in internalizing symptoms (McLaughlin and Hatzenbuehler 2009; McLaughlin et al. 2009). Consistent evidence suggests that emotion dysregulation is also associated with risk for behavior problems and aggression in children and adolescents (McLaughlin et al. 2011; Bohnert, et al. 2003; Cole, et al. 1994; Shields and Cicchetti 1998; Eisenberg et al. 1997). Emotion dysregulation may thus represent another mechanism linking stressful life events and peer victimization to the onset of aggressive behavior in adolescents. To our knowledge, this possibility has never been empirically examined.

Several specific aspects of emotion regulation may underlie the relationship between stress and adolescent aggression. Exposure to family conflict has been shown to increase sensitivity to anger in children and to undermine emotional understanding (Repetti, et al. 2002). Peer victimization experiences engender a range of negative emotions, including anger and sadness (Mahady Wilton, et al. 2000), and high levels of emotional arousal and reactivity have been documented among youths who are the victims of peer aggression (Schwartz, et al. 1993). Dysregulated emotional reactivity following such stressors may contribute to the heightened reactions to hostile cues observed among victimized children and adolescents (Dodge et al. 1990, 2003). Repeated exposure to stressful experiences such as physical abuse can decrease children’s ability to empathize and limit their repertoire of coping skills (Shields and Cicchetti 1998). Given substantial evidence that deficits in emotional understanding, emotional control and coping behaviors may increase engagement in aggressive behavior (McLaughlin et al. 2011; Bohnert, et al. 2003; Cole, et al. 1994; Shields and Cicchetti 1998; Eisenberg et al. 1997), emotion dysregulation is a plausible mechanism linking stress exposure to adolescent aggressive behavior.

Specifically, we examined whether exposure to stress influenced response-focused emotion regulation strategies. In one of the most influential models of emotion regulation, James Gross (1998, 2001) distinguishes between emotion regulation strategies that occur prior to an initial emotional reaction (antecedent-focused) versus strategies that occur following an emotional reaction (response-focused). Evidence suggests that antecedent-focused strategies, such as reappraisal or situation selection, are more effective at modulating the intensity and duration of emotional reactions than response-focused strategies. For example, expressive suppression—a response-focused emotion regulation strategy—dampens expressive features of an emotional reaction, but amplifies physiological and experiential aspects of that reaction (Gross 1998). Individuals who report greater use of antecedent-focused emotion regulation strategies exhibit

greater positive affect and reduced negative affect compared to individuals who engage in higher levels of response-focused emotion regulation (Gross and John 2003).

Exposure to peer victimization and stressful life events elicit a range of negative emotions in adolescents (Larson and Ham 1993; Mahady Wilton et al. 2000). We were interested in examining whether these sorts of environmental stressors influence the strategies that adolescents use to modulate these negative emotions once they have been activated. Specifically, we anticipated that stress exposure would result in greater use of maladaptive response-focused emotion regulation strategies. Because response-focused emotion regulation strategies are less effective at modulating emotional reactions and are associated with greater levels of negative affect than antecedent-focused emotion regulation strategies (Gross 1998; Gross and John 2003), we expected that engagement in maladaptive response-focused emotion regulation strategies would be unlikely to effectively modulate the negative emotions associated with stressful experiences, increasing vulnerability to aggressive behavior. We selected three indicators of response-focused emotion regulation: emotional awareness, indexing the degree to which adolescents are aware of and understand their emotions; maladaptive expressive tendencies, assessing the degree to which adolescents have difficulty modulating the expression of anger and sadness; and rumination, an emotion regulation strategy that involves passively focusing on feelings of distress and thinking about their causes and consequences without initiating problem solving behaviors (Nolen-Hoeksema, et al. 2008). Each of these response-focused emotion regulation strategies has previously been linked to aggressive behavior in children and adolescents (Bohnert et al. 2003; Peled and Moretti 2007; Zeman, et al. 2002).

The purpose of the current study was to examine the role of emotion dysregulation as a mechanism underlying the associations of both peer victimization and stressful life events with the development of aggressive behavior using prospective data from a large, diverse community-based sample of adolescents. We hypothesized that peer victimization and stressful life events would predict increases in response-focused emotion dysregulation and aggressive behavior. We further predicted that increases in emotion dysregulation would mediate the relationship between stress exposure and changes in aggression over time. Finally, we examined the role of gender as a moderating variable, given the established gender differences in rumination (Nolen-Hoeksema and Hilt 2009), stress exposure (Rudolph and Hammen 1999), forms of peer victimization (Crick and Bigbee 1998) and aggressive behavior (Dodge et al. 2003; Guerra et al. 2003; Miller-Johnson et al. 2002; Deater-Deckard et al. 1998; Cole et al. 1994) among children and adolescents. These hypotheses were examined using longitudinal data with three separate assessments, allowing us

to provide a stringent test of mediation (Maxwell and Cole 2007).

## Method

### Participants

The sample for this study was recruited from the total enrollment of two middle schools (Grades 6–8) in central Connecticut that agreed to participate in the study. The parents of all eligible children ( $N=1567$ ) in the participating middle schools were asked to provide active consent for their children to participate in the study. Parents who did not return written consent forms to the school were contacted by telephone. Twenty-two percent of parents did not return consent forms and could not be reached to obtain consent, and 6% of parents declined to provide consent. The overall participation rate in the study at baseline was 72%. Of participants who were present at baseline, 221 (20.8%) did not participate at the Time 2 assessment, and 217 (20.4%) did not participate at the Time 3 assessment, largely due to transient student enrollment in this district. Data from the school district indicate that over the 4-year period from 2000 to 2004, 22.7% of students had left the district (Connecticut Department of Education 2006). Analyses were conducted using the sample of 1,065 participants who were present at the baseline assessment, excluding participants who were present at Time 2 and/or Time 3 but not at Time 1.

The baseline sample included 51.2% ( $N=545$ ) boys and 48.8% ( $N=520$ ) girls. Participants were evenly distributed across grade level with an age range of 11–14 years. The racial/ethnic composition of the sample was as follows: 13.2% ( $N=141$ ) non-Hispanic White, 11.8% ( $N=126$ ) non-Hispanic Black, 56.9% ( $N=610$ ) Hispanic/Latino, 2.2% ( $N=24$ ) Asian/Pacific Islander, 0.2% ( $N=2$ ) Native American, 0.8% ( $N=9$ ) Middle Eastern, 9.3% ( $N=100$ ) Biracial/Multiracial, and 4.2% ( $N=45$ ) Other racial/ethnic groups. Twenty-seven percent ( $N=293$ ) of participants reported living in single-parent households. School records indicated that 62.3% of students qualified for free or reduced lunch in the 2004–2005 school year.

### Measures

**Aggressive behavior** A revised version of The Peer Experiences Questionnaire (RPEQ; Prinstein, et al. 2001) was used to assess participants' engagement in aggression toward peers. The RPEQ included 18 items that assess aggression toward peers. Participants rate how often they engage in a specific behavior toward others in the past year (e.g., "I threatened to hurt or beat up another kid") on a 5-point Likert scale ranging from never (1) to a few times a week

(5). The RPEQ has also demonstrated good internal consistency on both versions of the measure (aggressor and victim), as well as for the subscales, and convergent validity (Prinstein et al. 2001). The RPEQ demonstrated good internal consistency in this sample ( $\alpha=0.90$ ).

*Peer Victimization* The RPEQ (Prinstein et al. 2001) was also used to assess participants' peer victimization experiences. The questionnaire includes 18 items that ask participants to rate how often an aggressive behavior was directed towards them in the past year on a 5-point Likert scale ranging from never (1) to a few times a week (5). The original and revised measure has demonstrated good test-retest reliability, internal consistency, and convergent validity (Prinstein et al. 2001; Vernberg, et al. 2000). The RPEQ assesses each of the following forms of victimization: overt (e.g., "A kid threatened to hurt or beat me up"); relational ("To get back at me, another kid told me that he or she would not be my friend"); and reputational ("A kid gossiped about me so that others would not like me."). Scores are obtained by summing the items within each subscale. Each of the RPEQ victimization subscales demonstrated adequate internal consistency in this sample: overt ( $\alpha=0.78$ ); relational ( $\alpha=0.79$ ); reputational ( $\alpha=0.79$ ).

*Stressful Life Events* The Life Events Scale for Children (LES-C; (Coddington 1972)) is composed of 25 items that each represent a stressful life event (e.g., "Your parents got divorced" and "You were hospitalized for a serious illness"). Participants are asked to indicate which events they have experienced in the prior 6 months; items were summed for a measure of total stress exposure. Life events checklists are the most commonly used instruments to assess adolescent stress (Grant et al. 2004), and the LES is one of the two most commonly used checklists in the adolescent stress literature (Hammen 2008).

#### Emotion Dysregulation Measures

*Poor Emotional Understanding* Emotional understanding was assessed using an 8-item subscale from the Emotion Expression Scale for Children (EESC; Penza-Clyve and Zeman 2002) that provides statements involving lack of emotional awareness and understanding. Children respond to items on a 5-point Likert scale ranging from not at all true (1) to extremely true (5). Higher scores on this subscale reflect lack of emotional understanding. A representative item from this scale is, "I often do not know how I am feeling." The EESC has high internal consistency and moderate test-retest reliability, and the construct validity of the measure has been established (Penza-Clyve and Zeman 2002). This scale has been used with early adolescents (Sim and Zeman 2005). This subscale demonstrated good reliability in this sample ( $\alpha=.82$ ).

*Dysregulated Emotion Expression* The Children's Sadness Management Scale (CSMS) and Anger Management Scale (CAMS) assess both adaptive and maladaptive aspects of emotion expression and regulation for the specific emotions of sadness and anger (Zeman, et al. 2001). We used the Dysregulation subscale of each of these measures, which assesses the extent to which children engage in maladaptive or inappropriate expressions of emotion. Higher scores on this scale reflect higher levels of emotion dysregulation. Children respond on a 3-point Likert scale ranging from hardly ever (1) to often (3). The scales have demonstrated adequate reliability, and their construct validity has been established (Zeman et al. 2001). These scales have been used in prior research with early adolescents (Sim and Zeman 2005). Representative items from the dysregulation scale are, "I attack whatever it is that is making me angry," (CAMS) and "I cry and carry on when I'm sad" (CSMS). The Dysregulation subscale of the CSMS ( $\alpha=0.60$ ) and CAMS ( $\alpha=0.66$ ) each demonstrated adequate reliability.

*Rumination* The Children's Response Styles Questionnaire (CRSQ; Abela et al. 2002) is a 25-item scale that assesses the extent to which children respond to sad feelings with rumination, defined as self-focused thought concerning the causes and consequences of depressed mood. The measure is modeled after the Response Styles Questionnaire (Nolen-Hoeksema and Morrow 1991) that was developed for adults. For each item, youth are asked to rate how often they respond in that way when they feel sad on a 4-point Likert scale ranging from almost never (1) to almost always (4). A sample item is: "Think about a recent situation wishing it had gone better." The reliability and validity of the CRSQ have been demonstrated in samples of early adolescents (Abela et al. 2002). The CRSQ rumination scale demonstrated good reliability in this study ( $\alpha=0.86$ ).

#### Procedure

Participants completed study questionnaires during their homeroom period. All questionnaires used in the present analyses were administered at Time 1 and Time 3, and the emotion dysregulation measures were additionally administered at Time 2. Four months elapsed between the Time 1 (November 2005) and Time 2 (March 2006) assessments, and 3 months elapsed between Time 2 and Time 3 (June 2006) assessments. This time frame was chosen to allow the maximum time between assessments to observe changes in internalizing and externalizing symptoms while also ensuring that all assessments occurred within the same academic year to avoid high attrition. Given time constraints imposed by the school, we were only able to assess potential mediators at Time 2 whereas all study measures were administered at

Times 1 and 3. Participants were assured of the confidentiality of their responses and the voluntary nature of their participation.

#### Data Analytic Plan

Structural equation modeling (SEM) was used to perform the mediation analyses using AMOS 6.0 software (Arbuckle 2005). Analyses were conducted using the full information maximum likelihood estimation method, which estimates means and intercepts to handle missing data. A latent variable representing emotion dysregulation was created using the observed variables of poor emotional awareness, dysregulated expression of anger and of sadness, and rumination (McLaughlin et al. 2009). A multiply indicated latent variable was created for aggressive behavior and peer victimization using parcels of items from the RPEQ. Parcels were created using the domain representative approach, which accounts for the multidimensionality of aggressive behavior (i.e., overt, relational, and reputational aggression), such that each parcel included items from each of these subscales (Little, et al. 2002). The use of parcels to model constructs as latent factors, as opposed to an observed variable representing a total scale score, confers a number of psychometric advantages including greater reliability, reduction of error variance, and increased efficiency (Kishton and Wadaman 1994; Little et al. 2002). Consistent with previous research in this sample (McLaughlin and Hatzenbuehler 2009), stressful life events were modeled as an observed variable.

After testing the measurement models for emotion regulation and aggressive behavior, the first mediation analysis proceeded as follows: (1) Time 1 peer victimization was examined as a predictor of aggressive behavior at Time 3, controlling for Time 1 aggressive behavior; (2) Time 1 peer victimization was examined as a predictor of Time 2 emotion dysregulation, controlling for Time 1 emotion dysregulation; (3) Emotion dysregulation at Time 2 was evaluated as a predictor of aggressive behavior at Time 3, controlling for Time 1 aggressive behavior; (4) the full mediation model was examined to evaluate the hypothesis that emotion dysregulation mediates the relationship between peer victimization and aggressive behavior. Sobel's standard error was used to test the significance of the intervening variable effect (Sobel 1982). The product of coefficients approach is associated with low bias and Type 1 error rate, accurate standard errors, and adequate power to detect small effects (MacKinnon et al. 2002). A separate set of mediation analyses were conducted using the same approach outlined above to evaluate whether emotion regulation mediated the association between stressful life events at Time 1 and aggressive behavior at Time 3, controlling for Time 1 aggression.

Finally, multi-group analyses were conducted to examine whether the process of mediation was the same for boys and

girls. Each of the mediation paths was constrained to be equal for males and females, and the difference in model fit was examined using a chi-square test. Only participants who were present at baseline ( $N=1,065$ ) were included in mediation analyses.

## Results

### Attrition

Analyses were first conducted to determine whether participants who did not complete all three assessments differed from those who completed the baseline and two follow-up assessments. Univariate ANOVAs were conducted for continuous outcomes with attrition as a between-subjects factor. Chi-square analyses were performed for dichotomous outcomes. These analyses revealed that participants who completed the Time 1 but not both follow-up assessments were more likely to be female,  $\chi^2(1)=6.85$ ,  $p<0.01$ , but did not differ in grade level, race/ethnicity, being from a single parent household, or on Time 1 aggression, levels of peer victimization or exposure to stressful life events, emotional awareness, dysregulated sadness, dysregulated anger, or rumination (all  $p$ -values $>0.10$ ).

### Descriptive Statistics

Table 1 displays the mean and standard deviation of all measures at each time point by gender. Table 2 provides the zero-order correlations among all study measures. As expected, peer victimization and stressful life events were positively associated with emotion dysregulation and aggressive behavior, which were positively associated with one another.

### Measurement Models

The measurement model of emotion dysregulation was constructed using four indicator variables, and the factor loadings of each were acceptable: poor emotional awareness (.68), dysregulated expression of anger (.46) and sadness (.44), and ruminative responses to distress (.80). For the hypothesized model,  $\chi^2(2)=1.21$ ,  $p=.299$ , CFI=.99, and RMSEA=0.01 (90% CI: 0.00–0.06). Thus, all fit indices indicated that the measurement model of emotion dysregulation fit the data very well.

The measurement models for aggressive behavior and peer victimization were constructed from parcels of items created using the domain representative approach (Little et al. 2002), such that each parcel included items from each of the subscales of the relevant measures. The aggression model was created from four parcels (factor loadings of .83–.88) and fit the data quite well,  $\chi^2(1)=1.13$ ,  $p=.324$ , CFI=1.00, and RMSEA=0.01 (90% CI: 0.00–0.06). The peer

**Table 1** Means and standard deviations of peer victimization, stressful life events, emotion regulation, and symptom measures by gender

| Measure                       | Male        | Female      | Total       | <i>t</i> | <i>p</i> |
|-------------------------------|-------------|-------------|-------------|----------|----------|
| Time 1                        |             |             |             |          |          |
| RPEQ—Peer Victimization       | 7.43(3.30)  | 6.73(3.14)  | 7.07(3.24)  | 0.84     | 0.403    |
| LES-C—Stressful Life Events   | 5.09(3.47)  | 5.12(3.19)  | 5.10(3.33)  | -0.15    | 0.880    |
| EESC—Poor Emotional Awareness | 17.98(6.51) | 19.13(7.17) | 18.67(7.02) | -3.42    | 0.001    |
| CSMS—Dysregulated Sadness     | 4.35(1.38)  | 4.96(1.54)  | 4.71(1.50)  | -0.64    | 0.000    |
| CAMS—Dysregulated Anger       | 5.51(1.74)  | 5.28(1.60)  | 5.43(1.63)  | 0.62     | 0.539    |
| CRSQ—Rumination               | 9.33(7.40)  | 12.31(8.05) | 10.94(7.65) | -6.77    | 0.000    |
| RPEQ—Aggressive Behavior      | 8.59(8.39)  | 7.63(8.01)  | 8.09(8.20)  | 1.62     | 0.105    |
| Time 2                        |             |             |             |          |          |
| EESC—Poor Emotional Awareness | 19.17(6.43) | 20.88(7.35) | 19.81(6.79) | -3.58    | 0.000    |
| CSMS—Dysregulated Sadness     | 4.31(1.33)  | 4.95(1.40)  | 4.66(1.65)  | -4.72    | 0.000    |
| CAMS—Dysregulated Anger       | 5.44(1.63)  | 5.55(1.55)  | 5.53(1.64)  | -1.23    | 0.218    |
| CRSQ—Rumination               | 8.67(6.27)  | 12.16(8.43) | 10.84(7.65) | -5.88    | 0.000    |
| Time 3                        |             |             |             |          |          |
| RPEQ—Aggressive Behavior      | 9.35(9.12)  | 9.39(9.27)  | 9.29(9.00)  | 0.18     | 0.854    |

Higher scores on emotion regulation measures indicate higher levels of emotion dysregulation; RPEQ revised peer experiences questionnaire; EESC emotion expression scale for children; CSMS children’s sadness management scale; CAMS children’s anger management scale; CRSQ children’s response styles questionnaire; LES-C life events scale

victimization model was also created from four parcels, each including items reflecting each of the three types of victimization (factor loadings of .75–.87). This model was an excellent fit to the data,  $\chi^2(2)=2.21$ ,  $p=.332$ , CFI=1.00, and RMSEA=0.01 (90% CI: 0.00–0.06).

**Mediation Analyses**

*Peer Victimization* Emotion dysregulation was first examined as a mediator of the longitudinal relationship between peer victimization and aggression. Time 1 peer victimization was significantly associated with aggression at Time 3, controlling for aggression at Time 1,  $\beta=.10$ ,  $p=0.032$ ,

$R^2=.16$ . Model fit was as follows:  $\chi^2(52)=453.4$ ,  $p<0.001$ , CFI=0.94, and RMSEA=0.08 (90% CI: 0.07–0.08). Time 1 peer victimization was associated with Time 2 emotion dysregulation, controlling for emotion dysregulation at Time 1,  $\beta=.11$ ,  $p=0.005$ ,  $R^2=.65$ . Model fit was as follows:  $\chi^2(52)=442.6$ ,  $p<0.001$ , CFI=0.89, and RMSEA=0.08 (90% CI: 0.07–0.08). Time 2 emotion dysregulation was associated with Time 3 aggression, controlling for Time 1 symptoms,  $\beta=.23$ ,  $p<0.001$ ,  $R^2=.21$ . Model fit was as follows:  $\chi^2(52)=113.97$ ,  $p<0.001$ , CFI=0.99, and RMSEA=0.03 (90% CI: 0.02–0.04).

In the full mediation model, Time 1 peer victimization was no longer a significant predictor of Time 3 aggression,

**Table 2** Correlations between peer victimization, stressful life events, aggression, and emotion regulation characteristics

|                                     | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12 |
|-------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----|
| 1. RPEQ Peer Victimization T1       | —      |        |        |        |        |        |        |        |        |        |        |    |
| 2. LES-C Stressful Life Events T1   | 0.20** | —      |        |        |        |        |        |        |        |        |        |    |
| 3. RPEQ Aggression T1               | 0.58** | 0.25** | —      |        |        |        |        |        |        |        |        |    |
| 4. EESC—Poor Emotional Awareness T1 | 0.38** | 0.19** | 0.24** | —      |        |        |        |        |        |        |        |    |
| 5. CSMS Dysregulated Sadness T1     | 0.29** | 0.09** | 0.21** | 0.30** | —      |        |        |        |        |        |        |    |
| 6. CAMS Dysregulated Anger T1       | 0.13** | 0.19** | 0.25** | 0.19** | 0.05   | —      |        |        |        |        |        |    |
| 7. CRSQ Rumination T1               | 0.36** | 0.18** | 0.17** | 0.56** | 0.35** | 0.16** | —      |        |        |        |        |    |
| 8. EESC—Poor Emotional Awareness T2 | 0.31** | 0.11** | 0.17** | 0.40** | 0.20** | 0.13** | 0.36** | —      |        |        |        |    |
| 9. CSMS Dysregulated Sadness T2     | 0.20** | 0.05   | 0.13** | 0.15** | 0.21** | 0.05   | 0.24** | 0.33** | —      |        |        |    |
| 10. CAMS Dysregulated Anger T2      | 0.16** | 0.12** | 0.21** | 0.22** | 0.15** | 0.30** | 0.20** | 0.32** | 0.25** | —      |        |    |
| 11. CRSQ Rumination T2              | 0.29** | 0.16** | 0.19** | 0.39** | 0.27** | 0.09*  | 0.48** | 0.59** | 0.40** | 0.24** | —      |    |
| 12. RPEQ Aggression T3              | 0.28** | 0.15** | 0.38** | 0.18** | 0.08*  | 0.18** | 0.19** | 0.35** | 0.23** | 0.25** | 0.29** | —  |

Correlations are reported for both peer victimization and stressful life events at Time 1, emotion regulation deficits at Time 1 and Time 2, and symptoms at Time 1 and Time 3; RPEQ revised peer experiences questionnaire; EESC emotion expression scale for children; CSMS children’s sadness management scale; CAMS children’s anger management scale; CRSQ children’s response styles questionnaire; LES-C life events scale; \* $p<0.05$ , \*\* $p<0.01$

controlling for Time 1 symptoms and Time 1 emotion dysregulation, when Time 2 emotion dysregulation was added to the model,  $\beta = -0.02, p = .729$  (see Fig. 1). Sobel's z-test revealed a significant indirect effect of peer victimization on aggression through emotion dysregulation,  $z = 2.27, p = 0.023$ . This model accounted for the covariation between Time 1 aggression, emotion dysregulation, and peer victimization and explained 67.4% of the variance in emotion dysregulation ( $R^2$ ) and 22.1% of the variance in aggressive behavior. This model fit the data well,  $\chi^2(162) = 521.77, p < 0.001, CFI = 0.96$ , and  $RMSEA = 0.04$  (90% CI: 0.04–0.05).

**Stressful Life Events** Emotion dysregulation was next examined as a mediator of the longitudinal relationship between stressful life events and aggressive behavior. Time 1 stressful life events were associated with Time 3 aggressive behavior, controlling for aggressive behavior at Time 1,  $\beta = 0.08, p = 0.033, R^2 = .19$ . Model fit was as follows:  $\chi^2(26) = 121.8, p < 0.001, CFI = 0.98$ , and  $RMSEA = 0.05$  (90% CI: 0.04–0.06). Time 1 stressful life events were associated with Time 2 emotion dysregulation, controlling for emotion dysregulation at Time 1,  $\beta = 0.08, p = 0.012, R^2 = .67$ . Model fit was as follows:  $\chi^2(26) = 308.4, p < 0.001, CFI = 0.83$ , and  $RMSEA = 0.09$  (90% CI: 0.08–.10). As shown above, Time 2 emotion dysregulation was associated with Time 3 aggressive behavior, controlling for aggressive behavior at Time 1,  $\beta = .23, p < 0.001, R^2 = .21$ . Model fit was as follows:  $\chi^2(52) = 113.97, p < 0.001, CFI = 0.99$ , and  $RMSEA = 0.03$  (90% CI: 0.02–0.04).

In the final model, Time 1 stressful life events were no longer a significant predictor of Time 3 aggressive behavior, controlling for aggressive behavior and emotion dysregulation at Time 1, when Time 2 emotion dysregulation was added to the model,  $\beta = 0.02, p = .678$  (see Fig. 2). Sobel's z-test

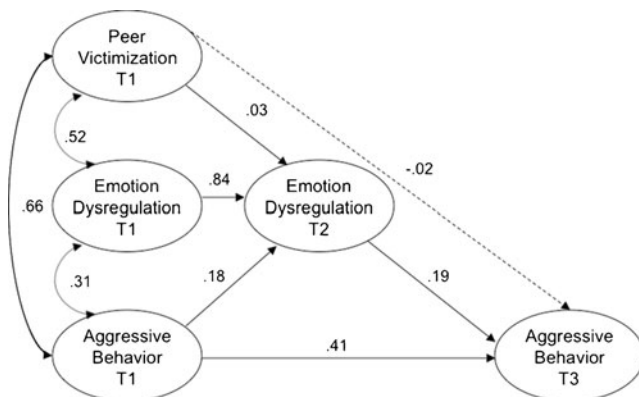
revealed a significant indirect effect of stress on aggression through emotion dysregulation,  $z = 2.32, p = 0.020$ . This model accounted for the covariation between Time 1 aggression, emotion dysregulation, and stressful life events and explained 68.0% of the variance in emotion dysregulation and 22.0% of the variance in aggressive behavior. The final mediation model fit the data well,  $\chi^2(112) = 439.6, p < 0.001, CFI = 0.95$ , and  $RMSEA = 0.05$  (90% CI: 0.04–0.05).

Combined Models

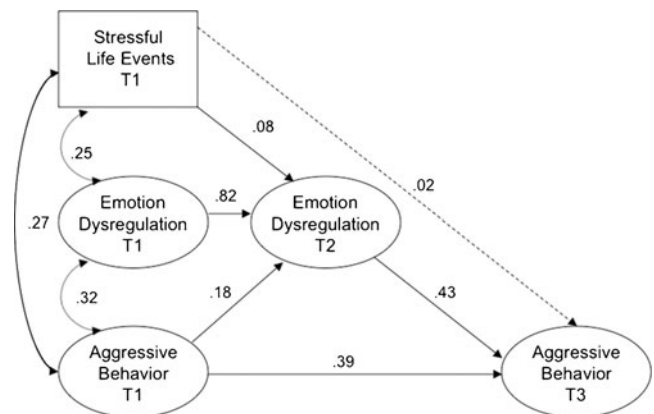
Finally, we examined a series of models that included both peer victimization and stressful life events to determine whether the observed associations were maintained with both types of stress exposure in the same model. A nearly identical pattern of results was obtained from these models. In the first step of the mediation analysis, both peer victimization,  $\beta = 0.09, p = 0.048$ , and stressful life events,  $\beta = 0.09, p = 0.042$ , were associated with aggressive behavior at Time 3, adjusting for baseline levels. In step 2 of the analysis, both peer victimization,  $\beta = .10, p = 0.012$ , and stressful life events,  $\beta = 0.08, p = 0.028$ , were associated with Time 2 emotion dysregulation, controlling for Time 1 emotion dysregulation. In the final mediation model, neither peer victimization,  $\beta = -0.03, p = .514$ , nor stressful life events,  $\beta = 0.03, p = .488$ , are associated with Time 3 aggressive behavior, adjusting for Time 1 levels, after controlling for emotion dysregulation.

Gender Effects

We examined whether the role of emotion dysregulation as a mediator of the relationship between peer victimization, stressful life events, and subsequent aggression was modified by gender. When the mediation paths of interest (See



**Fig. 1** Figure represents final mediation model for peer victimization. Numbers represent standardized path coefficients ( $\beta$ ). All paths shown are significant ( $p < 0.05$ ), except those drawn with broken lines. All constructs were modeled as latent variables. Due to space constraints, indicator variables are not displayed



**Fig. 2** Figure represents final mediation model for stressful life events. Numbers represent standardized path coefficients ( $\beta$ ). All paths shown are significant ( $p < 0.05$ ), except those drawn with broken lines. All constructs were modeled as latent variables other than stressful life events. Due to space constraints, indicator variables are not displayed

Fig. 1) were constrained to equivalence across males and females, the model fit did not significantly worsen for peer victimization,  $\chi^2(3)=7.04$ ,  $p=0.071$  or stressful life events,  $\chi^2(3)=5.32$ ,  $p=.150$ , indicating that the process and strength of mediation was consistent across gender.

## Discussion

Understanding the mechanisms that link stress to psychopathology is critical to inform the development of interventions targeting stress-related psychiatric morbidity in adolescents. Prior research has documented robust associations between childhood stress exposure—particularly exposure to violence and victimization—and the development of aggressive behavior (Dodge et al. 1990, 2003; Attar et al. 1994; Coie et al. 1992; Deater-Deckard et al. 1998; Lansford et al. 2010). Although disruptions in social information processing have been the most frequently studied pathway linking violence exposure to subsequent aggression (Dodge et al. 1990, 1995; 2003; Guerra et al. 2003; Weiss et al. 1992; Lansford et al. 2010), the results of this study provide novel evidence for the role of emotion dysregulation as a mechanism linking a wide range of stressors to increases in aggression among adolescents.

We hypothesized that stress exposure, including peer victimization, may deplete adolescents' coping resources, diminishing their ability to monitor, identify, and adaptively manage their emotions. Consistent with this hypothesis, previous studies have linked chronic stress exposure in children to a variety of difficulties with emotion regulation (Repetti et al. 2002; Cicchetti and Toth 2005; Mahady Wilton, et al. 2000; McLaughlin and Hatzenbuehler 2009). Moreover, youths who are victims of peer aggression have been found to exhibit elevated emotional arousal and reactivity (Schwartz, et al. 1993). We also hypothesized that elevations in emotion dysregulation would be associated with greater engagement in aggressive behaviors, in line with previous studies documenting these relationships (Bohnert et al. 2003; Cole et al. 1994; Shields and Cicchetti 1998; McLaughlin et al. 2011; Esienberg et al. 1994). In addition to confirming these relationships using longitudinal data from a large racially and ethnically diverse sample of early adolescents, we extend this previous research by documenting that emotion dysregulation mediated the longitudinal associations of both peer victimization and stressful life events with increases in aggression for both males and females. These findings build on previous work documenting the role of emotion dysregulation as a mechanism linking stress exposure to internalizing psychopathology (McLaughlin et al. 2009, 2011).

Specifically, we find that exposure to both peer victimization and stressful life events are associated with increases

in response-focused emotion dysregulation among adolescents. Response-focused emotion regulation includes a variety of processes that serve to dampen or modulate the intensity and duration of an emotional experience once an emotion has been activated (Gross 1998; 2001). The response-focused processes examined here include emotional awareness and understanding, expressive modulation, and rumination. Each of these emotion regulation strategies have been linked to youth aggressive behavior in previous studies (Bohnert et al. 2003; Peled and Moretti 2007; Zeman, et al. 2002). Our findings suggest that in addition to eliciting a wide range of negative emotions, experiences of stress and victimization disrupt a variety of emotion regulation processes that serve to modulate these emotional experiences.

Why might stressful experiences disrupt these emotion regulation processes? A variety of social stressors—including stigma and social exclusion—have been shown to be “ego depleting” (Baumeister, et al. 2005; Inzlicht et al. 2006). Ego depletion refers to a process whereby exerting self-control or effort in one domain consumes regulatory resources, reducing their availability for use in other domains (Baumeister, et al. 1998). Ego depletion studies have shown that engaging in effortful processes to control or manage emotional experiences depletes regulatory resources, reducing self-control in other areas (Baumeister et al. 1998; Stucke and Baumeister 2006). This literature indicates that stressful experiences can deplete regulatory resources, including the ability to adaptively modulate emotional experiences. Moreover, experimental evidence suggests that exerting effort to modulate or control one's emotions reduces the capacity to inhibit aggressive behavior (Stucke and Baumeister 2006), highlighting one explanation for our findings that emotion regulation difficulties result in increased propensity for aggressive behavior.

Although mechanisms linking victimization and exposure to aggression to subsequent aggressive behavior have been well studied, most of the existing literature has examined mechanisms related to biases in social information processing (Dodge et al 1990, 1995; 2003; Crick and Dodge 1996; Lansford et al. 2010). Our results provide evidence for the role of emotion dysregulation as another mechanism underlying the association between stress and aggression. It is important to note that biased social information processing could be a primary contributor to emotion dysregulation among youths exposed to violence and other types of victimization. For example, an adolescent exposed to peer aggression may experience anger and arousal after making a hostile attribution for a peer's behavior and express that anger towards the peer by shouting or threatening the peer. In this situation, a problem with social information processing led directly to emotion dysregulation and, potentially, aggressive behavior. Emotion dysregulation might therefore represent a component mechanism in the social information

processing pathway linking exposure to violence and aggressive behavior (Dodge et al. 1990, 1995; 2003; Guerra et al. 2003; Weiss et al. 1992; Lansford et al. 2010). In this way, our findings could be considered complementary to the existing literature on social information processing deficits and aggression. The present study builds on this previous work, however, by showing that a wider range of stressful life events—including those not involving violence or victimization—lead to deficits in emotion dysregulation and elevations in adolescent aggressive behavior. Emotion dysregulation might therefore represent an independent pathway linking stressful life events not involving victimization and violence to the onset of aggressive behavior in adolescents.

Moreover, our findings suggest that a wide range of emotion regulation processes may be disrupted by experiences of stress and victimization, including emotional awareness, expressive modulation of sadness and anger, and rumination, heightening risk for aggressive behavior. At first glance, the relationship between disruptions in some of these emotion regulation strategies and aggressive behavior is not obvious, particularly dysregulated sadness expression and rumination. However, multiple lines of evidence suggest that both dysregulated sadness and rumination are associated with aggressive behavior. In children, victims of peer aggression report strong feelings of sadness as well as high levels of retaliatory aggression (Camodeca and Goossens 2005). In addition, although rumination is typically conceptualized as a response to sadness or dysphoria (Nolen-Hoeksema et al. 2008), rumination can be elicited by experiences of anger (Peled and Moretti 2007). Rumination triggered by anger has been shown to increase engagement in aggressive behavior (Peled and Moretti 2007, 2010), including in children and adolescents. Finally, children with depression often engage in aggressive behaviors (Dodge 1993; Garber, et al. 1991) and have been shown to exhibit a hostile attribution bias similar to the bias observed in aggressive children (Quiggle, et al. 1992). Moreover, depressed children exhibit more anger and sadness than non-depressed children, but anger does *not* predict aggressive behavior in depressed children (Quiggle, et al. 1992). This indirectly suggests that emotion regulation difficulties related to sadness may play a role in aggressive behavior in depressed children.

These findings have important implications for preventative interventions aimed at preventing the onset of stress-related psychiatric morbidity in youths. Current interventions aimed at reducing peer victimization among adolescents consist largely of school-based prevention programs that attempt to change beliefs about aggressive behaviors (Olweus 1994; DeRosier 2004; DeRosier and Marcus 2005). Although such programs are effective, even the most successful interventions do not have perfect success rates.

The development of interventions to address the negative sequelae of adolescent stress exposure, including aggressive behavior, is therefore an important priority. Current treatments for aggression consist mainly of cognitive-behavioral techniques (Kazdin, et al. 1992; Tate, et al. 1995). Our results suggest that the inclusion of techniques to enhance emotion regulation might improve the efficacy of existing interventions. Existing intervention techniques that target emotion regulation in the treatment of internalizing disorders (Suveg, et al. 2006; Trooper, et al. 2009) may have similar ameliorative effects on aggressive behavior. For example, Kovacs et al. (2006) developed an intervention targeting distress and negative mood that specifically enhances self-regulation in adolescents by identifying typical responses to distress and replacing maladaptive responses with positive responses taken from among the child's existing repertoire of emotion regulation skills. Such intervention techniques could be usefully applied in prevention programs targeting adolescents exposed to peer victimization and other chronic stressors. Because these techniques target emotion regulation skills directly, they have the potential to prevent the onset of both internalizing and externalizing psychopathology.

This study has several noteworthy strengths, including longitudinal assessment and a large, diverse sample. However, the following limitations must be acknowledged. First, attrition among the study sample was significant at each time point, although we found no difference between participants who did and did not complete follow up assessments on variables of primary interest. A second notable limitation is the use of self-report measures of emotion dysregulation. This method presents challenges as compared to observational or lab-based measures, such as asking adolescents to report on their *typical* response to emotional experiences. Because of biases associated with recalling affective experiences, such as a tendency to remember the most recent experience (Fredrickson 2000; Stone et al. 1998), adolescents may have provided responses based only on their most recent or most intense emotional experiences. Shared method variance is also a limitation, given that psychopathology was also assessed using self-report. However, the use of self-report measures is common in studies examining adolescent emotion regulation (Sim and Zeman 2005; Southam-Gerow and Kendall 2000; Zeman et al. 2002), and in the current school-based study was the only option available to us for assessing this construct. In addition, we focused specifically on response-focused emotion regulation processes in this study. The extent to which stressful life events—particularly experiences of rejection and victimization—are associated with disruptions in antecedent-focused emotion regulation processes represents an important goal for future research. Finally, our results are observational and warrant replication in experimental

studies to rule out confounding factors and reverse causality. For example, adolescents who are aggressive are more likely to contribute to the generation of stressful events in their lives, particularly non-interpersonal stressors (Rudolph et al. 2000). Future experimental studies are needed to evaluate whether stress exposure does, indeed, lead to changes in emotion dysregulation and aggressive behavior. Finally, the final models explained about 22% of the variance in aggressive behavior at Time 3, suggesting the importance of other risk factors in shaping adolescent aggressive behavior. In addition to the well-established social information processing deficits that have been shown to predict aggression, a variety of other genetic, neurobiological, environmental, and psychological factors are associated with aggressive behavior in adolescents (Dodge et al 1990, 1995; 2003; Crick and Dodge 1996; Guerra et al. 2003; Lansford et al. 2010; Weiss et al. 1992). Our findings suggest that, in addition to these previously established risk factors, emotion dysregulation should be included as an important determinant of a comprehensive developmental psychopathology model of adolescent aggression.

The current study provides evidence for the role of emotion dysregulation as a mechanism linking stress exposure to increases in aggressive behavior in adolescence. Exposure to peer victimization and stressful life events were each associated with increases in emotion dysregulation over time, and these elevations in emotion dysregulation accounted for the relationship between stress exposure and subsequent increases in aggressive behavior. This pathway was observed in both males and females. These results suggest that preventative interventions targeting adolescents exposed to peer aggression and chronic stress should incorporate techniques to improve emotional awareness, identification, monitoring, and the adaptive expression and modulation of emotional experiences.

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