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# Disruptions in Emotion Regulation as a Mechanism Linking Community Violence Exposure to Adolescent Internalizing Problems

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Although community violence is an established risk factor for youth aggression, less research has examined its relation with internalizing psychopathology. This study examined associations of community violence exposure with internalizing symptoms, and state and trait emotion dysregulation as mechanisms underlying these associations, in 287 adolescents aged 16–17 (45.6% male; 40.8% White). Community violence exposure was associated with internalizing symptoms, negative affect during peer evaluation, trait emotional reactivity, and infrequent problem solving. Multiple emotion dysregulation indices were also associated with internalizing symptoms. In simultaneous multiple mediator models, indirect effects of community violence on internalizing problems were significantly explained by state and trait emotion dysregulation. Findings implicate emotion dysregulation as one mechanism linking community violence exposure to adolescent internalizing symptoms.

Exposure to community violence is common among adolescents in the United States. Recent estimates suggest that more than half of youth aged 14–17 have been exposed to community violence in their lifetime, and that more than one-third have witnessed a violent assault in their community in the last year (Finkelhor, Turner, Shattuck, & Hamby, 2013). Although community violence exposure is associated with elevated risk for multiple forms of internalizing psychopathology in children and adolescents (Fowler, Tompsett, Braciszewski, Jacques-Tiura, & Baltes, 2009; Gorman-Smith & Tolan, 1998; Singer, Anglin, Song, & Lunghofer, 1995), the mechanisms that underlie this relationship are not well understood. The present study examines whether state and trait dimensions of emotion dysregulation may explain some of the association between community violence and internalizing psychopathology.

Exposure to community violence, broadly defined as violent acts against or witnessed by an individual in their neighborhood, is associated with higher levels of internalizing problems, including both depression and anxiety symptoms, in most studies (Fowler et al., 2009; Martinez & Richters, 1993; Schwab-Stone et al., 1999; Singer et al., 1995) with few exceptions (Cooley-Quille, Boyd, Frantz, & Walsh, 2001; Farrell & Bruce, 1997). Studies that have not found an association between community violence and symptoms of depression and anxiety were conducted with ethnically (>90% African American) and regionally (samples from one urban school setting) homogeneous samples of early adolescents, suggesting that these specific groups may be less vulnerable to internalizing symptoms following community violence exposure (Cooley-Quille et al., 2001; Farrell & Bruce, 1997). In the present study, we examine the association between community violence exposure and symptoms of depression and anxiety in a large, racially and ethnically diverse sample of older adolescents recruited from three U.S. cities, with a specific focus on identifying underlying mechanisms linking community violence exposure to internalizing problems.

Identifying such mechanisms is critical for developing effective interventions to prevent the

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onset of mental health problems in children and adolescents who experience violence in their communities. We propose that exposure to community violence disrupts emotion regulation processes that, in turn, are associated with heightened risk for internalizing psychopathology. Here, we rely on Gross's (1998) definition of emotion regulation as the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions. A large body of evidence suggests that emotion regulation encompasses state and trait dimensions. Trait emotion regulation reflects habitual patterns of responding to emotional situations. Many domains of emotion regulation fall into this category and are assessed using trait measures (e.g., rumination; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). While individual differences in trait emotion regulation reflect global differences in responses to emotional situations, evidence that emotion regulation may vary more within-person than between-person (Fleeson, 2001, 2004) suggests that it is equally important to consider how individuals respond to specific types of emotionally evocative events (i.e., state emotion regulation). Patterns of cognitive responses to distress stabilize by middle school (Hankin, 2008), whereas physiological and self-reported indicators of emotional reactivity and lability increase across adolescence; these divergent patterns indicate that state and trait dimensions of emotion regulation follow different developmental courses across adolescence (Gunnar, Frenn, Wewerka, & Van Ryzin, 2009; Larson & Ham, 1992; Larson, Moneta, Richards, & Wilson, 2002; Silk et al., 2012; Stroud et al., 2009). Given this variability, state and trait emotion regulation processes may be differentially susceptible to negative environmental experiences like community violence. In this study, we focus on how community violence exposure influences state and trait emotional reactivity as well as responses to distress that serve to modulate the intensity and duration of emotions (Gross, 1998).

A growing body of literature on state and trait emotional reactivity following exposure to trauma suggests that they are plausible mechanisms linking community violence exposure and internalizing psychopathology during adolescence. Indeed, evidence indicates that traumatic stressors in childhood can influence patterns of self-report and physiological indices of state emotional reactivity (Cooley-Quille et al., 2001; Maughan & Cicchetti, 2002; McLaughlin, Sheridan, Alves, & Mendex, 2014; Oosterman, De Schipper, Fisher, Dozier, & Schuengel, 2010). One widely used physiological measure of emotional reactivity is respiratory sinus arrhythmia (RSA), a measure of parasympathetic nervous system control over heart rate that is mediated by the vagus nerve. The polyvagal theory argues that vagal withdrawal is a primary mechanism regulating rapid changes in heart rate in response to environmental demands in order to mobilize metabolic resources in emotionally arousing situations and facilitate social behavior (Porges, 1995, 2007). Vagal suppression during stressful or arousing tasks is argued to be adaptive; indeed, greater vagal suppression is associated with greater expression of emotion, low levels of negative emotionality, adaptive emotion regulation skills (Calkins, 1997; Gentzler, Santucci, Kovacs, & Fox, 2009) and reduced risk for internalizing problems (Gentzler et al., 2009; Graziano & Derefinko, 2013). Exposure to traumatic events, such as child abuse, and interpersonal stressors, including victimization by peers and parental divorce, are also associated with greater self-reported trait emotional reactivity in adolescents (Heleniak, Jenness, Stoep, McCauley, & McLaughlin, 2015; McLaughlin & Hatzenbuehler, 2009; McLaughlin, Hatzenbuehler, & Hilt, 2009), which, in turn, has been positively associated with internalizing symptoms in numerous longitudinal studies (McLaughlin et al., 2010; Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013; Pine, Cohen, & Brook, 2001; Silk, Steinberg, & Morris, 2003). Although heightened emotional reactivity may be adaptive in environments characterized by danger, facilitating rapid identification of threats to well-being, in safe environments greater emotional reactivity is likely maladaptive leading to unwarranted anxiety, social problems, and feelings of helplessness. Together, these lines of evidence suggest that both self-reported and physiological measures of heightened emotional reactivity to specific stressors as well as trait emotional reactivity are potential mechanisms linking community violence and internalizing problems. We are unaware of previous studies directly examining this possibility among adolescents.

Exposure to stress is associated not only with emotional reactivity, but also with other patterns of emotion regulation. Habitual use of maladaptive responses to distress, including rumination and other ineffective strategies for regulating negative emotions, has been observed in youths exposed to traumatic stress (Maughan & Cicchetti, 2002), as well as other types of stressful life events such as divorce, death of a parent, and peer victimization (McLaughlin et al., 2009; Michl et al., 2013; Wadsworth, Raviv,

Compas, & Connor-Smith, 2005). Developing a reliance on passive cognitive styles such as rumination over active problem solving may be sensible in situations where children have no control over the danger in their environment. However, in situations where safety is not compromised, these regulatory styles become maladaptive, leading to poor ability to effectively modulate the intensity and duration of emotional responses in the moment and a tendency to ruminate rather than address solvable problems. Indeed in prospective studies, stressful life events predict subsequent increases in the use of maladaptive strategies for responding to negative emotions, including rumination (McLaughlin & Hatzenbuehler, 2009; Michl et al., 2013), which in turn confer risk for the development of internalizing psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010).

Although there is theoretical support for the role of emotion dysregulation as a mechanism linking community violence exposure to youth internalizing psychopathology, scant research has examined this relation empirically. In one study, Schwartz & Proctor (2000) reported that greater community violence was associated with higher teacher-reported negative emotional intensity, a marker of trait emotional reactivity, and fewer contextually appropriate emotional responses, a marker of state emotion regulation ability. These emotion regulation deficits correlated with aggression and bullying, but internalizing symptoms were not examined. Kliewer and colleagues (2004) reported that parent-rated capacity for contextually appropriate emotional responses buffered the association between community violence exposure and internalizing symptoms among early adolescents at trend-level significance. Evidence that disrupted emotion regulation links other forms of victimization—such as child maltreatment, domestic violence, and peer victimization—to internalizing symptoms (Harding, Morelen, Thomassin, Bradbury, & Shaffer, 2012; Kim-Spoon, Cicchetti, & Rogosch, 2013; McLaughlin et al., 2009) provides further rationale for comprehensively examining emotion regulation in adolescents exposed to a more common environment of diffuse threat characteristic of community violence.

This study examines emotional reactivity and maladaptive responses to distress as mechanisms linking exposure to community violence and internalizing psychopathology in a diverse, community-based sample of adolescents. Because adolescents frequently respond with heightened emotional reactivity to social situations, particularly those involving peers (e.g., Somerville, 2013), and because interactions with peers are a particularly salient developmental context for adolescents (Gardner & Steinberg, 2005), we examined state emotional reactivity in response to an ecologically valid peer evaluation task (Silk et al., 2012). We examined four hypotheses. We predicted that greater exposure to community violence would be associated with: (1) higher levels of internalizing symptoms, and (2a) elevated self-report and physiological indicators of state emotional reactivity during peer evaluation as well as (2b) particularly heightened reactivity to rejection during peer evaluation, and (2c) trait emotional reactivity and maladaptive responses to distress. We expected that elevated state emotional reactivity during (3a) evaluation and (3b) rejection and (3c) trait emotional reactivity and maladaptive responses to distress would be associated with symptoms of anxiety and depression. Finally, we predicted that an indirect effect of community violence exposure on internalizing symptoms would be found through (4a) elevated state emotional reactivity during peer evaluation, and (4b) heightened trait emotional reactivity and maladaptive responses to distress.

## METHOD

### Participants

Data were drawn from a larger study of self-regulation and sensitivity to peer context as risk factors for adolescent psychopathology in a community sample of 16- and 17-year-old adolescents ($N$ = 287) from three major cities in the United States (Boston, MA; Seattle, WA; and Pittsburgh, PA). Participants were recruited with community flyers and were on average in 11th grade. Approximately half of the sample was female ($n$ = 156; 54.4%), and 20.6% of the sample identified as Black ($n$ = 59), 6.3% as Hispanic/Latino ($n$ = 18), 11.1% as biracial ($n$ = 32), 16.0% as Asian ($n$ = 46), 40.8% as White ($n$ = 117), 2.1% as members of other racial/ethnic groups ($n$ = 6), or declining to report race/ethnicity status ($n$ = 7, 2.4%). All data from the physiological assessment are reported on the Boston sample, the only participants who provided physiological measurements. This subsample ($n$ = 101) was similar to the larger sample in grade distribution, gender, race/ethnicity, and socio economic status.

### Procedure

The study involved two sessions, two weeks apart. Peer acceptance and rejection were manipulated

using a previously validated peer evaluation chatroom task (Silk et al., 2012). In Session 1, adolescents completed all questionnaire measures and viewed profiles of other adolescents in preparation for the Session 2 peer evaluation task. Profile pictures depicted unfamiliar youths who consented to be photographed for the task (Silk et al., 2012). From twenty pictures, participants selected then rank-ordered the five adolescents they most wanted to chat with in Session 2. The same five profiles were provided to each participant, regardless of the pictures chosen. Each participant had their picture taken and provided their own profile. They were told that the adolescents whose profiles they rated would view their profile and indicate whether they wanted to chat.

In Session 2, adolescents were randomized to one of the three feedback conditions: neutral ($n$ = 54), peer acceptance ($n$ = 107), or peer rejection ($n$ = 114). A total of 12 participants were lost to follow-up before Session 2. We present data only for adolescents randomized to peer acceptance and rejection. Participants assigned to the neutral condition did not complete state emotional reactivity assessments and were not included in any analysis of the peer evaluation task. Participants were told they had been matched to the two peers they rated most highly in the first visit and that, together, they would engage in a chat game using a remote connection. Participants then completed an affect rating. Adolescents at the Boston site were connected to physiological equipment and engaged in a 5-min baseline period in which they were asked to sit quietly. To enhance believability, the research assistant initially encountered a "connection error" while connecting to the other sites and feigned a phone call to another site to troubleshoot the connection difficulty. Once the connection was "fixed," participants viewed a list of topics (e.g., friends, shopping, sports) and were told to choose the adolescent with whom they most want to chat about each topic. Participants were told that they and the other adolescents would take turns selecting whom to talk to about each topic (with the participant as one choice).

The chat game proceeded in two 6-min blocks, beginning with an instruction on who would be making choices for the round. In the first two minutes of each block, subjects selected which adolescents they wished to chat with about each of 15 topics. The next four minutes of each block comprised 30 randomized trials in which participants were either chosen or not chosen as the preferred person to discuss each of the 15 topics by each of the two virtual peers. The person choosing was projected in the bottom left corner of the screen, and pictures of two other players were centered on the screen. For each round, the question "Who would you rather talk to about. . ." was posed with the chosen topic for that trial (i.e., "family?"). The photograph of the person chosen was highlighted, and the person not chosen was superimposed with an "X" (Figure 1). The participant was asked to indicate who was chosen for each trial to ensure they were paying attention. Participants completed an affect rating after each task block. In the acceptance condition, the participant was selected by a virtual peer in 2/3 of the trials, and in the rejection condition they were selected in 1/3 of the trials.

At the conclusion of the second session, participants were informed that they were playing with a computer program rather than real peers. They were then asked to report whether they guessed that the other participants were not real. All participants received compensation for study participation at the end of each study visit.

## Measures

***Community violence exposure.*** The Screen for Adolescent Violence Exposure (SAVE; T. Hastings


FIGURE 1 Peer Evaluation Task. Participant (bottom left) is asked to choose an adolescent to talk to about her family. Her choice is bordered in red, and the rejected adolescent is superimposed with a red "X".

& Kelley, 1997) is a 32-item measure assessing lifetime violence exposure in school, home, and neighborhood contexts. Respondents rate the frequency of exposure to indirect violence (e.g., "I have run for cover when people started shooting") and direct violence (e.g., "Someone has pulled a knife on me") on a 5-point Likert scale. The total score is based on the summation of responses. The SAVE has demonstrated excellent test–retest reliability and convergent, divergent, and construct validity (T. Hastings & Kelley, 1997), and demonstrated excellent internal consistency in this sample ($\alpha$ = .91).

***State emotional reactivity—Self-reported affect.*** The state form of the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Carey, 1988) was administered three times during the study, prior to the chatroom task, after the first block of the chatroom task, and again after the second block of the task (see Procedure). The PANAS is a 20-item measure comprised of two subscales: positive and negative affect. Participants endorse the extent to which they feel each of 10 positive (e.g., proud) and negative (e.g., nervous) emotions on a 5-point Likert scale. Items are summed, respectively, to create a positive affect score and a negative affect score. The PANAS has excellent psychometric properties (e.g., Watson & Walker, 1996) and reliably measures state fluctuations in affect (Rossi & Pourtois, 2012). The positive affect ($\alpha$ = .90–.91) and negative affect ($\alpha$ = .83–.86) scales demonstrated good reliability in this study.

***State emotional reactivity—RSA.*** Continuous cardiac and hemodynamic measures were recorded noninvasively during the session. Electrocardiogram (ECG) recordings were obtained with a Biopac ECG amplifier (Goleta, CA) using a modified Lead II configuration (right clavicle, left lower torso, and right leg ground). Cardiac impedance recordings were obtained with a Bio-Impedance Technology model HIC-2500 impedance cardiograph (Chapel Hill, NC). One pair of Mylar electrode tapes was placed on the neck and another pair was placed on the torso. A continuous 500 μA AC 95 kHz current was passed through the two outer electrodes, and basal thoracic impedance (z0) and the first derivative of basal impedance ($dz/dt$) was measured from the inner electrodes. Biopac MP150 hardware and Acknowledge software was used to integrate and acquire the ECG and impedance cardiography data, both sampled at 1.0 kHz.

ECG data were scored by raters blind to participant status on all variables of interest. Signals were averaged into 1-min epochs. Minutes with significant artifact in the ECG signal were not scored to prevent bias in RSA estimates. Missing data due to artifact ($n$ = 3) did not vary by community violence exposure, emotion regulation, or psychopathology. Mean RSA scores across the rest period and first and second blocks of the chatroom task were calculated from the inter-beat interval time series using spectral analysis for the frequency band 0.12–0.40 Hz. Based on evidence that controlling for respiration rate is necessary for RSA to represent a measure of purely parasympathetic cardiac control (Grossman & Taylor, 2007), we controlled for respiration rate in analyses involving RSA. Respiration rate was derived from the basal ICG signal.

***Trait emotional reactivity.*** The Emotional Reactivity Scale (ERS; Nock, Wedig, Holmberg, & Hooley, 2008) is a 21-item measure of trait emotional reactivity that asks participants to rate items assessing emotional sensitivity (e.g., "I tend to get emotional very easily"), arousal/intensity (e.g., "When I experience emotions, I feel them very strongly/intensely"), and persistence (e.g., "When I am angry/upset, it takes me much longer than most people to calm down"). Each item is rated on a 5-point Likert scale and summed to create a total score. The ERS has excellent reliability and validity among adolescents (Nock et al., 2008), and demonstrated good reliability in this study ($\alpha$ = .93).

***Responses to distress.*** The Children's Response Styles Questionnaire (CRSQ; Abela, Brozina, & Haigh, 2002) is a 25-item scale that assesses the extent to which children respond to sad feelings with rumination (e.g., "Think about a recent situation wishing it had gone better" and "Think why can't I handle things better?"), distraction (e.g., "Read a book or magazine"), or problem solving (e.g., "Think of a way to make your problem better"). For each item, youths are asked to rate how often they respond in that way on a 4-point Likert scale. The reliability and validity of the CRSQ have been demonstrated in samples of adolescents (Abela et al., 2002). The CRSQ rumination scale demonstrated good reliability in this study ($\alpha$ = .89), and the problem-solving scale demonstrated adequate reliability ($\alpha$ = .68). The reliability of the distraction sub scale was poor ($\alpha$ = .56), and therefore was not included in analyses.

***Internalizing symptoms.*** Internalizing symptoms were assessed using the Children's Depression Inventory (CDI; Kovacs, 1979) and the

Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Conners, 1997). The CDI is a widely used self-report measure of depressive symptoms in children and adolescents. The CDI includes 27 items consisting of three statements (e.g., "I am sad once in a while," "I am sad many times," "I am sad all the time") representing different levels of severity of a specific symptom of depression. The item pertaining to suicidal ideation was removed. The 26 remaining items were summed for a total score. The CDI has demonstrated good reliability and validity among children and adolescents (Craighead, Smucker, Craighead, & Ilardi, 1998). The CDI demonstrated good reliability in this sample ($\alpha = .86$).

The Multidimensional Anxiety Scale for Children (MASC; March et al., 1997) is a 39-item measure of youth anxiety. Each item presents a symptom of anxiety (e.g., "I worry about other people laughing at me"), and participants indicate how true each item is for them on a 4-point Likert scale. The MASC has high internal consistency and test–retest reliability established convergent and divergent validity (Muris, Merckelbach, Ollendick, King, & Bogie, 2002). The MASC demonstrated good reliability in this sample ($\alpha = .89$).

Each scale was summed to yield total scores for each, then standardized. The standardized composites of the CDI and MASC were summed together to create a total index of internalizing symptoms.

### Analysis Methods

Before testing our hypotheses, we examined Pearson correlations between emotion dysregulation and internalizing variables and plausible confounding variables (site, income-to-needs ratio, and race/ethnicity). We found no evidence that these plausible confounders were driving the relationships of interest, with the exception of an association between race and trait emotional reactivity ($r = .16$, $p = .02$). Race was controlled for in all analyses involving trait emotional reactivity.

We first examined each pathway of our indirect effect models (Baron & Kenny, 1986). We examined (1) the association of community violence with our composite internalizing measure using linear regression. To examine (2a) changes in state emotional reactivity during peer evaluation as a function of community violence exposure, we conducted three separate $3 \times 2$ repeated-measures analyses of variance (ANOVAs) with negative affect, positive affect, and RSA entered, respectively, at each time-point (pre-chatroom task, block 1 of chatroom task, block 2 of chatroom task) as within-subjects factors and community violence added as the between-subjects factor. Next, to evaluate whether (2b) community violence exposure was associated with state emotional reactivity specifically in response to peer rejection, task condition (accept vs. reject) and an interaction term of Community violence*Task condition were added as additional between-subjects predictors to each of the repeated-measures ANOVAs. ANOVAs were examined separately for the accept and reject group following significant interactions. Then, we used linear regression to examine whether (2c) community violence was related to trait emotion regulation (i.e., emotional reactivity, rumination, and problem solving).

Next, linear regression was used to examine whether (3a) change in emotional reactivity during peer evaluation was significantly associated with internalizing problems. In each regression model, the internalizing composite was entered as the dependent variable, the value of the parameter of interest at the end of the chatroom task was entered as the predictor variable, and the baseline value as a covariate in order to analyze emotional change across the task while controlling for individual differences at baseline. These linear regressions were then repeated to evaluate whether (3b) rejection specifically influenced the association of emotional reactivity with internalizing problems, with interaction terms for the second block of each parameter of interest and condition added as predictor variables for each of the three indicators of state emotional reactivity (i.e., Negative affect block 2*Condition, Positive affect block 2*Condition, RSA block 2*Condition). Then, we used linear regression to examine whether (3c) trait emotional reactivity and maladaptive responses to distress would be associated with symptoms of anxiety and depression.

Next, we conducted analyses to determine whether there was an indirect effect of community violence exposure on internalizing problems through (4a) state emotion dysregulation and (4b) trait emotion dysregulation using a bootstrapping approach that provides confidence intervals for indirect effects in multiple-mediator models (Preacher & Hayes, 2008). So as not to restrict our state reactivity analyses to the Boston subsample from whom physiological data were collected, change in RSA was examined in a separate model from changes in self-reported positive and negative affect. We therefore conducted indirect effect analyses in a total of three separate multiple-mediator models, (4a1) indicators of change in positive and negative self-reported

affect, (4a2) change in RSA, and (4b) all three indicators of trait emotion dysregulation.

In all models, predictors were mean-centered to ensure that effects were always within the range of the data and to reduce multicollinearity (Hayes, Glynn, & Huge, 2012). We controlled for gender in all models, for race in models including trait emotional reactivity, and for respiration rate in models including RSA. All regression analyses were conducted using MPlus software Version 7, and full information maximum likelihood (FIML) was used to handle missing data. Repeated-measures ANOVAs and mediation analyses were conducted in SPSS, Version 20.

## RESULTS

### Descriptive Statistics

Table 1 provides the means and standard deviations of all measures. Table 2 provides the zero-order correlations among all measures of community violence, emotion dysregulation, and symptoms of depression and anxiety.

TABLE 1
Means and Standard Deviations of Community Violence, Emotion Dysregulation, and Internalizing Symptoms

| *Measure* | *Mean* | *SD* |
|---|---|---|
| 1. SAVE | 21.94 | 14.07 |
| 2. NA BL | 1.37 | 0.51 |
| 3. NA b1 | 1.33 | 0.45 |
| 4. NA b2 | 1.33 | 0.45 |
| 5. PA BL | 2.62 | 0.87 |
| 6. PA b1 | 2.56 | 0.85 |
| 7. PA b2 | 2.46 | 0.88 |
| 8. RSA BL | 6.65 | 1.27 |
| 9. RSA b1 | 6.64 | 1.10 |
| 10. RSA b2 | 6.66 | 1.17 |
| 14. ERS Tot | 27.61 | 16.64 |
| 15. CRSQ Rum | 17.48 | 8.10 |
| 16. CRSQ Pr Sol | 6.71 | 3.10 |
| 17. INT | 0.00 | 1.67 |

*Notes.* SAVE = Screen for Adolescent Violence Exposure; NA BL b1 and b2 = Positive and Negative Affect Scale, the Negative Affect subscale at baseline, immediately following the first block of the peer evaluation, and immediately following the second block of the peer evaluation; PA BL b1 and b2 = Positive and Negative Affect Scale, the Positive Affect subscale at baseline, immediately following the first block of the peer evaluation, and immediately following the second block of the peer evaluation; RSA BL b1 and b2 = RSA averaged across the 5-minute baseline; averaged across the first block of the peer evaluation and averaged across the second block of the peer evaluation; ERS Tot = Emotional Reactivity Scale total score; CRSQ Rum and Pr Sol = Children's Response Styles Questionnaire, Rumination and Problem Solving subscales; INT = calculated by summing the standardized composites of the CDI and MASC scales.

### Community Violence Exposure and Internalizing Psychopathology

Exposure to community violence was associated with higher levels of internalizing symptoms ($\beta = .31$, $p < .001$).

### Community Violence Exposure and Emotion Dysregulation

***State emotional reactivity—Self-reported affect.*** Community violence was associated with self-reported negative affect during the peer evaluation task as a between-subjects effect, $F(1,205) = 26.95$, $p < .001$, with higher mean levels of negative affect reported by participants exposed to greater levels of community violence during the task. Rate of change in negative affect did not significantly vary across the chatroom task as a function of community violence exposure $F(2,205) = 0.15$ $p = .859$. Community violence exposure was not associated with variation in level or rate of changes in positive affect across the peer evaluation.

When examining emotional reactivity specifically to rejection in the peer evaluation task, the model for rate of change in negative affect revealed a marginal 3-way Time × Community Violence × Condition interaction suggesting that, at high levels of community violence, participants assigned to the reject condition demonstrated increases in negative affect while those assigned to the accept condition reported decreases in negative affect across the task $F(1,205) = 2.38$, $p = .094$. However, when we examined rate of change in negative affect separately for participants assigned to the reject and accept conditions, we did not find significant variation in slope of negative affect as a function of community violence exposure. We also found no evidence that community violence was associated with level of change or rate of change in self-reported positive affect in response to peer rejection relative to peer acceptance across the task.

***State emotional reactivity—RSA.*** No association between exposure to community violence and level or rate of change in vagal suppression was observed across the peer evaluation task.

When examining sensitivity to rejection in the peer evaluation task, the model for rate of change in RSA revealed a marginally significant 3-way Time × Community Violence × Condition

TABLE 2
Correlations of Community Violence Exposure, Emotion Dysregulation, and Internalizing Symptoms

| | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* | *12* | *13* | *14* | *15* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. SAVE | – | | | | | | | | | | | | | | |
| 2. NA BL | .28** | – | | | | | | | | | | | | | |
| 3. NA b1 | .34** | .75** | – | | | | | | | | | | | | |
| 4. NA b2 | .31** | .76** | .83** | – | | | | | | | | | | | |
| 5. PA BL | .00 | .15* | .13* | .07 | – | | | | | | | | | | |
| 6. PA b1 | .02 | .14* | .12 | .12 | .87** | – | | | | | | | | | |
| 7. PA b2 | .01 | .13* | .14* | .11 | .83** | .90** | – | | | | | | | | |
| 8. RSA BL | −.13 | −.33** | −.18 | −.15 | .09 | −.04 | −.14 | – | | | | | | | |
| 9. RSA b1 | .02 | −.20 | −.14 | −.12 | −.06 | −.11 | −.16 | .48** | – | | | | | | |
| 10. RSA b2 | .04 | −.23** | −.03 | −.07 | .02 | −.01 | −.09 | .49** | .91** | – | | | | | |
| 11. ERS Tot | .33** | .35** | .36** | .28** | .01 | .05 | .06 | −.18 | .10 | .14 | – | | | | |
| 12. CRSQ Rum | .16** | .23** | .27** | .24** | −.06 | −.09 | −.04 | −.14 | .05 | .08 | .56** | – | | | |
| 13. CRSQ Pr Sol | −.16** | .05 | .03 | .01 | .19** | .16* | .23** | −.05 | −.13 | −.14 | −.02 | −.10 | – | | |
| 14. INT | .26** | 29** | 35** | 38** | −.11 | −.09 | −.09 | −.03 | −.05 | .01 | .61** | .53** | −.29** | – | |

*Notes.* SAVE = Screen for Adolescent Violence Exposure; NA BL b1 and b2 = Positive and Negative Affect Scale, the Negative Affect subscale at baseline, immediately following the first block of the peer evaluation, and immediately following the second block of the peer evaluation; PA BL b1 and b2 = Positive and Negative Affect Scale, the Positive Affect subscale at baseline, immediately following the first block of the peer evaluation, and immediately following the second block of the peer evaluation; RSA BL b1 and b2 = RSA averaged across the five-minute baseline; averaged across the first block of the peer evaluation and averaged across the second block of the peer evaluation; ERS Tot = Emotional Reactivity Scale total score; CRSQ Rum and Pr Sol = Children's Response Styles Questionnaire, Rumination and Problem Solving subscales; INT = calculated by summing the standardized composites of the CDI and MASC scales.
*$p < .05$; **$p < .01$.

interaction such that, at high levels of community violence, participants assigned to the reject condition experienced blunted vagal suppression compared with those assigned to the accept condition across the task, $F(1,67) = 2.40$, $p = .095$. However, when we examined rate of change in RSA separately for participants assigned to the reject and accept conditions, variation in slope of RSA as a function of community violence exposure did not reach significance.

***Trait emotional reactivity.*** Exposure to community violence was associated with a higher ERS total score ($\beta = .33$, $p < .001$).

***Responses to distress.*** Exposure to community violence was negatively associated with the CRSQ problem solving scale at trend level ($\beta = -.15$, $p = .073$), but not significantly associated with the CRSQ rumination scale.

### Emotion Dysregulation and Internalizing Symptoms

***State emotional reactivity—Self-reported affect.*** Increases in negative affect across the peer evaluation were positively associated with internalizing symptoms ($\beta = .39$, $p < .001$). No association was observed between changes in positive affect across the peer evaluation task and internalizing symptoms.

Interactions between condition and changes in self-reported affect were added as predictors to the regression models, and were not significant in predicting internalizing symptoms across the task.

***State emotional reactivity—RSA.*** No association between vagal suppression and internalizing symptoms was found across the peer evaluation task.

Condition (reject vs. accept) did not significantly moderate the association of vagal suppression and internalizing symptoms across the task.

***Trait emotional reactivity.*** The ERS total score was positively associated with internalizing symptoms ($\beta = .62$, $p < .001$).

***Responses to distress.*** The rumination scale of the CRSQ was positively associated with internalizing symptoms ($\beta = .52$, $p < .001$). The problem solving scale was negatively related to internalizing symptoms ($\beta = -.30$, $p < .001$).

### Indirect Effects

In three separate analyses, we investigated whether there was a significant indirect effect of community violence on internalizing symptoms through changes in state emotion dysregulation, specifically (1) the set of indicators of self-reported affect and (2) RSA, as well as (3) the set of three indicators of trait emotion dysregulation. Indirect effects were tested using bootstrapping appropriate for multiple mediator models (Preacher & Hayes, 2008). The indirect effect of community violence exposure on internalizing problems through change in self-reported negative and positive affect across the chatroom task was significant, 95% confidence interval (CI): (0.0011–0.0127), but not through change in RSA in the Boston sample, 95% CI: (−0.0025–0.0059). The set of three indicators of trait emotion dysregulation (trait emotional reactivity, rumination, and problem solving), also significantly explained the association between community violence exposure and internalizing symptoms, 95% CI: (0.0129–0.0363).

Finally, as a supplementary analysis using data from the Boston sample, we were able to examine all six indicators of emotion dysregulation in a single multiple-mediator model. The indirect effects of community violence exposure on internalizing symptoms were significantly explained by the model of six state and trait emotion dysregulation indicators, 95% CI: (0.0014–0.0419). Relative contributions of each of the individual mediation pathways are provided in Table S1 in the online Supporting Information.

### Sensitivity Analyses

All analyses were rerun excluding those adolescents ($n = 10$) who reported during the debriefing that they did not believe the other subjects in the study were real; the pattern of results remained unchanged. Additionally, we examined whether our findings persisted after controlling for parental socioeconomic status (SES), measured by the family income-to-needs ratio. Family SES was not significantly associated with community violence or internalizing symptoms in this sample, and SES data were only available on a smaller proportion of the sample (51.2%; $n = 147$). For this reason, we report these results as a sensitivity analysis. All associations were unchanged after adjusting for SES with few exceptions. In the small sample of participants with both physiological and parental SES data ($n = 51$), the association of community violence

exposure with rate of change in vagal suppression to peer rejection was no longer significant, the self-reported affect indirect effects model slipped to trend-level significance, and the supplemental six-mediator model was no longer significant (Tables S4–S6 in the online Supporting Information).

## DISCUSSION

A majority of U.S. adolescents have been exposed to community violence in their lifetime (Finkelhor et al., 2013). Consistent with prior studies, we found that greater exposure to community violence was associated with higher levels of internalizing symptoms during adolescence, a developmental period of heightened susceptibility to internalizing disorders (Hankin et al., 1998). We extend previous literature examining community violence and the development of psychopathology (Fowler et al., 2009) by identifying a plausible mechanism linking community violence and adolescent internalizing symptoms. Our results suggest that community violence exposure might disrupt a variety of emotion regulation processes in adolescence. Adolescents exposed to community violence were more likely to report increases in negative affect when evaluated by peers and blunted vagal suppression to peer rejection, a physiological pattern that has frequently been identified as a maladaptive form of emotional reactivity (Hinnant & El-Sheikh, 2009; Kreibig, 2010; Rottenberg, Salomon, Gross, & Gotlib, 2005). Adolescents exposed to community violence also reported higher levels of trait emotional reactivity and engaged in lower levels of problem solving, an adaptive response to distress (Nolen-Hoeksema, 2000). In turn, some—though not all—emotion dysregulation processes were associated with greater symptoms of depression and anxiety. Finally, disruptions in self-reported state and trait emotion regulation processes contributed to the association between community violence exposure and internalizing problems. Together, these findings highlight a novel pathway linking community violence with internalizing symptoms in adolescents.

Our first goal was to examine the association between community violence exposure and symptoms of internalizing psychopathology in adolescence. We found that exposure to community violence was associated with greater internalizing symptoms. This finding is consistent with a growing body of literature suggesting that community violence is not only associated with elevations in externalizing problems in children, but also internalizing problems (Durant, Getts, Cadenhead, Emans, & Woods, 1995; Gorman-Smith & Tolan, 1998; Martinez & Richters, 1993; Schwab-Stone et al., 1999; Singer et al., 1995). Existing programs aimed at buffering youth living in dangerous neighborhoods from developing long-term mental health sequelae largely focus on remediating risk factors for aggressive behavior. Our findings underscore the critical need to devote resources to the prevention of anxiety and depression among youth who have experienced community violence during adolescence, a developmental period characterized by risk for internalizing disorders. Indeed, early adolescence marks the median first onset of anxiety disorders (Kessler et al., 2005), while the incidence of major depression reaches its peak between the ages of 15 and 18 (Hankin et al., 1998). The increased risk of internalizing disorders during adolescence is due, at least in part, to greater exposure to stressful life events and heightened reactivity to those events (Hankin & Abramson, 2001; Rudolph & Hammen, 1999). This pattern suggests that adolescents navigating stressors associated with life in a violent community might be at particular risk for internalizing psychopathology.

Our second aim was to evaluate whether community violence was associated with multiple markers of state emotional reactivity as well as greater trait emotional reactivity and more frequent engagement in ineffective responses to distress characteristic of emotion dysregulation. Consistent with our hypotheses, community violence exposure was associated with increases in self-reported negative affect during a task that approximates the social stress commonly experienced by adolescents in their daily lives, evaluation by peers online. These increases in negative affect during peer evaluation were associated with community violence regardless of whether adolescents were assigned to peer rejection or peer acceptance conditions, indicating a heightened overall sensitivity to peer evaluation. This emotional reactivity to peer evaluation adds to extant evidence that violence exposure heightens emotional and physiological sensitivity to potentially threatening situations (MacMillan et al., 2009; Maughan & Cicchetti, 2002; McLaughlin, Sheridan, et al., 2014).

Community violence exposure was additionally associated at trend level with a pattern of reduced vagal suppression for adolescents assigned to the rejection condition of the peer evaluation task. This finding is consistent with other studies that have identified an association between adverse life experiences and blunted vagal reactivity to stress (El-

Sheikh & Hinnant, 2011; McLaughlin, Alves, & Sheridan, 2014). High vagal reactivity is considered adaptive as it allows for rapid deployment of the sympathetic nervous system in the context of interpersonal stress, while blunted vagal reactivity is considered to be maladaptive, indicating over-vigilance to threatening stimuli and a limited ability to immediately identify and cope with stress (Obradović, Bush, & Boyce, 2011; Schmitz, Krämer, Tuschen-Caffier, Heinrichs, & Blechert, 2011; Thayer & Lane, 2000). This might be particularly true in adolescence, when the presence of peers compromises regulation abilities (Gardner & Steinberg, 2005). It is noteworthy that for adolescents in our study exposed to greater levels of community violence, blunted vagal suppression emerged specifically to peer rejection, but not peer evaluation in general. Exposure to community violence is likely to enhance adolescents' vigilance to perceived threat in the environment. In the case of social threat, adolescents exposed to community violence may have been primed to react to the more salient threat of rejection than to peer evaluation.

Consistent with our hypotheses, community violence exposure was associated with heightened trait emotional reactivity. Adolescents with higher exposure to community violence reported becoming emotional more easily (greater sensitivity), experienced stronger emotions (greater arousal/intensity), and had emotions of a longer duration (greater persistence). Heightened emotional reactivity likely reflects an adaptive response to living in a dangerous environment where legitimate threats are present. Indeed, violence exposure is associated with heightened attention and reactivity to threat cues (Pollak & Kistler, 2002; Pollak & Sinha, 2002). However, high levels of emotional reactivity can also be maladaptive in contexts that are safe, where threat reactions may reduce the likelihood of perceiving safety cues and lead to inappropriately exaggerated responses to interpersonal interactions.

We also found that community violence exposure was associated at trend level with lower levels of problem solving. Our finding builds on a growing body of work indicating that exposure to early adverse life events is associated with disrupted development of effective cognitive strategies for regulating emotion (Gibb, 2002; Gibb et al., 2006). It is possible that greater exposure to violence in one's community may lead to attributions that threats to well-being are global and uncontrollable (Abramson, Seligman, & Teasdale, 1978; Gibb, 2002). Indeed, unlike adults, youth typically have no control over the environment in which they live, and as a result may not see the community-level problems as ones they can solve. In addition, if adults living in violent communities are more likely to be depressed (Clark et al., 2008) caregivers and other adults may be modeling fewer effective emotional response strategies to adolescents (Garber, Braafladt, & Zeman, 1991; Silk, Shaw, Skuban, Oland, & Kovacs, 2006). At first glance, it is surprising that community violence was not more strongly associated with rumination. However, prior evidence linking violence exposure with rumination comes largely from samples of children victimized by known perpetrators, for example peer victimization and parental physical abuse (Heleniak et al., 2015; McLaughlin et al., 2009). A tendency to attribute personal responsibility is more likely following assaults by known perpetrators rather than random acts of violence (Bell, Kuriloff, & Lottes, 1994; McGee, Wolfe, & Olson, 2001), and self-blame following negative life events is closely associated with engagement in rumination (Garnefski, Kraaij, & Spinhoven, 2001; Garnefski et al., 2002). Adolescents may be less likely to engage in ruminative self-focus following exposure to community violence where they may not have been targeted directly. Future research is needed to examine these possibilities further.

Our third aim was to evaluate whether state and trait emotion dysregulation processes were related to symptoms of depression and anxiety. Consistent with our hypotheses, increases in negative affect in the context of peer evaluation were associated with increased internalizing symptoms, as were higher trait emotional reactivity and habitual rumination. Taken together, these findings are consistent with growing evidence that emotion regulation deficits are key to the onset and persistence of anxiety and mood disorders (Aldao et al., 2010). Our finding that vagal suppression during the peer evaluation task was unrelated to internalizing symptoms is consistent with some (Hinnant & El-Sheikh, 2009; McLaughlin, Alves, et al., 2014) but not all (Boyce, 2001; P. Hastings et al., 2008) previous studies examining vagal reactivity and internalizing psychopathology. In their recent meta-analysis, Graziano and Derefinko (2013) concluded that, despite inconsistent findings that are likely a function of the variety of tasks used in the literature, vagal suppression is significantly negatively correlated with internalizing psychopathology. In contrast, vagal reactivity has more consistently been shown to moderate the relation between adversity and internalizing psychopathology, with greater

adversity associated with higher symptoms only among youths with blunted vagal reactivity (El-Sheikh, 2005; El-Sheikh & Erath, 2011; McLaughlin, Alves, et al., 2014). Graziano and Derefinko (2013) report that samples drawn from more low-risk and ethnically Caucasian communities are more likely to receive the buffering benefit of vagal suppression while the opposite is true for high-risk ethnically diverse samples, which may explain the lack of association between vagal reactivity and internalizing psychopathology in this sample.

Finally, we examined whether the pathways that link severe victimization (e.g., maltreatment) with anxiety and depression might be similar to those following exposure to community violence, which is also characterized by threat albeit typically of a less severe nature than maltreatment. Our findings extend previous literature by demonstrating that disruptions across many state and trait emotion regulation processes may explain the association between community violence exposure and internalizing problems in adolescents. These findings suggest that adolescents living in dangerous communities could benefit from strategies that bolster emotion regulation in each of the areas we identified, for example relaxation and mindfulness skills for decreasing state emotional reactivity, behavioral activation to provide opportunities for positive experiences to decrease trait reactivity, and cognitive reappraisal and problem solving to address the paucity of cognitive strategies. These skills, which are routine in evidence-based treatments for internalizing problems, might be a useful adjunct to existing interventions for violence–exposed families that address the many risk factors for externalizing problems in youths exposed to community violence (e.g., inconsistent parental monitoring and discipline, Smith et al., 2004; Tolan, Gorman-Smith, & Henry, 2004).

Strengths of this study include identification of a potential pathway underlying the relationship between community violence and internalizing psychopathology in adolescents and use of multiple methods for the assessment of emotion regulation. However, several key limitations should be acknowledged. Most critically, the study design was cross-sectional, precluding us from examining our multiple mediator state and trait emotion dysregulation models over time. Replication of these findings in longitudinal studies is an important goal for future research. A second limitation is that we did not assess post-traumatic stress disorder (PTSD) symptoms in our participants. Given consistent evidence for a relationship between exposure to community violence and PTSD symptoms (Fowler et al., 2009), it would be useful to control for PTSD symptoms in models predicting depression and anxiety symptoms. Third, because our measure of community violence is broad and did not query the perpetrator, we cannot be certain that we were capturing only community violence as opposed to violence occurring within other settings. Fourth, state and trait emotion regulation processes are distinct yet related dimensions. Although steps were taken to control for the confounding of state and trait measures (i.e., measurement at separate visits, entering baseline state emotion dysregulation measures as covariates), it is not possible to entirely disentangle state from trait emotion dysregulation. Fifth, our ability to detect the effects of state emotion dysregulation was hampered because the physiological measure of emotional reactivity was measured only in a smaller sample of participants and because the between-subject design of the chatroom task reduced our sample by half in the analyses where we examined sensitivity to rejection specifically. In addition, internalizing problems were assessed via self-report instruments as opposed to diagnostic status. Although these are established well validated measures (Achenbach, 1991; Achenbach & Edelbrock, 1981), shared method variance may have contributed to their relation to the self-reported emotion regulation measures. Furthermore, given the high comorbidity of internalizing and externalizing symptoms during adolescence, it is possible that effects observed in this study may be capturing the covariance between these symptoms rather than internalizing symptoms specifically. Future research will need to disentangle the relative associations of internalizing and externalizing psychopathology with indices of community violence exposure and state and trait emotion dysregulation. Finally, it will be important for future research to examine the role of trait emotion dysregulation as a moderator, rather than mediator, of the association between community violence and internalizing psychopathology because it may be possible that community violence will have a stronger relationship with internalizing psychopathology among those who are susceptible to affect dysregulation.

This study provides novel evidence for the roles of state and trait emotion dysregulation as a potential mechanism linking community violence exposure and internalizing symptoms during adolescence, a developmental period of heightened risk for depression and continued risk for anxiety. Higher exposure to community violence was

associated with elevated state and trait emotional reactivity and greater use of maladaptive responses to distress, indicating a widespread pattern of emotion regulation deficits among adolescents with high levels of community violence exposure. These results suggest that incorporation of techniques targeting broad use of emotion regulation skills and their practice in everyday stressful situations into prevention interventions targeting youths exposed to community violence might be useful in reducing vulnerability to internalizing psychopathology.

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## Supporting Information

Additional Supporting Information may be found online in the supporting information tab for this article:

**Table S1.** Indirect effects of community violence exposure on internalizing problems through all six state and trait emotion dysregulation indices

**Table S2.** Means and standard deviations of community violence, emotion dysregulation, and internalizing problems for the entire sample and for the Boston and Pittsburgh and Seattle sites

**Table S3.** State emotional reactivity during each phase of the peer evaluation chatroom task by condition

**Table S4.** Community violence, state emotional reactivity, and internalizing symptoms controlling for family income-to-needs ratio

**Table S5.** Community violence, trait emotion dysregulation, and internalizing symptoms controlling for family income-to-needs ratio

**Table S6.** Indirect effects of community violence exposure on internalizing problems through all four state and trait emotion dysregulation models controlling for family income-to-needs ratio