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Self-Reported Emotion Reactivity Among Early-Adolescent Girls: Evidence for Convergent and Discriminant Validity in an Urban Community Sample

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Emotion reactivity, measured via the self-report Emotion Reactivity Scale (ERS), has shown unique associations with different forms of psychopathology and suicidal thoughts and behaviors; however, this limited body of research has been conducted among adults and older adolescents of predominantly White/European ethnic backgrounds. The present study investigated the validity of ERS scores for measuring emotion reactivity among an urban community sample of middle-school-age girls. Participants (*N* = 93, ages 11–15, 76% African-American, 18% Latina) completed the ERS and measures of emotion coping, internalizing problems, proactive and reactive aggression, negative life events, and lifetime suicidal ideation and substance use. As hypothesized, ERS scores were significantly associated with internalizing problems, poor emotion coping, negative life events, reactive aggression, and suicidal ideation (evidence for convergent validity), but showed little to no association with proactive aggression or lifetime substance use (evidence for discriminant validity). A series of logistic regressions were conducted to further explore the associations among internalizing problems, emotion reactivity, and suicidal ideation. With depressive symptoms included in the model, emotion reactivity was no longer uniquely predictive of lifetime suicidal ideation, nor did it serve as a moderator of other associations. In conjunction with previous research, these findings offer further support for the construct validity and research utility of the ERS as a self-report measure of emotion reactivity in adolescents.

Keywords: emotion reactivity; convergent and discriminant validity; emotion regulation; adolescent girls; risk and protective factors

EMPIRICAL AND THEORETICAL RESEARCH SUGGESTS that emotion reactivity may be an important mechanism in various forms of child and adolescent psychopathology. However, there has been relatively little research directly examining emotion reactivity in youth. Nock, Wedig, Holmberg, and Hooley (2008) developed the Emotion Reactivity Scale (ERS), which is the first self-report rating scale designed to specifically measure emotion reactivity. Although some studies show preliminary support for the ERS, external validation is lacking. The present study extends the literature on emotion reactivity by examining the ERS among a younger and more ethnically diverse sample than has been previously studied. Specifically, we investigate

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the convergent and discriminant validity of ERS scores as a measure of emotion reactivity in early-adolescent girls by examining their relations to several other social, behavioral, and emotional variables.

EMOTION REACTIVITY

Emotion regulation theory has become increasingly influential in developmental psychopathology and clinical child and adolescent psychology in recent years, yielding specific and transdiagnostic implications for the assessment and treatment of psychological problems in youth (Cole & Hall, 2008; Southam-Gerow & Kendall, 2002). Broadly defined, *emotion regulation* refers to the ongoing process through which one's affective state is continually modulated. As such, emotion regulation and dysregulation are considered to be distinct from emotions themselves (Gross & Jazaieri, 2014), encapsulating all changes in the intensity, valence, and time-course characteristics of one's emotional state (Cole & Hall, 2008; Cole, Martin & Dennis, 2004). Extending on this conceptual framework, emotion reactivity refers to the *emotion-response process*; an individual attends to a situation, appraises it as relevant, and experiences the activation of an emotion which can be described in experiential, behavioral, and physiological terms (Gross & Jazaieri, 2014). Nock et al. (2008, p. 107) operationalized emotion reactivity as "the extent to which an individual experiences emotions (a) in response to a wide array of stimuli (i.e., emotion sensitivity), (b) strongly or intensely (i.e., emotion intensity), and (c) for a prolonged period of time before returning to baseline level of arousal (i.e., emotion persistence)." Emotion reactivity is therefore distinct from specific emotions (e.g., anger, sadness, anxiety) and other constructs[1] such as temperament, emotional vulnerability, and mood lability.

This conceptualization is methodologically useful because it is defined according to an observable stimulus-response process (Gross & Jazaieri, 2014) and three distinct facets to facilitate more reliable measurement of the overarching construct (Nock et al., 2008) through a variety of methodologies. The self-report perspective is particularly critical for several reasons. A variety of variables measured predominantly through self-report (e.g., emotional distress, social problems) have been found to be uniquely associated with psychopathology and suicidality (O'Connor & Nock, 2014). As psychophysiological research becomes more common, the self-report perspective remains valuable precisely because it is not directly correlated with behavioral and physiological measurements of the same experience (e.g., Glenn, Blumenthal, Klonsky, & Hajcak, 2011). Further, it is essential to assess affective phenomena, such as emotional reactivity, according to one's own subjective, psychological experience.

Accordingly, Nock et al. (2008) developed the ERS,[2] a 21-item self-report rating scale, and examined the evidence for its validity in a combined community-clinical sample of 87 young adults and adolescents (78% female; 72% European-American; all other ethnicities < 12%). They found evidence for strong internal consistency and a unidimensional factor structure (α = .94; item loadings = .44 – .86); evidence for convergent and discriminant validity with measures of temperament and behavioral activation/inhibition; and evidence for criterion validity with diagnosed psychopathology and self-injurious thoughts and behavior. Further, emotion reactivity was found to statistically mediate the relationship between psychopathology and both suicidal ideation and self-injurious thoughts and behaviors (Nock et al., 2008).

Although independent validation studies of the original ERS are lacking, the measure has since been translated into both Dutch (Claes, Smits, & Bijttebier, 2014) and French (Lannoy et al., 2014), with preliminary evidence supporting the validity of these adaptations. The Dutch version of the ERS exhibits a single-factor structure with high internal consistency and gender invariance; positive associations with negative affect and maladaptive coping strategies; negative associations with positive affect, effortful control, and adaptive coping strategies; and positive associations with nonsuicidal self-injury (NSSI) and eating disorder symptoms (Claes et al., 2014). Similarly, the French translation supports both a

[1] The psychological literature contains several constructs similar and relevant to the study of emotion reactivity. For example, positive/negative emotionality (Dougherty, 2006), emotion dysregulation, emotional vulnerability (Linehan, 1993), mood lability (Palmier-Claus, Taylor, Varese, & Pratt, 2012), affect intensity (Larsen & Diener, 1987), and irritability (e.g., Stringaris et al., 2012). While these constructs may have some degree of overlap, emotion reactivity is clearly delineated according to emotion regulation theory and uniquely operationalized in terms of measurement (see, e.g., Nock et al., 2008; Gross & Jazaieri, 2014).

[2] Much like emotion reactivity is to be distinguished from related but distinct constructs (see previous footnote), the Emotion Reactivity Scale is to be differentiated from numerous measures that have been developed to measure those other constructs. Some examples include the Affective Reactivity Index (Stringaris et al., 2012), Difficulties in Emotion Regulation Scale (Gratz & Roemer, 2004), and Affective Intensity Measure (Larsen & Diener, 1987). As with the theoretical constructs they are intended to assess, these measures have different properties and purposes; the degree to which they are in fact distinct from one another is an open empirical question.

single-factor and hierarchical structure, with emotion reactivity linked to maladaptive cognitive emotion regulation strategies and emotionally driven impulsive behaviors (Lannoy et al., 2014).

Taken together, extant evidence supports the validity of self-reported emotion reactivity as measured via ERS scores. Yet, despite its usage in a number of recent studies, the validity of the English version of the ERS has not been thoroughly examined. Only a single study by the measure's developers (Nock et al., 2008) has pursued this objective. Even when aggregating the findings from the Dutch, French, and English versions, the evidence for measurement validity of ERS scores comes from samples predominantly comprised of European or European-American individuals in adulthood or late adolescence. Thus, the generalizability of the ERS may be limited, and research is needed to support its validity among individuals of other ethnic backgrounds and age groups. Adolescence represents a particularly important age group in which to investigate the ERS. Findings from the neuroscience (e.g., Pfeifer & Blakemore, 2012) and developmental (e.g., Zimmermann & Iwanski, 2014) literatures reveal that emotion reactivity, dysregulation, and amygdala activation peak during adolescence, whereas inhibitory control, self-regulation, coping skills, and the prefrontal cortex continue to develop well into adulthood (Eslinger & Biddle, 2008). Additionally, rates of suicidal behaviors (Foley et al., 2006; Nock et al., 2013) and depression (Avenevoli, Swendsen, He, Burstein & Merikangas, 2015) both increase sharply and over the course of adolescence, and both show associations with emotion reactivity (Nock et al., 2008). With respect to ethnicity, it is necessary, both for ethical and for scientific reasons, to assess the reliability, validity, and utility of this new measurement tool among ethnic minority populations in which it may be used (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 2014). Further, research on emotion reactivity may help elucidate the underpinnings of depression and suicidality among African-American and female youth.

CONVERGENT AND DISCRIMINANT VALIDITY

The validation of a psychological instrument is an ongoing process, with each additional study yielding incremental evidence regarding the validity and utility of using that instrument for a particular purpose in a given population (Strauss & Smith, 2009). Considering the conceptual and theoretical ambiguities in emotion regulation theory (see, e.g., Cole, Martin & Dennis, 2004; Gross & Jazaieri, 2014) as well as the lack of objective indices of emotion reactivity (e.g., a specific diagnostic category or observable outcome) to support criterion validity, there is a particular need for evidence concerning the convergent and discriminant validity of the ERS. In the present study, we adopt the conventional definitions of these terms: *convergent validity* is the degree to which ERS scores are associated with measurements of theoretically related or similar variables (i.e., convergence); and discriminant validity is the degree to which ERS scores are less associated with measurements of theoretically unrelated or dissimilar variables (i.e., divergence). Moreover, convergent and discriminant validity are taken as two key aspects of construct validity (Strauss & Smith, 2009). In this study, we investigate the convergent and discriminant validity of ERS scores in terms of hypothesized associations with the variables described below. Based on the above definitions, we interpret moderate/strong associations of ERS scores with hypothesized convergent variables as evidence for convergent validity, whereas comparatively smaller associations (nonsignificant/weak correlations) with hypothesized discriminant variables is interpreted as evidence for discriminant validity. Finally, all of these findings are considered in aggregate as providing information about the construct validity of the ERS.

HYPOTHESIZED CORRELATES OF EMOTION REACTIVITY

To the extent that emotion reactivity represents a facet of emotion dysregulation, emotion regulation theory would posit that it is distinct from, but associated with, adaptive regulatory processes, such as coping strategies. Specifically, *emotion coping* refers to one's ability to use cognitive, behavioral, and social strategies to address negative emotions in a constructive manner (Zeman, Shipman, & Suveg, 2002). Emotion coping scores are inversely associated with anxious/depressed symptoms, internalizing symptoms, externalizing problems, and lability/negativity (Zeman et al., 2002, 2010). From these findings, it follows that ERS scores should be inversely associated with emotion coping scores. Indeed, evidence suggests that emotion reactivity is broadly linked to poorer coping strategies (Claes et al., 2014; Lannoy et al., 2014). However, the association between emotion reactivity and emotion coping has not been examined, despite the clear conceptual association between these two constructs (Zeman et al., 2010).

With regard to specific emotions, there is evidence for links between emotion reactivity and several facets of internalizing problems, including high negative affect, low positive affect, depressive

symptoms, and behavioral inhibition (Claes et al., 2014; Lannoy et al., 2014; Nock et al., 2008). ERS scores are also associated with mood, anxiety, and eating disorders (Nock et al., 2008), as well as patterns of symptom presentation in pathological skin picking (Snorrason, Smári & Ólafsson, 2010) and comorbid symptoms among those with hoarding behaviors (Hall et al., 2013). However, little attention has been given to the associations between ERS scores and stress and anxiety symptoms from a dimensional (nondiagnostic) perspective. Further, methods for measuring stress-related variables by self-report often make it difficult to disentangle one's subjective appraisal of stressful events as opposed to one's objective degree of exposure to life events that are considered to be stressful; both have important clinical and developmental implications (e.g., Chan, 1998).

The evidence is less consistent regarding the relations between emotion reactivity and externalizing problems (e.g., Nock et al., 2008). With respect to aggressive behavior, additional insight might be gained by delineating the functions of aggression—i.e., *reactive aggression* (behavior in response to a perceived threat) and *proactive aggression* (behavior motivated by external reward; Fite et al., 2012; Vitaro & Brendgen, 2012). Although highly correlated with one another (typically between .6 and .8; Polman, de Castro, Koops, van Boxtel, & Merk, 2007), proactive and reactive aggression are theoretically and empirically distinct. Theoretically, reactive aggression is consistent with the frustration-aggression hypothesis (Berkowitz, 1989) whereas proactive aggression is consistent with a social learning model of aggression (Bandura, 1973). Empirically, a great deal of evidence for the proactive-reactive distinction has been generated from factor-analytic studies (Fite, Colder, & Pelham, 2010; Little et al., 2003; Raine et al., 2006), as well as unique differential associations with a wide variety of social, behavioral, emotional, and psychological variables across development (Card & Little, 2006; Fite et al., 2012; Vitaro & Brendgen, 2012). For example, these studies indicate that reactive, but not proactive, aggression is linked to internalizing problems and peer rejection. Given the emotionally impulsive nature of reactive aggression, emotion reactivity is likely associated with reactive, but not proactive, aggression. Indeed, emotion reactivity is linked to higher levels of frustration and aggression (consistent with reactive aggression) and lower levels of behavioral control (inconsistent with proactive aggression; Claes et al., 2014; Nock et al., 2008). Similarly, reactive aggression is strongly linked to depressive symptoms, much like emotion reactivity, but unlike proactive aggression (Fite et al., 2012; Vitaro & Brendgen, 2012).

Early substance use represents another relevant risk factor for young adolescents, associated with increased risk for substance use disorders and other psychosocial difficulties over time (Ellickson, Tucker, Klein, & Saner, 2004). But it is also important to consider that cross-sectionally, the nature and degree of substance use changes markedly over the course of adolescence. Among early adolescents (e.g., ages 11–13) of all ethnic backgrounds, alcohol, tobacco, and marijuana use is the exception rather than the rule; however, substance use increases sharply through late adolescence (e.g., ages 17–19) before peaking during young adulthood (Chen & Jacobson, 2012; Malone et al., 2012). Early initiation of substance use appears to be facilitated largely by (a) exposure to substance-using peers and family members, and (b) a lack of parental monitoring, communication, and limit-setting (Kosterman et al., 2000). Accordingly, early initiators may not exhibit a consistent pattern of psychosocial difficulties and emotional dysregulation (e.g., using substances as a coping mechanisms), despite their increased risk for developing such a pattern over time. Thus, we would not necessarily expect a particular positive (or negative) association between substance use initiation and emotion reactivity.

Lastly, emotion reactivity has shown associations with suicidal behaviors and NSSI, even after controlling for internalizing problems (Claes et al., 2014; Nock et al., 2008). While the great majority of studies using the ERS have focused on its association with NSSI (e.g., Bresin et al., 2010; Jenkins & Schmitz, 2012), less is known about the role of emotion reactivity in relation to suicidal ideation. Clear links exist between internalizing psychopathology and suicidal ideation/behavior (e.g., Foley et al., 2006; Nock et al., 2013), as well as between emotion reactivity and depression (Claes et al., 2014; Nock et al., 2008); however, the role of emotion reactivity in the link between depression and suicidal ideation has not been well explored. Some evidence suggests that psychological disorders may act as additive or multiplicative risk factors for suicide (Foley et al., 2006). Most notably, depressive symptoms, irrespective of diagnosis, are among the strongest predictors of suicide ideation and attempts (Nrugham, Larsson, & Sund, 2008; Reifman & Windle, 1995; Taliaferro & Muehlenkamp, 2014). Other psychological and emotion-regulatory factors also play a role, but here the evidence is mixed. For example, maladaptive views and strategies regarding coping with negative emotions are uniquely associated with suicidal ideation and self-harm behavior (Deeley & Love, 2013; Horwitz, Hill & King, 2011; McMahon et al., 2013). Yet other studies have found that coping

style is not a prominent risk or protective factor (e.g., O'Donnell et al., 2004).

One possible explanation for these mixed findings is that emotion regulatory processes may serve more of a moderating role in the relations between risk factors and suicidal ideation; but here the evidence is also mixed. Dour, Cha, and Nock (2011) found evidence for an Emotion × Cognition interaction, such that high emotion reactivity predicted suicide attempts among those with low, but not high, levels of problem solving. Similarly, Hirsch et al. (2007) found that dispositional optimism moderated the link between cumulative life stressors and suicide ideation and attempts, such that a more optimistic cognitive style served as a protective factor. Yet other studies have found evidence for additive but *not* multiplicative effects among such risk factors—for example, between stress and poor coping (Elliott & Frude, 2001), and between negative emotionality and low emotion self-confidence (i.e., expectations of ability to cope with and/or change negative emotions; Deeley & Love, 2013). Considering these mixed findings, there are both theoretical and empirical reasons to examine emotion reactivity as a moderator of depressive symptoms, negative life events, and emotion coping in regard to their association with suicidal ideation.

OVERVIEW OF THE PRESENT STUDY

Based on the literature reviewed above, we examined the ERS within an urban community sample of early-adolescent girls to investigate the ERS scores' (a) *convergent validity* in terms of their associations with internalizing symptoms, poor emotion coping, negative life events, reactive aggression, and lifetime suicidal ideation; and (b) *discriminant validity* in terms of their associations with proactive aggression (as compared to reactive aggression) and lifetime substance use (as compared to lifetime suicidal ideation). Further, (c) we conducted exploratory analyses of emotion reactivity as a unique predictor of lifetime suicidal ideation and as a moderator of its associations with depressive symptoms, negative life events, and emotion coping. In regard to each of these objectives, we hypothesized that ERS scores would show (a) moderate to strong associations with convergent variables; (b) little or no association with discriminant variables (as compared to their convergent counterparts); and (c) unique associations with suicidal ideation above and beyond depressive symptoms and other risk factors, while also exacerbating the effect of depressive symptoms, negative life events, and emotion coping as predictors of lifetime suicidal ideation.

Methods

PARTICIPANTS AND PROCEDURES

Study data were collected as part of a program evaluation of a 6-week summer day camp for middle-school-age adolescents at two sites in a large urban midwestern city. The camp seeks to enroll at-risk youth, free of charge, and utilizes performing arts training and personal development classes to help improve self-esteem, confidence, and resiliency. The program evaluation is conducted as part of an ongoing university-community partnership, intended to (a) provide feedback and recommendations to assist the organization in reaching their goals, and (b) facilitate community-based, youth development research among at-risk populations.[3]

Parent consent and youth assent were obtained prior to data collection. Self-reported data were collected from 109 campers. Of the total sample, 93 adolescents (85%) were female, and only their data were used in the present analyses. Study participants were between 11 and 15 years of age (M = 12.2). Participants indicated their ethnicity as follows (allowed to select one or more responses): 77% identified as Black/African-American, 22% as White/Caucasian, and 19% as Hispanic/Latina. All participants were from school districts and residences in low-income, inner-city zip codes. According to the program evaluation's parent-reported data, 70% of the families had an annual household income of less than $40,000, and less than 25% percent of parents/caregivers had earned a college degree.

Data were collected on the second and third days of camp to provide baseline and background information. Measures were administered simultaneously and according to the same procedures at both camp sites. Trained graduate and undergraduate research assistants read items aloud while campers followed along and completed the measures silently. Participants were assured that their responses would be kept confidential from the researchers and camp staff. Further, participants sat far apart from one another and were not allowed to talk so as not to influence one another's responses. In exchange for their participation, campers and their parents received a free DVD of the final camp performance. All procedures and measures were approved by the researchers' institutional review board and camp directors prior to data collection.

[3] For further details on the camp, program evaluation, and related research, see Bender & Roberts, 2009; Brown-Kirschman, Roberts, Shadlow, & Pelley, 2010; Holtzman, & Roberts, 2012; Stewart, Roberts, & Kim, 2010.

MEASURES

All data were collected via youth self-report. Unless otherwise noted, analyses are based on participants' mean response scores, such that results can be interpreted according to the original scale properties.

Emotion Reactivity

The ERS (Nock et al., 2008) was used to measure emotion reactivity. The measure consists of 21 items rated on a 5-point Likert scale from 0 (*not at all like me*) to 4 (*completely like me*). Items were designed to measure individuals' emotion sensitivity (e.g., "I get angry easily," "I am a sensitive person"), intensity (e.g., "I experience emotions strongly," "I get so upset I cannot think straight"), and persistence (e.g., "It takes me longer than most people to get over feeling upset, or to get over disagreements with people"). The scale demonstrated excellent internal consistency in the study sample (α = .94). As described above, previous research supports the validity and measurement properties of ERS scores for measuring emotion reactivity among adults and adolescents (e.g., Nock et al., 2008).

Internalizing Problems

The self-report form of the Behavior Assessment System for Children, Second Edition (BASC-2; Reynolds & Kampaus, 2004) was used to assess internalizing problems. The BASC-2 is a widely used broadband measure of child and adolescent behavioral, emotional, and social functioning. The present analyses utilized the composite internalizing scale and three subscales thereof: Depression (e.g., sadness, feeling you do nothing right), Anxiety (e.g., nervousness, worry, fear), and Social Stress (e.g., feeling left out, or that others find things wrong with you). Items provide a statement about "how some young people may think or feel or act," and participants indicate whether the statement is true or false (dichotomous items) or never, sometimes, often, or almost always true (4-point Likert items). Consistent with standard administration (Reynolds & Kampaus, 2004), participants ages 12–15 completed the adolescent version (176 items), while 11-year-old participants completed the child version (139 items). Both forms have similar measurement models and are normed by age and gender against a nationally representative sample of 3,400 youth (Reynolds & Kampaus, 2004). With respect to the internalizing scales used in the present study, the two forms are nearly identical and directly comparable across age groups. Evidence supports the reliability and validity of these scales' scores for use among community and clinical samples (Reynolds & Kampaus, 2004). Standardized *t*-scores (M = 50, SD = 10) were used in analyses, allowing for clinically oriented interpretation (scores $\geq$ 70 considered "clinically significant"; scores between 60 and 69 considered at "risk"; scores < 60 considered "typical").

Proactive and Reactive Aggression

Proactive and reactive aggression were assessed using a 6-item rating scale (Dodge & Coie, 1987). Items were measured on a 5-point Likert scale from 1 (*never*) to 5 (*almost always*), with 3-item subscales assessing proactive (e.g., threatens or bullies others to get his/her own way) and reactive (e.g., when teased or threatened, gets angry easily and strikes back) aggression. Previous research has found evidence supporting the reliability and validity of these subscales by teacher-, parent-, and self-report (e.g., Dodge, Lochman, Harnish, Bates, & Pettit, 1997; Evans, Fite, Hendrickson & Mages, 2015; Waschbusch, Willoughby, & Pelham, 1998). Although ratings of proactive and reactive aggression are highly correlated (typically around .6–.8; Polman et al., 2007), the two constructs are theoretically and empirically distinct, with well-supported factor structures and differential correlates after controlling for their shared variance (Card & Little, 2006; Fite et al., 2010, 2012). Internal consistency in the sample was good for both subscales (αs = .80–.81).

Emotion Coping

The Children's Emotional Management Scales, Coping Subscale (CEMS-C; Zeman et al., 2010; Zeman, Shipman, & Penza-Clyve, 2001; Zeman et al., 2002) was used to measure adolescents' levels of emotion coping. The scale contains 12 items, rated on a 3-point Likert scale (1 = *hardly ever*, 2 = *sometimes*, 3 = *often*), designed to measure one's tendency to use effective coping strategies for sadness (5 items; e.g., calmly dealing with what makes me sad), worry (3 items; e.g., talking to someone to feel better when I'm worried), and anger (4 items; e.g., controlling my temper), which are combined to yield a composite emotion coping score. The coping scale scores have demonstrated evidence of reliability and validity both with regard to the distinct emotions (e.g., Zeman et al., 2001, 2002, 2010) and as a composite indicator overall EC (e.g., Thomassin, Morelen, & Suveg, 2012). This measure showed good internal consistency in the present sample (α = .85).

Lifetime Suicidal Ideation

Selected items from the Center for Disease Control's (2011) Middle School Youth Risk Behavior Survey (YRBS) were used to measure lifetime suicidal ideation. Participants responded (yes or no)

to two[4] questions: have you ever (a) "seriously thought about killing yourself?" or (b) "made a plan about how you would kill yourself?" Responses were pooled to create a composite variable, such that a "yes" to either item was interpreted as the presence of lifetime ideation. The YRBS suicidality items have shown evidence of discriminant validity in previous research (e.g., May & Klonsky, 2011). The two SUI items exhibited substantial agreement in the present sample (κ = .67), such that most, but not all, participants who endorsed either item also endorsed the other.

Lifetime Substance Use

Seven items from the YRBS were used to measure lifetime substance use. Participants responded whether they had ever tried (a) cigarettes, (b) alcohol, (c) marijuana, (d) any form of cocaine, (e) prescription drugs or (f) steroids without permission, or (g) inhalants. Responses were pooled to create a composite measure of lifetime substance use, such that a "yes" to one or more of these items was coded to indicate lifetime substance use initiation. Past research has found evidence for the validity of these YRBS items for measuring of adolescent substance use (e.g., Paschall, Ringwalt, & Gitelman, 2010). These items showed good internal consistency (α = .80).

Negative Life Events

The Life Events Checklist (LEC; Johnson & McCutcheon, 1980) was used to measure adolescents' experience of negative life events (NLE). The LEC is a self-report measure consisting of 45 events that can occur among young populations (e.g., parent left home, got in trouble at school, moved to a new school). Participants indicate whether the event has occurred in the last 12 months, and, if so, how they perceived it: "No," "Yes and it was good," or "Yes and it was bad." Thus, the LEC can be used to measure the frequency with which participants experience stressful life events, as well as the participants' appraisal of these events as positive or negative (Brand & Johnson, 1982). Evidence has been found for the validity of the negative life events scores relation to several psychological and environmental variables (e.g., Brand & Johnson, 1982; Carothers, Borkowski, & Whitman, 2006). While all events on this measure are considered stressful to some degree, there is a great deal of variability in item content, as well as in the type and degree of stress that is likely associated with the different events. In order to control for this and objectively measure the occurrence of NLEs, rather than one's subjective appraisals thereof, we used a standardized scoring procedure that was weighted to consider two aspects of NLEs: (a) the total number of stressful life events that occurred, positive or negative; and (b) the number of the events that occurred that would be considered "bad" by most of the youth who experience them. Greater weights were given to events that were more universally viewed as negative; events that were more universally seen as positive were still included (because they are still stressful) but given less weight.

Specifically, each item on the LEC was assigned a weighting value from 1 to 3 according to the percentage of participants who rated that event as "bad" (as opposed to "good") out of the total number of participants who experienced the event. Events that were endorsed as negative by at least two-thirds of the participants who experienced them were coded as 3, representing the highest level of NLEs. Twenty-four items (e.g., a close friend died, a parent went to jail) met this criterion; these items were considered negative by 80% to 100% of participants who experienced them. Items endorsed as negative by one- to two-thirds of the participants who experienced them were coded as 2. Nine items (e.g., getting a new stepparent, a sibling leaving home) met this criterion, with between 33% to 59% of participants endorsing these as negative. Items endorsed as negative by less than one-third of the participants who experienced them were coded as 1. Twelve items (e.g., making a sports team, having a new boyfriend or girlfriend) met this criterion, with 0% to 13% of youth endorsing these as negative and the vast majority perceiving them as positive. Using this coding system, participants' scores are calculated as the weighted sum total of stressful events experienced. Possible scores ranged from a minimum of 0 (no stressful events were experienced) to a maximum of 102 (all of the events were experienced).

ANALYTIC PLAN

Analyses were performed in Mplus Version 7 (Muthén & Muthén, 2012). Univariate and bivariate characteristics of the data, including patterns of missingness, were inspected prior to data analysis. The large majority of participants (75%, n = 70) provided complete data for all measures, and an additional nine participants (10%) were missing data on 3 or fewer of the 14 study variables. With respect to particular measures, rates of missingness were all below 5%, with two exceptions: YRBS variables (6%–9% missing) and BASC-2 variables (15%–

[4] The YRBS includes a third item related to suicide attempts: "Have you ever tried to kill yourself?" This item was endorsed by few participants, all of whom had endorsed the other items; thus, it was not included in analyses.

18% missing). The presence of missing data was not associated with age or ethnicity, and Little's (1988) test was nonsignificant (p = .686), supporting the conclusion that data were missing completely at random (MCAR). Accordingly, missing data were handled through maximum likelihood estimation (Kline, 2011; Muthén & Muthén, 2012). In the path models, missing data on X-variables were accounted for using auxiliary variables as predictors. Models were estimated with 5,000 iterations, using Monte Carlo integration as needed to accommodate dichotomous variables (Muthén & Muthén, 2012). Correlations among variables were examined to assess the convergent validity of emotion reactivity in relation to hypothesized positive and negative correlates. Following Cohen's (1988) conventions, we interpreted "large," "medium," and "small" effect sizes as correlation estimates greater than .50, .30, and .10, respectively.

Discriminant validity was assessed by inspecting full and partial correlations between emotion reactivity and proactive and reactive aggression. Based on the correlation results and previous research, a series of hierarchical logistic regression models were specified to examine the role of emotion reactivity as one of several predictors of suicidal ideation, as well as a moderator of its associations with other variables such as depressive symptoms. Blocks of predictors were entered for covariates and emotion reactivity (Step 1), correlates and risk factors for suicidal ideation (Step 2), and an interaction model, with emotion reactivity modeled as a moderator of the links between depressive symptoms, NLE, and emotion coping and suicidal ideation (Step 3). All logistic regression analyses controlled for age and ethnicity. Interactions were modeled via product terms calculated from mean-centered data. Post hoc power analyses, assuming a moderate effect size and an alpha of .05, indicated an achieved power of 90.5% for correlation analyses, 91.8% for multiple regressions, but only 30.2% power for the logistic regression analyses. Thus, results of logistic regression models should be interpreted with caution.

Results

Evidence for Convergent Validity

Means, standard deviations, correlations, and distributional characteristics (range, skewness, and kurtosis) for all variables are presented in Table 1. Emotion reactivity showed significant zero-order correlations with nearly all other variables in a direction consistent with hypotheses. With regard to convergent validity, emotion reactivity was positively associated with internalizing problems,

Table 1
Descriptive Statistics and Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Emotion reactivity	–													
2. Internalizing	.58**	–												
3. Depression	.26*	.80**	–											
4. Anxiety	.60**	.88**	.60**	–										
5. Social stress	.43**	.86**	.76**	.69	–									
6. Proactive aggr	.37**	.32**	.24*	.28**	.19	–								
7. Reactive aggr	.58**	.35**	.17	.29**	.19+	.58**	–							
8. Emotion coping	-.65**	-.34**	-.10	-.37**	-.19+	-.37**	-.57**	–						
9. NLE	.35**	.58**	.57**	.48**	.46**	.38**	.33**	-.32**	–					
10. Age	.07	.00	.01	.04	-.16	.11	.10	-.05	-.08	–				
11. Black [a]	.06	-.01	-.10	.05	-.02	.07	.04	-.10	-.03	.14	–			
12. Latina [a]	.03	-.04	-.08	-.04	.02	-.04	-.04	.02	-.01	.06	-.54**	–		
13. Substance use [a]	.08	.29**	.37**	.20+	.24*	.19+	.19+	-.06	.26*	.06	-.28**	.04	–	
14. Suicidal ideat [a]	.28**	.37**	.46**	.37**	.36**	-.02	.08	-.10	.16	.14	.05	-.18+	.19+	–
N	92	76	79	76	76	91	91	93	89	93	91	91	87	85
M	1.5	51.7	50.1	51.5	48.8	1.5	2.45	2.3	27.4	12.7	–	–	–	–
SD	1.0	12.1	11.2	12.1	10.9	0.8	1.2	0.4	15.6	0.8	–	–	–	–
Percentage	–	–	–	–	–	–	–	–	–	–	77%	19%	17%	13%
Skewness	0.5	1.0	1.4	0.5	1.2	2.1	0.6	-0.4	0.8	1.6	–	–	–	–
Kurtosis	-0.8	0.8	1.5	-.03	1.2	3.9	-0.7	-0.4	0.7	3.8	–	–	–	–
Observed min	0.0	36	40	33	35	1.0	1.0	1.1	3	11.2	0	0	0	0
Observed max	3.8	91	86	82	86	4.7	5.0	3.0	81	15.8	1	1	1	1
Theoretical range:	0-4	*t*	*t*	*t*	*t*	1-5	1-5	1-3	0-102	na	0-1	0-1	0-1	0-1

[a] Point-biserial correlations and phi coefficients reported for binary variables. Sx = symptoms, aggr = aggression, NLE = negative life events, ideat = ideation, *t* = t-distribution. + $p < .1$, * $p < .05$, ** $p < .01$.

both generally and specifically with depression, anxiety, and social stress. Emotion reactivity was also strongly associated with poor emotion coping and reactive aggression, and moderately associated with proactive aggression, lifetime suicidal ideation, and NLE. Overall, these correlations with emotion reactivity were consistent with hypotheses, providing evidence for the convergent validity of ERS scores, while also revealing a unique pattern of associations. For example, ERS scores were strongly associated with internalizing symptoms, reactive aggression, and emotion coping (about 34%–42% shared variance). Such high-magnitude correlations among ostensibly disparate constructs (e.g., externalizing vs. internalizing) are uncommon in the literature and were not observed among any of the other study variables, as shown in Table 1.

EVIDENCE FOR DISCRIMINANT VALIDITY

Full and partial correlations among two pairs of variables—proactive and reactive aggression, and lifetime substance use and suicidal ideation—were considered as evidence for discriminant validity. As noted above, proactive and reactive aggression both showed significant zero-order correlations with emotion reactivity, but with the magnitude of the association was significantly lower for proactive aggression (sharing about 14% of its variance with emotion reactivity) as compared to reactive aggression (about 34% shared variance). Further, after controlling for age, gender, and the shared variance (roughly 34%) between the two types of aggression, the partial correlation between proactive aggression and emotion reactivity was no longer significant ($\beta = .05$, $p = .62$) whereas the strong association between reactive aggression and emotion reactivity was robust ($\beta = .56$, $p < .01$). This model accounted for about 32% of the variance in emotion reactivity.

Similarly, suicidal ideation and substance use were considered for evidence of discriminant validity. At the bivariate level, suicidal ideation ($r = .28$, $p < .01$) was moderately associated with emotion reactivity, sharing about 12% of their variance, whereas substance use ($r = .08$) was not. This pattern held when these two variables were examined in multiple regression analyses controlling for ethnicity and age: suicidal ideation ($\beta = .26$, $p = .02$), but not substance use ($\beta = .04$, $p = .72$), was a significant predictor of emotion reactivity, accounting for about 18% of the variance in emotion reactivity. Indeed, group comparisons confirmed that adolescents with a history of suicidal ideation reported higher levels of emotion reactivity ($M = 2.14$, $SD = 1.35$) than those without ($M = 1.31$, $SD = 0.90$), $t(82) = 2.64$, $p < .01$. By contrast, mean levels of emotion reactivity were not significantly different between those reporting substance use ($M = 1.59$, $SD = 1.07$) and those not ($M = 1.40$, $SD = 0.99$), $t(84) = .67$, $p = .50$.

SUICIDAL IDEATION MODELS

Lastly, emotion reactivity was examined as one of several possible predictors of lifetime suicidal ideation in a series of hierarchical logistic regression models, controlling for age and ethnicity. Significant correlates and risk factors of suicidal ideation—emotion reactivity and each of the three internalizing scales—were entered into the model in three steps. Model results are presented in Table 2. Step 1 showed that emotion reactivity was uniquely associated with suicidal ideation, accounting for about 32% of its variance. In Step 2, only depressive symptoms emerged as a unique predictor, whereas anxiety and social stress were not significant and emotion reactivity was no longer significant. This model accounted for about 75% of the variance in suicidal ideation. Finally, three alternative models examined in Step 3 (3A, 3B, 3C) revealed no evidence for emotion reactivity as a moderator of depression, NLEs, or emotion coping in the prediction of lifetime suicidal ideation. In each of these models the direct effect of depression remained the only significant predictor of suicidal ideation, with no significant changes in *R*-square.

Discussion

This study examined several correlates of self-reported emotion reactivity measured via the ERS. Using data drawn from an urban community sample of predominantly African-American, early-adolescent girls, these findings corroborate and extend upon previous research in several ways. First, the convergent validity of ERS scores is supported by positive associations with internalizing problems (depression, anxiety, and social stress), poor emotion coping, negative life events, reactive aggression, and suicidal ideation. Second, evidence for discriminant validity is found in its disparate patterns of associations with different forms of aggression (reactive > proactive) as well as different lifetime exposure to risk factors (suicidal ideation > substance use initiation). Finally, logistic regression analyses showed that although emotion reactivity was a significant predictor of lifetime suicidal ideation, this effect was overshadowed when depression was included in the model; further, no evidence for an interaction involving emotion reactivity was found.

In conjunction with previous validation studies (Claes et al., 2014; Lannoy et al., 2014; Nock et al., 2008), these findings add to the corpus of evidence supporting the validity and utility of ERS scores for

Table 2
Regression Models Predicting Lifetime Suicidal Ideation

Steps and predictor variables	Step 1		Step 2		Step 3A		Step 3B		Step 3C	
	B	(SE)	*B*	(SE)	*B*	(SE)	*B*	(SE)	*B*	(SE)
1. Covariates and emotion reactivity/coping										
Age	0.54	(0.43)	-0.03	(0.86)	-0.05	(0.95)	-0.04	(0.89)	0.04	(0.88)
Black	0.28	(0.75)	1.69	(1.86)	1.82	(1.97)	1.74	(1.93)	1.56	(1.86)
Emotion reactivity	1.09*	(0.48)	1.25	(0.90)	1.28	(0.89)	1.22	(0.88)	1.23	(0.88)
Emotion coping	1.05	(1.14)	2.06	(1.93)	1.64	(1.97)	1.96	(1.92)	2.11	(2.07)
2. Correlates and risk factors for suicidal ideation										
Depression	–	–	0.16*	(0.08)	0.18 +	(0.09)	0.16*	(0.08)	0.15 +	(0.08)
Anxiety	–	–	0.09	(0.08)	0.09	(0.09)	0.09	(0.08)	0.08	(0.08)
Social stress	–	–	-0.14	(0.10)	-0.14	(0.11)	-0.14	(0.10)	-0.13	(0.10)
Negative life events	–	–	-0.03	(0.05)	-0.03	(0.05)	-0.02	(0.05)	-0.03	(0.05)
Substance use	–	–	0.73	(1.16)	0.55	(1.21)	0.64	(1.22)	0.72	(1.15)
3. Emotion reactivity as a moderator										
× depression	–	–	–	–	-0.02	(0.04)	–	–	–	–
× negative life events	–	–	–	–	–	–	-0.01	(0.03)	–	–
× emotion coping	–	–	–	–	–	–	–	–	-0.12	(0.94)
R^2	.322	(.207)	.749**	(.199)	.757**	(.211)	.741**	(.207)	.733**	(.212)

+ $p < .1$, * $p < .05$, ** $p < .01$.

measuring emotion reactivity among adolescents. Several aspects of this contribution are noteworthy. First, this appears to be the youngest sample in which the validity of the ERS has been examined, and the only sample predominantly comprised of individuals of ethnic minority backgrounds. Although further research will be needed to truly assess the cross-cultural validity and lifespan-developmental limitations of the ERS, these findings are a promising first step in that direction. Validation of the ERS among early adolescents is particularly important, insofar as many of the research topics related to emotion reactivity (i.e., depression, NSSI, suicidal ideation) emerge during this developmental period.

Second, while previous studies have examined the validity of ERS scores in relation to diagnosed psychological disorders, emotion regulation variables, impulsivity, and positive/negative affect (Claes et al., 2014; Lannoy et al., 2014; Nock et al., 2008), the present study examined several new hypothesized correlates, and reexamined the correlates considered in previous research according to slightly different conceptualizations (e.g., dimensional measures rather than categorical diagnoses). Consistent with previous research, the present findings support the convergent validity of ERS scores in terms of their association with several forms of internalizing psychopathology, as well as with reactive aggression, poor emotion coping, and negative life events. Although these data are only cross-sectional, results suggest some interesting hypotheses regarding the link between stressful events and emotional reactivity. While it is possible that emotionally reactive youth are simply perceiving events as more stressful, the standardized scoring system used for the LEC measure suggests that this is likely not the case; youth who reported *objectively* experiencing more negative and stressful life events *within the past year* (regardless of their subjective appraisal of these events) were also rating themselves as *subjectively* more emotionally reactive *at present*. At the same time, subjective self-report ratings of current social stress, depression, and anxiety were also correlated with emotion reactivity. In other words, emotion reactivity may be linked to stress both in terms of objective environmental factors (negative life events) as well as the subjective distress and cognitive appraisal of events. Further research is needed to disentangle these variables.

With respect to discriminant validity, ERS scores showed significant divergent associations with reactive and proactive aggression. While construct similarity and previous research were sufficient to support speculative hypotheses, the pattern of divergence was exceptionally sharp, even compared to the body of literature on differential correlates of proactive and reactive aggression (Fite et al., 2012; Vitaro & Brendgen, 2012). Similarly, the presence of an association with lifetime suicidal ideation, but not with lifetime substance use, offers further support for discriminant validity. These results are consistent with the hypothesis that early substance use initiation (i.e., during or before the middle school years) is more strongly associated with environmental variables (e.g., peer influence, limited supervision), whereas suicidal ideation is more strongly associated with emotion dysregulation variables.

The logistic regression analyses showed that emotion reactivity does predict lifetime suicidal ideation; however, this association was overshadowed by the effects of depressive symptoms. This finding is difficult to interpret because it could be the result of low statistical power for these analyses. It may be the case that the link between emotion reactivity and suicidal ideation is weaker than the link with depressive symptoms. Alternatively, it is possible that, given the cross-sectional nature of this study, depressive symptoms are occurring as a lingering effect related to one's lifetime suicidal ideation. While this finding is not consistent with previous research (e.g., Nock et al., 2008), very little is known about the link between emotion reactivity and suicidal ideation. The research related to this question appears to have started with an initial focus on suicidal behavior, ideation, and NSSI (Nock et al., 2008); however, subsequent research seems to have focused largely on NSSI rather than suicidal ideation. While we did not assess NSSI, and therefore cannot address this issue of self-harm behaviors in a comprehensive manner, the present findings do underscore the need for more research on the link between emotion reactivity, suicidal ideation, and NSSI. Further research is especially needed among large community samples and elevated-risk clinical samples, and utilizing longitudinal designs to assess incremental predictive validity and utility.

LIMITATIONS AND FUTURE DIRECTIONS

As noted above, the cross-sectional design is an important limitation. Longitudinal research is needed to examine whether emotion reactivity predicts later psychopathology, suicidal ideation, NSSI, and other outcomes. Further, although it is important to measure such constructs from the adolescent's perspective, the present study may have been limited by self-report and mono-informant biases. For example, it is possible that youth may find it more socially desirable to underreport (or overreport) their levels of reactive aggression. Future research should incorporate more objective methods of measurement (e.g., behavior observation, neuroimaging) to better understand emotion reactivity from converging perspectives. More broadly, multimethod longitudinal designs are needed to better understand the associations among emotions and regulatory processes, such as reactivity and coping, as well as how these factors relate to suicidal ideation and self-harm. The small sample size is an important limitation. The logistic regression analyses were particularly underpowered, limiting the interpretations that can be drawn. Finally, the present study focused specifically on adolescent girls. Research among adolescent boys is needed to help inform the interpretation of the present findings as well as those of future research conducted among mixed-gender or gender-specific samples.

CONCLUSIONS

Consistent with prior research, these findings support the validity and utility of ERS scores as a self-reported measure of emotion reactivity among early adolescent girls in diverse community populations. In the present sample, measurements of emotion reactivity exhibited signs of *convergent validity* (correlated with depressive symptoms, anxiety, social stress, suicidal ideation, reactive aggression, and negative life events) and *discriminant validity* (associated with reactive, but not proactive, aggression; and with lifetime suicidal ideation, but not substance use initiation). These findings offer additional evidence for the validity of the ERS among community samples of girls, while also suggesting several directions for further research.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

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