

The Emotion Reactivity Scale: Development, Evaluation, and Relation to Self-Injurious Thoughts and Behaviors

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Prior research has examined the relations between various facets of emotion and psychopathology, with a great deal of recent work highlighting the importance of emotion regulation strategies. Much less attention has been given to the examination of emotion reactivity. This study reports on the development and evaluation of the Emotion Reactivity Scale (ERS), a 21-item self-report measure of emotion sensitivity, intensity, and persistence, among a sample of 87 adolescents and young adults. Factor analysis revealed a single factor of emotion reactivity best characterized the data. The ERS showed strong internal consistency ($\alpha=.94$), convergent and divergent validity via relations with behavioral inhibition/activation and temperament, and criterion-related validity as measured by associations with specific types of psychopathology and self-injurious thoughts and behaviors (SITB). Moreover, emotion reactivity statistically mediated the relation between psychopathology and SITB. These findings provide preliminary support for the ERS and suggest that increased emotion reactivity may help explain the association between psychopathology and SITB.

IMPRESSIVE SCIENTIFIC ADVANCES have been made in the study of emotions (Ekman & Davidson, 1994; Lewis & Haviland-Jones, 2000). Although many different and competing models of the nature

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of emotions exist and numerous scientific questions in this area remain unresolved, it is clear that individuals vary in their emotional response to different contexts and that their subjective experience of emotions plays a central role in virtually all aspects of conscious life. Therefore, it is not surprising that the study of emotion has figured prominently in research on psychopathology. Most early studies of emotion in psychological disorders have centered on the assessment of specific emotions experienced in each disorder, such as depression in mood disorders and fear in anxiety disorders (e.g., Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; Spielberger, 1983). More recent work has viewed various psychological disorders as resulting from problems with emotion regulation (e.g., Cole, Michel, & Teti, 1994; Gross & John, 2003; Southam-Gerow & Kendall, 2002). Specifically, difficulties in emotion regulation have been suggested in pathologies such as mood disorders (Davidson et al., 2002; Silk, Steinberg, & Morris, 2003), anxiety disorders (Mennin, Heimberg, Turk, & Fresco, 2005; Suveg & Zeman, 2004), eating disorders (Safer, Telch, & Agras, 2001a, 2001b), personality disorders (Conklin, Bradley, & Westen, 2006; Levine, Elsa, & Hood, 1997; Linehan, 1993; Yen, Zlotnick, & Costello, 2002), and self-injurious thoughts and behaviors (SITB) (Nock & Prinstein, 2004, 2005).

Less research attention has focused on the increased *emotion reactivity* that is likely to predispose individuals to problems with emotion regulation. Emotion reactivity refers to 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). This definition is consistent with previous conceptualizations of emotion

reactivity (e.g., Cole et al., 1994; Eisenberg, Fabes, Murphy, et al., 1995) or “emotional vulnerability” (Linehan, 1993). Several different theoretical models have highlighted the importance of both emotion regulation and emotion reactivity in the development and maintenance of psychopathology (Davidson, 2003; Gross, 2002; Porges, Doussard-Roosevelt, & Maiti, 1994); however, specific studies of emotion reactivity have been lacking.

Although not widely studied in relation to psychopathology, emotion reactivity, or similar constructs, has been studied as one component of temperament and personality (Clark, Watson, & Mineka, 1994; Derryberry & Rothbart, 1988; Eisenberg, Fabes, Gunthrie, & Reiser, 2000; Kagan, 1994a, 1994b, 1997; Muris & Ollendick, 2005; Rothbart, Ahadi, & Evans, 2000). Emotion reactivity and temperament are overlapping, but distinct, constructs. Temperament is conceptualized as a much larger construct, encompassing not only emotion reactivity but also other aspects of behavior and experience, including self-regulation, that are not included in the concept of emotion reactivity. We would expect increased reactivity to be positively associated with behavioral inhibition and several specific facets of temperament, such as frustration, fear, and aggression; to be negatively associated with facets such as inhibitory control (e.g., Eisenberg et al., 2000; Eisenberg, Fabes, & Murphy, 1995; Fabes et al., 1999; Kagan, 1994b); but to be unrelated to other dimensions of temperament, such as behavioral activation, pleasure sensitivity, and surgency.

One of the reasons emotion reactivity may be of such great importance is because it may help explain *why* or *how* behavioral problems are developed and are maintained. For instance, extreme behavioral problems may represent efforts to avoid or escape from the aversive experience of strong emotion reactivity (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). For instance, mood (Martell, Addis, & Jacobson, 2001), anxiety (Barlow & Craske, 2000), and eating (Garcia-Grau, Fuste, Miro, Saldana, & Bados, 2002) disorders have all been proposed to result from efforts to avoid intense and aversive cognitive and emotional states. Similarly, the primary reason given for engagement in both nonsuicidal self-injury (NSSI; e.g., repetitive cutting, burning, etc.) and suicide attempts by those who perform such behaviors is to escape from aversive and intolerable emotional experiences (Boergers, Spirito, & Donaldson, 1998; Hawton, Cole, O’Grady, & Osborn, 1982; Nock & Prinstein, 2004, 2005). It may be the increased emotion reactivity associated with some psychological disorders that increases the likelihood of SITBs among those with these disorders. Indeed, prior research has

shown that more than 90% of those who make suicide attempts and of those who die by suicide have a diagnosable psychological disorder (Cavanagh, Carson, Sharpe, & Lawrie, 2003; Moscicki, 1999), as do more than 85% of those who engage in NSSI (Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006); however, the reason that psychological disorders are related to SITB remains unknown. It is possible that this relation is explained (i.e., statistically mediated) by the extreme emotion reactivity experienced in these disorders. That is not to say that psychopathology necessarily causes emotion reactivity—indeed, a stronger theoretical argument could be made in the opposite direction—but only that it is through or because of this heightened emotion reactivity that psychopathology may lead to SITB. Such a model is consistent with reports that most SITB are performed in an effort to escape aversive, intolerable emotional states. Surprisingly, however, such a model has never been tested to our knowledge.

Despite the voluminous work on emotion and the importance of the emotion reactivity construct, there is currently no measure that assesses individuals’ subjective experience of emotion sensitivity, intensity, and persistence. To be sure, broader measures of temperament and personality exist (e.g., Behavioral Inhibition/Behavioral Activation Scale, Carver & White, 1994; Early Adolescence Temperament Questionnaire, Ellis & Rothbart, 2001), as do more focused measures of individual components of emotion reactivity (e.g., Emotion Intensity Scale, Bachorowski & Braaten, 1994; Affect Intensity Measure, Larson & Diener, 1987). However, the development of a brief measure that comprehensively assesses the three specific facets of emotion reactivity, as defined above, would facilitate research on this important construct and may also be of use to clinicians working with patients who report problems with strong emotion reactivity. Such a measure would be especially useful if shown to be appropriate for use with younger populations as well, as tools for measuring constructs related to emotion reactivity and regulation are particularly lacking for developmental psychopathology researchers and clinical child and adolescent psychologists (see Southam-Gerow & Kendall, 2002).

The primary goal of the current study was to develop and evaluate the psychometric properties of a new measure: the Emotion Reactivity Scale (ERS). We examined the factor structure and internal consistency of the ERS, as well as the construct validity of this new measure by testing its associations with existing measures of temperament and behavioral inhibition (which has been proposed to underlie negative feelings such as fear, frustration, and sadness) and behavioral activation

(which has been proposed to underlie positive feelings such as hope and happiness). Specifically, we expected that the ERS would be positively associated with theoretically similar constructs, including behavioral inhibition, depressed mood, fear, and frustration; but not with dissimilar constructs, such as behavioral activation, attention, and inhibitory control. The second goal of the current study was to test the hypothesis that emotion reactivity is elevated among those with psychological disorders and SITB. Evidence for such relations would support the criterion-related validity of the ERS. The third and final goal of this study was to test the hypothesis that heightened emotion reactivity is one factor that may help explain why psychopathology is related to SITB. Toward this end, we tested whether the ERS statistically mediates the relation between psychopathology and three different types of SITB: NSSI, suicide ideation, and suicide attempts. We examined these three types of SITB separately given that prior work has demonstrated that there are important distinctions among different forms of SITB, such as their occurrence at different rates and the presence of distinct correlates (e.g., Nock & Kazdin, 2002; Nock & Kessler, 2006).

Method

PARTICIPANTS

A total of 94 (73 female) adolescents and young adults (age in years: $M=17.14$, $SD=1.88$, range 12-19) were recruited from the community and local psychiatric clinics for participation in a laboratory-based, case-control study of SITB. All participants received a description of the study aims and procedures and provided written informed consent to participate in the research, with parental consent required for those less than 18 years of age. Seven participants failed to complete all of the study measures and were therefore excluded from the current analyses. Those who failed to complete the study measures did not differ significantly from all other participants on gender, ethnicity, or presence of SITB, although they were slightly older (age in years: $M=18.5$, $SD=0.5$ vs. $M=17.0$, $SD=1.9$; $t_{92}=2.12$, $p<.05$). The final sample was composed of 87 participants (68 female; age in years: $M=17.0$, $SD=1.9$, range 12-19), which provided adequate statistical power to detect medium (power=.83) and large (power=.99) effects for our primary reliability and validity analyses ($p<.05$, two-tailed). Ethnicity was self-identified as European American (72.4%), biracial (11.5%), Hispanic (6.9%), Asian American (4.6%), African American (3.4%), and other (1.1%).

ASSESSMENT

Emotion reactivity. The ERS is a 21-item self-report measure designed to assess individuals' experience of emotion reactivity. The ERS begins with brief instructions: "This questionnaire asks different questions about how you experience emotions on a regular basis. When you are asked about being 'emotional,' this may refer to being angry, sad, excited, or some other emotion. Please rate the following statements." This instruction is followed by 21 items inquiring about three aspects of emotion reactivity: sensitivity (8 items; e.g., "I tend to get emotional very easily"), arousal/intensity (10 items; e.g., "When I experience emotions, I feel them very strongly/intensely"), and persistence (3 items; e.g., "When I am angry/upset, it takes me much longer than most people to calm down"). Each item is rated on a 0 to 4 scale (0 = *not at all like me* and 4 = *completely like me*), with total possible scores ranging from 0 to 84.¹

Behavioral inhibition/behavioral activation. The Behavioral Inhibition/Behavioral Activation Scale (BIS/BAS; Carver & White, 1994) is a 20-item self-report measure of reactivity to aversive events (BIS; 7 items) and responsiveness to reward (BAS; 5 items), drive (BAS; 4 items), and fun-seeking (BAS; 3 items), each rated on a 1 to 4 scale (1 = *strongly agree* and 4 = *strongly disagree*). Prior studies using the BIS/BAS have supported the construct validity of this measure by demonstrating that the BIS is associated with negative affect and neuroticism while the BAS is associated with positive affect and extraversion (Campbell-Sills, Liverant, & Brown, 2004; Carver & White, 1994; Kasch, Rottenberg, Arnow, & Gotlib, 2002).

Temperament. The Early Adolescence Temperament Questionnaire (EATQ-Revised-long form; Ellis & Rothbart, 2001) is a 103-item self-report measure of 12 different domains related to adolescent temperament. Prior research has supported the reliability and validity of the EATQ (Capaldi & Rothbart, 1992), and more recent work has revealed a four-factor structure of the EATQ-R representing: Negative Affect, Effortful Control, Affiliation, and Surgency (Ellis & Rothbart, 2001).

Psychopathology. The presence and number of psychological disorders were assessed using the Schedule for Affective Disorders and Schizophrenia for School Aged Children-Present and Lifetime Version (K-SADS-PL; Kaufman et al., 1997). The K-SADS-PL is a semistructured diagnostic interview designed to assess current and past episodes of 33 different psychological disorders according to the *Diagnostic and Statistical Manual of Mental*

¹ Copies of the ERS are available from Matthew K. Nock.

Disorders (DSM-IV; American Psychiatric Association, 1994). The K-SADS-PL was administered by the first author and four trained and supervised research assistants. Independent rating of the K-SADS-PL was completed for 20 of the interviews and demonstrated good interrater reliability (average $\kappa = .93$ across all diagnoses). For the purposes of the current study, we were particularly interested in examining relations between the ERS and mood (major depression, bipolar), anxiety (panic, separation anxiety, phobias, generalized anxiety, and obsessive-compulsive), eating (bulimia, anorexia), substance use (alcohol, drugs), and disruptive behavior (oppositional defiant, conduct, and attention-deficit/hyperactivity) disorders.

Self-injurious thoughts and behaviors. Self-injurious thoughts and behaviors were assessed using the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock, Holmberg, Photos, & Michel, 2007), a structured clinical interview that assesses the presence, frequency, severity, age-of-onset, and other characteristics of a broad range of SITB, including nonsuicidal self-injury, suicide ideation, and suicide attempts. In the current study, items were used that inquired about the presence of three different self-injurious constructs in the past 12 months: NSSI (“Have you done something to hurt yourself in the past year without intending to die?”), suicide ideation (“Have you had thoughts of killing yourself in the past year?”), suicide attempt (“Have you made an actual attempt to kill yourself in the past year in which you had at least some intent to die?”). These questions resulted in dichotomous answers of NSSI, suicide ideation, and suicide attempts as being either present or absent within the past 12 months. The SITBI has strong interrater reliability (average $\kappa = .99$), test-retest reliability over a 6-month period (average $\kappa = .70$), and construct validity as demonstrated by strong relations with other measures of suicide ideation (average $\kappa = .54$) and suicide attempt ($\kappa = .65$) (Nock et al., 2007).

PROCEDURES

Data were collected during the baseline assessment of a larger longitudinal study of SITB. After providing written informed consent and assent for those less than 18 years of age, participants completed all of the measures described below.

Results

FACTOR STRUCTURE AND RELIABILITY

Our first goal was to examine the factor structure and internal consistency of the ERS. We used exploratory analyses to examine the internal

structure of the ERS rather than confirmatory analyses given that this was the first evaluation of this measure and we wanted to flexibly consider the model that best fit with the data. We conducted an exploratory factor analysis (EFA) using Maximum Likelihood Estimation of the ERS items and applied an oblique (direct oblimin) rotation given we did not expect orthogonal factors. Using an eigenone criterion, three factors emerged, which accounted for 57.8% of the variance in scores. However, multiple criteria suggested that performance on the ERS may be best represented by a single factor. Specifically, the first factor accounted for almost half of the total variance in scores (43.4%), the three factors derived were indistinguishable from each other in item content, and the factors were highly correlated. Also, all 21 items had loadings of greater than .40 in the single factor solution (see Table 1).

The 21-item ERS demonstrated good internal consistency (Cronbach's $\alpha = .94$). Although the single factor structure for the ERS was supported by the EFA and reliability analysis, we also examined the internal consistency reliability of each of the three hypothesized factors of emotion reactivity, as researchers and clinicians may have hypotheses specific to one or more of these factors in future studies. As presented in Table 2, the Sensitivity subscale (Items 2, 5, 7, 9, 12, 13, 14, 15, 16, 18; $\alpha = .88$), Arousal/Intensity subscale (Items 3, 4, 6, 17, 19, 20, 21; $\alpha = .86$), and Persistence subscale (items 1, 8, 10, 11; $\alpha = .81$) each demonstrated strong internal consistency, suggesting that the total ERS score as well as the individual subscales are reliable indicators of emotion reactivity and its hypothesized subcomponents. The large correlations among the three subscales (Table 2) provide further support for treating the ERS as a unidimensional measure in the absence of subcomponent-specific hypotheses. Basic descriptive statistics for the overall ERS and subscales also are presented in Table 2. Notably, scores on the ERS were not significantly associated with age ($r = .20$, ns) and did not differ between males and females ($t_{85} = 1.27$, ns , $d = .28$).

CONSTRUCT VALIDITY

If the ERS is a valid measure of emotion reactivity, scores on the ERS should be correlated with measures of like constructs (i.e., convergent validity) and should be uncorrelated with measures of unlike constructs (i.e., divergent validity). We tested the convergent and divergent validity of the ERS by examining the correlations between this measure and the different subscales of the BIS/BAS and the EATQ-R. The observed pattern of correlations

Table 1
Items and factor loadings for the emotion reactivity scale

Item		Factor loading
5.	I tend to get very emotional very easily.	.86
9.	Even the littlest things make me emotional.	.79
3.	When I experience emotions, I feel them very strongly/intensely.	.75
1.	When something happens that upsets me, it's all I can think about it for a long time.	.75
6.	I experience emotions very strongly.	.73
19.	My moods are very strong and powerful.	.73
15.	My emotions go from neutral to extreme in an instant.	.72
8.	When I feel emotional, it's hard for me to imagine feeling any other way.	.69
20.	I often get so upset it's hard for me to think straight.	.68
2.	My feelings get hurt easily.	.68
4.	When I'm emotionally upset, my whole body gets physically upset as well.	.66
11.	When I am angry/upset, it takes me much longer than most people to calm down.	.65
17.	People tell me that my emotions are often too intense for the situation.	.63
7.	I often feel extremely anxious.	.62
13.	I am often bothered by things that other people don't react to.	.61
14.	I am easily agitated.	.59
18.	I am a very sensitive person.	.57
21.	Other people tell me I'm overreacting.	.55
16.	When something bad happens, my mood changes very quickly. People tell me I have a very short fuse.	.53
10.	If I have a disagreement with someone, it takes a long time for me to get over it.	.52
12.	I get angry at people very easily.	.44

supports the convergent and divergent validity of the ERS as a measure of emotion reactivity (Table 3). Specifically, the ERS had a moderate-to-large positive correlation with the BIS subscale, but small negative correlations with each of the BAS subscales. Moreover, the ERS had moderate-to-large positive correlations with the Negative Affect

Table 3
Means, standard deviations, and correlations of the emotion reactivity scale (ERS) with BIS/BAS and EATQ-R subscales

	Mean (SD)	α	Correlation with ERS Total Score
<i>BIS/BAS Subscales</i>			
BIS	21.32 (3.83)	.77	.37**
BAS Drive	10.91 (2.60)	.83	-.09
BAS Fun Seeking	11.83 (2.61)	.70	-.20
BAS Reward Responsiveness	16.43 (2.94)	.82	-.16
<i>EATQ Subscales</i>			
<i>Negative affect</i>			
Depressive Mood	3.24 (1.14)	.52	.61**
Frustration	3.28 (0.58)	.73	.53**
Aggression	3.37 (0.58)	.78	.30**
<i>Effortful Control</i>			
Attention	3.08 (0.62)	.74	-.45**
Inhibitory Control	3.31 (0.55)	.72	-.45**
Activation Control	2.88 (0.67)	.75	-.25*
<i>Surgency</i>			
Fear	2.64 (0.64)	.56	.37**
Shyness	2.79 (0.82)	.83	.33**
High Intensity Pleasure/Surgency	3.36 (0.62)	.74	-.07
<i>Affiliation</i>			
Affiliation	3.83 (0.59)	.75	-.02
Pleasure	3.63 (0.70)	.74	.13
Sensitivity			
Perceptual Sensitivity	3.35 (0.62)	.62	.28*

Note. BIS/BAS=Behavioral Inhibition/Behavioral Activation Scales; EATQ-R=Early Adolescence Temperament Questionnaire - Revised, Long Form. ** $p < .01$, * $p < .05$.

subscales of the EATQ-R, but small and mostly nonsignificant correlations with the Affiliation and Surgency subscales. The ERS also had moderate-to-large negative correlations with the Effortful Control subscales of the EATQ-R.

CRITERION-RELATED VALIDITY

It has been proposed that heightened emotion reactivity is central in several specific psychological disorders as well as SITB. Therefore, the construct validity of the ERS would be supported further by demonstrating that scores on the ERS differ in the presence versus absence of these conditions (i.e.,

Table 2
Internal consistency, means, standard deviations, and correlations among emotion reactivity scale (ERS) subscales

ERS	Range			M	SD	Correlations				
	α	Min.	Max.			1	2	3	4	
1. Total Scale	.94	2	74	36.66	17.52	—				
2. Sensitivity Subscale	.88	0	34	16.29	8.61	.96***	—			
3. Arousal/Intensity Subscale	.86	0	28	13.11	6.30	.93***	.83***	—		
4. Persistence Subscale	.81	0	16	7.26	4.03	.85***	.73***	.73***	—	

*** $p < .001$ (two-tailed).

criterion validity). As presented in Table 4, participants with a mood, anxiety, or eating disorder reported significantly higher emotion reactivity than those without each of these disorders. However, those with a substance use or disruptive behavior disorder did not report significantly elevated emotion reactivity, suggesting elevations on the ERS are not merely due to the presence of psychopathology in general. Moreover, those with a recent history of each type of SITB also reported significantly higher emotion reactivity than those without such a history.

EMOTION REACTIVITY, PSYCHOPATHOLOGY, AND SITB

Our final hypothesis was that emotion reactivity statistically mediates the relation between psychopathology and SITB. We tested this hypothesis following the criteria for demonstrating the operation of a statistical mediator outlined previously (see Baron & Kenny, 1986; Holmbeck, 1997; Kazdin & Nock, 2003). Specifically, we conducted a series of four regression analyses evaluating the relation between (a) the presence of psychopathology and self-injury, (b) psychopathology and emotion reactivity, (c) emotion reactivity and self-injury, and (d) psychopathology and self-injury while statistically controlling for emotion reactivity. Statistical mediation is demonstrated if in this last step (d) emotion reactivity is related to self-injury while the relation between psychopathology and self-injury is significantly diminished, as measured by the Sobel test (Sobel, 1982). For the purposes of these analyses, we created one psychopathology variable representing the sum of any mood, anxiety, and eating disorder variables (i.e., coded 0 to 3) given that: (a) previous analyses demonstrated that only mood, anxiety, and eating disorders were related to emotion reactivity, (b) we expected that the presence of comorbidity would be related to more emotion reactivity and greater likelihood of

self-injury, and (c) we wanted to limit the number of tests required and the correspondent increase in the probability of a Type I error. We then conducted the series of regression analyses described above separately for each of the three self-injury related constructs of interest (NSSI, suicide ideation, and suicide attempt).

In the examination of NSSI: (a) psychopathology was related to the presence of NSSI, $F_{1, 85} = 12.83$, $\beta = .36$, $p < .01$, (b) psychopathology was associated with ERS scores, $F_{1, 85} = 57.01$, $\beta = .63$, $p < .001$, (c) ERS scores were related to the presence of NSSI, $F_{1, 85} = 21.70$, $\beta = .45$, $p < .001$, and (d) ERS scores were associated with NSSI with psychopathology in the model, $\beta = .37$, $p < .01$, while psychopathology was no longer related to the presence of NSSI, $\beta = .13$, *ns*, and decreased significantly from step (a), Sobel $z = 2.58$, $p < .01$.

In the examination of suicide ideation: (a) psychopathology was related to the presence of suicide ideation, $F_{1, 85} = 9.93$, $\beta = .32$, $p < .01$, (b) psychopathology was associated with ERS scores, $F_{1, 85} = 57.01$, $\beta = .63$, $p < .001$, (c) ERS scores were related to the presence of suicide ideation, $F_{1, 85} = 16.24$, $\beta = .40$, $p < .001$, and (d) ERS scores were associated with suicide ideation with psychopathology in the model, $\beta = .33$, $p < .05$, while psychopathology was no longer related to the presence of suicide ideation, $\beta = .12$, *ns*, and decreased significantly from step (a), Sobel $z = 2.16$, $p < .05$.

In the examination of suicide attempts: (a) psychopathology was related to the presence of suicide attempts, $F_{1, 85} = 11.45$, $\beta = .34$, $p < .01$, (b) psychopathology was associated with ERS scores, $F_{1, 85} = 57.01$, $\beta = .63$, $p < .001$, (c) ERS scores were related to the presence of suicide attempts, $F_{1, 85} = 8.69$, $\beta = .31$, $p < .01$; however, (d) neither ERS scores, $\beta = .14$, *ns*, nor psychopathology, $\beta = .25$, *ns*, were significantly associated with suicide attempts when both were entered in the model, and the relation between psychopathology and suicide

Table 4
Scores on the emotion reactivity scale by absence versus presence of DSM-IV disorder and self-injurious thoughts and behaviors (SITB)

	Absent <i>M (SD) N</i>	Present <i>M (SD) N</i>	<i>t</i> _(df=85)	Cohen's <i>D</i>
<i>Presence of DSM-IV Disorder</i>				
Any mood disorder	30.5 (16.2) 63	49.7 (12.6) 31	-5.53***	1.20
Any anxiety disorder	29.1 (16.1) 59	45.5 (14.8) 35	-4.88***	1.06
Any eating disorder	34.7 (16.3) 88	63.7 (8.9) 6	-4.30***	0.94
Any substance use disorder	35.7 (17.6) 81	44.3 (16.0) 13	-1.48	0.32
Any disruptive disorder	36.7 (18.0) 83	36.2 (14.1) 11	0.08	0.02
<i>Presence of SITB</i>				
NSSI in past year	27.7 (15.3) 38	43.5 (16.0) 56	-4.66***	1.01
Suicide ideation in past year	29.3 (17.3) 42	43.2 (15.1) 52	-4.03***	0.88
Suicide attempt in past year	34.3 (17.4) 80	48.8 (13.0) 14	-2.95**	0.64

Note. NSSI=non-suicidal self-injury. *** $p < .001$, ** $p < .01$.

attempts did not decrease significantly from step (a), Sobel $z=0.99$, *ns*. Overall, these analyses suggest that the relation between psychopathology and SITB is largely explained by level of emotion reactivity.

Discussion

Emotion reactivity is an important construct in the study of psychopathology; however, to date no existing measures have provided a comprehensive assessment of the subjective experience of emotion reactivity. We developed and examined a new measure called the Emotion Reactivity Scale (ERS), demonstrated the reliability and validity of the ERS, and further elucidated the relations between emotion reactivity, psychopathology, and SITB. Several aspects of our findings warrant detailed comment.

The ERS assesses the three hypothesized facets of emotion reactivity—emotion sensitivity, intensity, and persistence—as subjectively experienced by an individual. Although individuals' subjective experience of emotion often is not strongly correlated with physiological experience or with objective ratings of emotion response (Blascovich, Mendes, & Seery, 2002; Hofmann, Newman, Ehlers, & Roth, 1995; Rapee & Lim, 1992; Vanman, Paul, Ito, & Miller, 1997), such reports are of great importance among those with psychopathology and engaging in SITBs, and thus were considered to be of primary importance in the current context. Whereas the physiological measurement of emotion reactivity enables the quantification of emotion sensitivity, intensity, and persistence (Stern, Ray, & Quigley, 2001), our analyses suggested that emotion reactivity is best conceptualized as a unidimensional construct when measured by self-report and also supported the internal consistency of this new measure.

This study supported the construct validity of the ERS. Individuals' reports of their emotional reactivity positively correlated with measures of similar constructs such as behavioral inhibition, depressed mood, fear, frustration, and aggression, but negatively related with measures of constructs related to attention and behavioral control. This interesting finding highlights the important relation between emotion reactivity and emotional, cognitive, and behavioral regulation. Given the potential importance of emotion reactivity and regulation to a wide range of psychological disorders (Southam-Gerow & Kendall, 2002), there is a great need to better understand these different components, but perhaps an even greater need to better understand how these different constructs interact. Prior experimental work has demonstrated that elevations in

emotion can impair performance on cognitive and behavioral tasks, such as attentional and decision-making tests (e.g., MacKay et al., 2004; Yamasaki, LaBar, & McCarthy, 2002). It also has been suggested that resulting problems with emotional and behavioral control may increase the likelihood of psychopathology and engagement in aggressive and self-injurious behaviors (e.g., Davidson, Putnam, & Larson, 2000; Lynch, Cheavens, Morse, & Rosenthal, 2004). Consistent with this view, we found that adolescents with a mood, anxiety, or eating disorder reported significantly higher emotion reactivity than those without such disorders. Interestingly, no such difference was observed among those with a substance use or disruptive behavior disorder relative to those without each of these disorders. These findings suggest that emotion reactivity is associated with specific forms of psychological disorders rather than with psychopathology more generally. Given the examination of the relations between emotion reactivity and specific psychological disorders was largely exploratory in the current study, the current results require replication and we can offer only *post hoc* explanations of the observed pattern of findings. One possible explanation for the lack of a relation between emotion reactivity and the presence of substance use and disruptive behavior disorders is that these are fairly heterogeneous disorders for which only subgroups with these diagnoses may show heightened emotion reactivity. For instance, a recent study of the subtypes of conduct disorder (CD) revealed that many of those with CD do not engage in aggressive or destructive behavior but meet diagnosis for CD as a result of staying out late or skipping school-behaviors that may not be related to high emotion reactivity (Nock, Kazdin, Hiripi, & Kessler, 2006). Future research in this area may be best served by examining symptom clusters rather than global diagnoses in order to answer these important questions.

Beyond supporting the reliability and validity of this new measure, our analyses demonstrated that emotion reactivity statistically mediates the relation between the presence of psychopathology and both NSSI and suicide ideation. This finding builds on decades of research showing that the presence of psychopathology is associated with the occurrence of suicidal and nonsuicidal behaviors (Cavanagh et al., 2003; Moscicki, 1999; Nock, Joiner, et al., 2006). The reason for the relation between psychopathology and SITB is not well understood. In line with our hypothesized model and in keeping with previous work on the regulatory functions of self-injurious thoughts and behaviors, our analyses suggest that increased emotion reactivity represents

one potential explanation for the relation between psychological disorders and SITB.

Interestingly, although emotion reactivity statistically mediated the relation between psychopathology and NSSI as well as that between psychopathology and suicide ideation, this was not the case for suicide attempts. The most parsimonious explanation for these findings is that the failure to find a significant effect for suicide attempts was due to the fact that these behaviors occur with less frequency than NSSI or suicide ideation and thus they are more difficult to predict statistically. An alternative explanation is that the factors influencing the occurrence of suicide attempts are more varied and complex than those for NSSI and suicide ideation and thus influenced by many factors other than emotion reactivity, although this remains a question for future research.

Despite the potential importance of this new measure and the strength of the results, the findings of this study should be viewed in the context of its limitations. First, our sample was relatively small, consisted of mostly adolescent females, and included only those who volunteered to participate in a lab-based research project. These sampling issues introduce several important limitations. Although this sample size provided adequate statistical power to detect medium and large effect sizes in the primary analyses, it was smaller than is commonly recommended for EFA. On balance, prior studies suggest that smaller sample sizes can produce stable factor solutions when factor loadings are relatively high, such as in the current study (Guadagnoli & Velicer, 1988). Nevertheless, the factor solution of the ERS obtained in the current study should be considered preliminary until it is replicated in a larger, more diverse sample. Aside from sample size, the homogeneous nature of the sample and the fact that the majority of participants were female raises questions about the generality of these findings. This is not a minor concern and is one that will need to be addressed in future research using the ERS. The current results may not generalize to other age groups or settings, to males, or to individuals unwilling to participate in clinical research.

Second, our reliance on self-report measures of all constructs may have introduced biases (e.g., social desirability) and inaccuracies (e.g., distortions of retrospective recall), and associations between the ERS and other constructs may have been inflated due to shared method variance. However, the demonstration of divergent validity limits the likely impact of such factors. Third, these data were cross-sectional, limiting our ability to make inferences about the direction of the relations

among study constructs and our abilities to test change in the variables measured over time. Thus prospective studies are needed to examine the temporal relation between emotion reactivity and self-injurious thoughts and behaviors.

This study has made a strong argument for a model in which emotion reactivity helps to explain why psychopathology is related with NSSI and suicide ideation. However, several additional caveats are important to keep in mind, and each points toward exciting directions for future research. First, although we demonstrated that emotion reactivity explains variance in the relation between psychopathology and SITB using statistical mediation techniques, we did not propose or show a temporal relation among these three constructs. Statistical mediation is typically used when one hypothesizes a causal relation between three constructs, but this was not the case in the current study. Indeed, although it is possible that the presence of psychopathology leads to heightened emotion reactivity, which in turn leads to SITB, it is also plausible that emotion reactivity is temporally primary. For instance, dispositional heightened emotion reactivity may increase the likelihood of both psychopathology and SITB. There is no way to tease these temporal relations apart given the cross-sectional nature of our data, and it remains to be tested whether emotion reactivity as measured by the ERS is a trait-like or state-like variable. Examining the longitudinal course of emotion reactivity and its prospective relations to psychopathology and SITB is an important and likely fruitful direction for future study in this area.

Second, emotion reactivity is only one of a number of components that might explain how and why psychopathology and SITB are related. Other emotional, cognitive, behavioral, environmental, and biological factors are doubtlessly involved. It will be important in future research to identify other potential mediators in this relation, such as the ability to regulate activated emotions, as well as potential moderators. This study represents a starting point, and the identification of these additional factors will be important so as to help develop a more complete model of SITB and thus inform treatment by identifying points of intervention. This will be especially important in understanding the complex relation between psychopathology and suicide attempts, as this relation was not statistically mediated by emotion reactivity, and suicide attempts confer the highest risk of mortality among all forms of SITB. Although a complete understanding of all the factors leading to psychopathology and the engagement in SITBs may be an unrealistic goal, it is hoped that further

research on the construct of emotion reactivity will advance scientific and practical efforts toward this end.

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