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The Difficulties in Emotion Regulation Scale: Factor Structure and Association with Nonsuicidal Self-Injury in Adolescent Inpatients

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Abstract Research suggests that difficulties in emotion regulation are an important correlate of nonsuicidal self-injury (NSSI) in adults. Research examining this link in adolescents is limited by the lack of comprehensive instruments to assess difficulties in emotion regulation. Against this background, the aims of the current study were to (a) confirm the six-factor structure of the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, Journal of Psychopathology and Behavioral Assessment, 23(4), 253–263, 2004) in a sample of adolescent inpatients (N=218); (b) explore the relation between different aspects of emotion dysregulation and lifetime NSSI while controlling for psychopathology and sex; and (c) assess the clinical utility of the DERS in detecting lifetime NSSI status. Fit indices obtained through Confirmatory Factor Analysis indicated that the six-factor structure of the DERS fit the data adequately and that most items loaded strongly on their respective latent factor. All six latent factors were significantly correlated with each other, with the exception of *lack of emotional awareness* and *difficulties engaging in goal-directed behavioral when distressed*. Regression analyses revealed that only the *limited access to emotion regulation strategies* subscale accounted for a significant portion of the variance in NSSI when controlling for other aspects of emotion dysregulation, sex, and psychopathology. Receiver Operating Characteristic analysis indicated that the DERS *limited access to emotion regulation strategies* subscale score has moderate diagnostic accuracy in detecting the presence of NSSI. The optimal cut-off score was 21.5 when detecting NSSI among inpatient adolescents. Results provide further support for the relation between emotion regulation difficulties and NSSI. The DERS appears to be a useful measure of detecting NSSI in clinical samples of adolescents.

Keywords Nonsuicidal self-injury · Emotion regulation · Adolescence · Psychiatric sample

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Nonsuicidal self-injury (NSSI) among adolescents is an increasing health concern. NSSI is defined as "the deliberate destruction of body tissue without conscious suicidal intent but resulting in injury severe enough for tissue damage to occur" (Gratz and Roemer 2008). An estimated 21 % of community adolescents (Brausch and Gutierrez 2010) and an estimated 61–68 % of inpatient adolescents (DiClemente et al. 1991; Sim et al. 2009) engage in self-injuring behavior.

While several theoretical approaches to NSSI have been proposed (see Suyemoto 1998 for a review), a common theme among these theories is that NSSI assists in the escape, management, or regulation of emotion (Chapman et al. 2006). Accordingly, Chapman et al. (2006) suggest that NSSI is an emotional avoidance strategy or behavior (along with other maladaptive strategies such as substance abuse or thought suppression). In this model, individual traits like difficulty regulating emotions when aroused, tendency to avoid, emotion regulation skills deficits, poor distress tolerance, and high emotional intensity combine with state vulnerabilities such as a stimulus that elicits an emotional response to produce NSSI as a strategy for temporary relief. The Chapman model places the individual's maladaptive management of unwanted emotions at the center of NSSI, as do most theories of NSSI as reviewed by Suyemoto (1998).

Although multiple and complex reasons for self-injuring co-occur and should be assessed (Brown et al. 2002), significant empirical evidence exists for the link between emotion dysregulation and NSSI. A recent analysis of 18 studies which investigated various reasons for self-injuring found strong support for an overall affect-regulation function of NSSI (Klonsky 2007). The author noted that although other functions (such as self-punishment, anti-dissociation, and interpersonal-influence) were endorsed as reasons for self-injuring too, using NSSI as a means to regulate affect and emotion remained a ubiquitous finding across studies. Laboratory findings confirm self-report studies. For instance, research has shown that those who self-injure have higher physiological arousal states when asked to imagine the period leading up to an episode of self-injury, and consequently lower levels of arousal when they imagine both the self-injury and the period immediately after (Haines et al. 1995; Brain et al. 1998). Further, several laboratory studies have now used pain as a proxy for NSSI in self-injuring samples and concluded that pain, and NSSI, often serve emotion regulation functions. For instance, Bresin and Gordon (2011) found that painful temperature stimulation reduced negative affect in individuals with a history of NSSI. Similarly, Franklin and colleagues (Franklin et al. 2010) showed that pain regulates cognitive processing and affective valence in people with a history of NSSI. Taken together, these studies support the conclusion that, for many, NSSI serves emotion regulation and negative affect reduction purposes.

The link between emotion regulation (ER) and NSSI described in the aforementioned adult literature has also been demonstrated for adolescents. For instance, affect regulation has been cited as the reason for self-injury above other functions in adolescents (Nock et al. 2010) and in the majority of self-injuring adolescents (Nock and Prinstein 2004; Kumar et al. 2004; Nixon et al. 2002; Penn et al. 2003). Moreover, just as in the adult literature, adolescents report experiencing negative emotional states (such as anger, depression, and loneliness and frustration) prior to self-injuring, with a marked decrease in those emotions both during and after the self-injuring episode, lending further support to an affect regulation and management model of NSSI (Laye-Gindhu and Schonert-Reichl 2005).

While the above research clearly demonstrates the link between ER and NSSI in both adults and adolescents, it is tempered by the reality that emotion regulation is a multidimensional construct (Gratz and Roemer 2004; Chapman et al. 2006; Linehan 1993) and there is currently no consensus in the conceptualization of ER (Gratz and Roemer 2004). Defined generally, emotion dysregulation refers to "maladaptive emotional responsiveness reflected in dysfunctional understanding, reactivity, and management" (Mennin et al. 2007, pg. 295–296). In defining ER, it is important to note that emotion regulation, as defined by Gratz and Roemer and others does not include emotional intensity per se. For instance, Mennin and colleagues (Mennin et al. 2007) explicitly differentiate difficulties with emotion regulation from the experience of heightened emotion. Their model of emotion dysfunction includes four components: heightened intensity of emotions, poor understanding of emotions, negative reactivity to emotions, and maladaptive emotional management responses. They suggest that while heightened intensity of emotions ("frequently experiencing negative affect strongly and having emotional reactions that occur intensely, easily, and quickly" Mennin et al. 2007, p. 286) may make it more difficult to successfully manage emotions, it is distinct from the three other components.

Extant measures assessing emotion dysregulation in youth mirror differences in the various models of ER and often tend to assess only one aspect of ER. For instance, the Children's Sadness Management Scale (CSMS; Zeman et al. 2001) includes factors that mostly tap into impulse control and ER strategies (i.e. distracting oneself with other activities, calming oneself). The Emotion Regulation Index for Children and Adolescents (ERICA; MacDermott et al. 2010) emphasizes impulsivity. Other measures, such as the Regulation of Emotions Questionnaire (REQ; Phillips and Power 2007) focus more on the internal (i.e. awareness and reflection of emotions) and external (i.e. expression of emotions) aspects of ER. As a final example, the Emotion Expression Scale for Children (EESC; Penza-Clyve and Zeman 2002) focuses mainly on reluctance of expressing negative emotions and difficulties with emotional clarity. In addition to highlighting the variety of existing conceptual models and assessments of ER, the differences between aforementioned measures make comparing findings on ER challenging.

In the present study, Gratz and Roemer's (2004) model of ER was used as a theoretical basis because of its previous use in NSSI research. This model defines ER as "involving the (a) awareness and understanding of emotions, (b) acceptance of emotions, (c) ability to control impulsive behaviors and behave in accordance with desired goals when experiencing negative emotions, and (d) ability to use situationally appropriate emotion regulation strategies flexibly to modulate emotional responses as desired in order to meet individual goals and situational demands" (p. 42). Gratz and Roemer's (2004) broad definition of ER comes from cited evidence suggesting that ER includes both the capacity to regulate emotional responses and the ability to experience and distinguish a broad spectrum of emotions and accept those emotions rather than trying to repress them. Therefore, in the Gratz and Roemer model, adaptive ER includes having both a repertoire of ER strategies and sufficient flexibility to use them. These emotion regulation strategies allow the individual to regulate the intensity and duration of

such emotions, such that the urgency associated with its expression, as well as the individual's behavior and response to an emotionally charged situation, are controlled.

Based on this model, Gratz and Roemer (2004) developed the Difficulties in Emotion Regulation Scale (DERS) to map onto and assess their model of ER. Accordingly, the DERS encompasses various aspects of ER, including *nonacceptance of emotional responses (nonacceptance), difficulties engaging in goal directed behavior (goals), impulse control difficulties (impulse), lack of emotional awareness (awareness), limited access to emotion regulation strategies (strategies)*, and *lack of emotional clarity (clarity)*. The DERS stands to improve existing research on ER because, as a comprehensive measure with multiple subscales, it explores several dimensions of ER at once. It is important to note that using the Gratz and Roemer (2004) model of ER and the DERS represents only one approach to conceptualizing ER which, while valuable in the present study due to previous links to NSSI, does not reflect the existing variety of models and assessments of ER. Moreover, Chapman et al. (2006), who provide a model specifically addressing the role of emotion in NSSI, highlight emotion regulation skills deficits, avoidance, and difficulty regulating emotions when aroused as separate entities while the Gratz and Roemer (2004) model combines them under the heading of emotion regulation.

The downward extension of the DERS to adolescents who display NSSI has not yet occurred. However, its potential for use in adolescent samples was demonstrated by two other studies. Weinberg and Klonsky (2009), for instance, used exploratory factor analysis to confirm the six-factor structure of the DERS in a community-dwelling adolescent sample. The authors noted good to excellent internal consistency in the 6 DERS subscales (although they noted only modest internal consistency in the "awareness" subscale), with overall good reliability and validity of the DERS scale. Similarly, the DERS' factor structure has also been confirmed in a large sample of Dutch community dwelling adolescents (Neumann et al. 2010).

Taken together, the DERS shows promise for investigating ER in adolescents, and, due to the comprehensive nature of the DERS, holds potential for examining the relation between various aspects of difficulties in ER and NSSI in a wide variety of populations. There is a great need to examine difficulties in ER as it relates to NSSI in adolescents because of the high rates of NSSI amongst adolescents (DiClemente et al. 1991; Sim et al. 2009) in addition to the fact that the age of onset for NSSI is typically during adolescence (Kumar et al. 2004).

Against this background, the first aim of the present study was to confirm the six-factor structure of the DERS (nonacceptance, goals, impulse, awareness, strategies, and clarity) in a sample of adolescent inpatients. Given the now well-established six-factor structure of the DERS in adults (Gratz and Roemer 2008) and community-dwelling adolescents (Neumann et al. 2010; Weinberg and Klonsky 2009), our aim was to confirm the factor structure rather than build a new theoretical model of a competing factor structure. It is well known that factor structures established in adults or community samples of adolescents are not by default directly transferred to clinical adolescent samples (Sharp et al. 2006). Demonstrating a similar factor structure for the DERS in a clinical sample that has been previously shown for adult and adolescent community samples would have direct relevance for the use of the DERS in clinical settings.

Establishing the factor structure in the clinical sample of the present study also enables us to further explore additional questions that speak to the relevance of the DERS in clinical settings. Therefore, our second aim was to examine which aspect(s) of difficulties in ER is/are most relevant to NSSI in adolescents because few studies have explored all aspects of ER as defined by Gratz and Roemer (2004). Gratz and Roemer (2008) used the DERS in a self-harming female college sample, and found that *limited access to emotion regulation strategies* and *lack of emotional clarity* accounted for greater variance in NSSI above and beyond other aspects of ER measured by the DERS. Indeed, *limited access to emotion regulation strategies* was suggested by Chapman et al. (2006) as a potentially important ER factor that may lead to NSSI. Specifically, Chapman et al. (2006) suggest that individuals with limited access to emotion regulation strategies that they perceive as effective, when faced with intense emotions, may be more likely to engage in maladaptive coping, such as avoidance which, in turn, may lead to NSSI (see model pg. 373). Importantly, the DERS strategies subscale contains items reflecting an individual's belief that emotion regulation strategies will be ineffective and that negative emotions will continue regardless of what they do. In other words, items do not probe whether a respondent can use strategies such as breathing, distraction, etc. but instead probe whether the individual believes that he or she is able to use strategies effectively to lessen negative emotions and avoid being overwhelmed. We predicted that *limited access to emotion strategies* would be most associated with NSSI, even when controlling for possible confounds such as sex, age, and psychopathology, which are often neglected in studies of ER and NSSI. Controlling for these variables is important, given findings indicating that adolescent girls are more likely to self-injure than boys (Hawton and Harriss 2008) and that the risk for NSSI increases with age within adolescence (Sourander et al. 2006) and with a diagnosis of depression, anxiety (Andover et al. 2005), and externalizing disorder (Nock et al. 2006).

Our third aim was to establish the clinical utility value of the DERS for the presence of lifetime NSSI. This is accomplished by determining sensitivity, specificity, and the clinical cut-off score of the most predictive subscale of the

DERS when used with inpatient adolescents. One barrier to effective treatment of NSSI in adolescents is the extremely limited number of reliable and valid assessment measures for identified risk factors, particularly emotional regulation skills (Zeman et al. 2006). Reporting biases in NSSI in adolescence have furthermore been suggested (Nock 2010), which necessitates proxy measures of NSSI in hospital settings. By establishing clinical cut-offs for a relevant DERS subscale, this measure can be used in clinical settings as a valuable tool to identify those most at risk for NSSI based on deficits in ER. For instance, it is possible that adolescents may be reluctant to endorse NSSI items with high face validity. Proxy measures for NSSI (like a relevant DERS subscale) may be extremely useful in this regard. Taken together, this study stands to add important validation information to the use of the DERS and its subscales in investigating and detecting NSSI in the context of inpatient adolescent psychiatric problems.

Method

Participants

All consecutive admissions (N=275) from a 16-bed adolescent inpatient unit which usually serves adolescents with severe treatment-refractory behavior, psychiatric, and substance disorders were invited to participate. The average length of stay in this program is 5–7 weeks. 53.2 % of the sample had previously been hospitalized for psychiatric reasons, including drug and alcohol detoxification and rehabilitation. The median and modal number of previous hospitalizations were 1 and 0, respectively. The treatment follows a milieu-based integrative approach that includes both psychodynamic (mentalization-based) and cognitive-behavioral approaches.

Of those approached for consent, 23 declined participation in the study, 9 consented but did not complete the battery, 2 consented and later revoked consent, 10 were discharged prior to being assessed, and 11 were excluded on the basis of (a) diagnosis of schizophrenia or any psychotic disorder, and/or (b) diagnosis of mental retardation. Inclusion criteria were age between 12 and 17 and English fluency. On the grounds of these exclusion criteria, 11 were excluded from the study, leaving 220 adolescents in the sample. Participants missing one or more complete measures were excluded, amounting to a total of 2 participants.

The final sample consisted of 218 adolescents with a mean age of 15.93 years (SD=1.41). The sample contained 128 (58.7 %) females and 90 (41.3 %) males and had the following ethnic breakdown: 90.8 % White, 2.8 % Hispanic, 1.8 % Asian, 0.9 % Black, 1.8 % Mixed, 0.5 % Native Hawaiian or Pacific Islander, and 1.4 % Other or Unreported. It is to be expected that a severe inpatient sample display high diagnostic comorbidity. In this sample, the average number of Axis I diagnoses was 2.38 (SD=2.44). Diagnostic and demographic information for this sample is presented in Table 1.

Measures

Nonsuicidal Self-Injury The Deliberate Self Harm Inventory (DSHI; Gratz 2001) is a 17-item self-report measure that assesses the frequency, severity, duration, and type of self-harm (i.e. NSSI) behavior. This measure specifies self-harm behaviors as those that are "deliberate, direct destruction or alteration of body tissue without conscious suicidal attempt, but resulting in injury severe enough for tissue damage (e.g., scarring) to occur" (Gratz 2001, p. 255). The DSHI has demonstrated high internal consistency (α=.82–.83), test-retest reliability (φ=.68, p<.001 for dichotomous use and r=.92, p<.001 for continuous use), construct validity, and concurrent validity (Gratz 2001). Following the guidelines set forth in Gratz and Tull (2010) when comparing individuals with a history of NSSI versus those without, a dichotomous variable was created in which adolescents who answered yes to any item were assigned to the "NSSI" group and those who did not answer yes to any item were assigned to the "No NSSI" group. 64.7 % of the sample had self-injured during their lifetime and was therefore included in the "NSSI" group.

Difficulties in Emotion Regulation The Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer 2004) is a self-report questionnaire measure that assesses emotion

Table 1 Diagnostic and demographic characteristics of the sample

	Percentage of sample
Female sex	58.7 %
Any internalizing disorder	59.2 %
Depressive disorder[a]	38.5 %
Anxiety disorder[b]	47.7 %
Any externalizing disorder	41.1 %
ADHD	18.8 %
Conduct disorder	20.2 %
Oppositional defiant disorder	19.7 %
Other	
Eating disorder[c]	6.4 %
Mania	4.6 %
Hypomania	3.2 %
Schizophrenia	3.2 %

[a] Includes major depressive disorder and dysthymia

[b] Includes social phobia, separation anxiety, specific phobia, panic disorder, agoraphobia, generalized anxiety disorder, post-traumatic stress disorder, and obsessive compulsive disorder

[c] Includes anorexia nervosa and bulimia nervosa

dysregulation. It consists of 36 items that are scored on a 5 point Likert scale, ranging from 1 (*'almost never (0–10 %)'*) to 5 (*'almost always (91–100 %)'*). A higher score indicates greater emotion dysregulation. The measure assesses six separate scales including: *nonacceptance, goals, impulse, awareness, strategies, and clarity*. In the measure's initial publication, the DERS displayed good internal consistency (α=.93), construct and predictive validity, and test-retest reliability across 4–8 weeks (p<.01) (Gratz and Roemer 2004). In the present study, each subscale had good internal consistency (α: nonacceptance=.90, goals=.86, impulse=.92, awareness=.85, strategies=.92, clarity=.81).

Psychopathology The Computerized Diagnostic Interview Schedule for Children(C-DISC; Shaffer et al. 2000) is a highly structured clinical interview used to diagnose psychiatric disorders in children and adolescents between the ages of 9 and 17. While it is designed to be administered by lay interviewers, all adolescents in this study were interviewed by doctoral psychology students or clinical research assistants who had completed training and several practice sessions administering the interview under the supervision of the fourth author (CS). The interview is administered following computerized prompts that the interviewer reads out loud. The C-DISC has previously demonstrated adequate test-retest reliability after 1 year for most diagnoses (κ=.25–.92) (Shaffer et al. 2000). Though no validity information was provided in the initial C-DISC publication, later studies have called into question the validity of the C-DISC when compared with clinician diagnoses (Lewczyk et al. 2003) though it remains common practice to opt for the C-DISC in research due to the structured nature of the assessment.

For the purposes of this study, only diagnoses that met full DSM-IV criteria on the clinical report of the C-DISC were considered. All positive diagnoses of anxiety (including social phobia, separation anxiety, specific phobia, panic disorder, agoraphobia, generalized anxiety disorder, post-traumatic stress disorder, and obsessive compulsive disorder), dysthymia, and major depressive disorder were grouped into the "any internalizing" category. Finally, ADHD, conduct disorder, and oppositional defiant disorder were grouped into the "any externalizing" category. The collapsing of overarching groups for analyses was motivated by a desire to avoid clumsiness and multiple comparisons in the data analyses.

Procedures

The study was approved by the appropriate institutional review board. All adolescents admitted to an inpatient psychiatric unit were approached on the day of admission about participating in this study. Informed consent from the parents was collected first, and if granted, assent from the adolescent was obtained in person. During the consenting procedure, the limits of confidentiality were discussed. Specifically, adolescents were told that all information provided would remain confidential with two exceptions, namely if they (a) disclosed information suggesting that they were currently at risk of harming themselves or others, or (b) disclosed abuse or neglect of a minor, elderly individual, or adult with a disability. It is important to note that adolescents were informed that retrospective information regarding suicide-related behaviors would not result in a breach of confidentiality.

Adolescents were then consecutively assessed by doctoral level clinical psychology students, licensed clinicians, and/or trained clinical research assistants. Diagnostic interviews were conducted independently and in private with the adolescents according to the standard procedures of the C-DISC previously described. All adolescents were assessed within the first two weeks following admission.

Results

The most common form of NSSI in the present sample was cutting, with 51.8 % of the sample endorsing this behavior in their lifetime. The other methods assessed and the percentage of adolescents endorsing the behavior is as follows: burning with cigarette 11.9 %, burning with lighter or match 24.3 %, carving words into skin 28.9 %, carving pictures into skin 22.5 %, severely scratched self 37.6 %, bit self 20.6 %, rubbed with sandpaper 4.6 %, dripped acid onto skin 0.9 %, used cleaner to scrub skin 1.8 %, stuck sharp objects into skin 30.3 %, rubbed glass into skin 11.9 %, broken own bones 0.9 %, banged head 18.8 %, punched self 20.6 %, prevented wounds from healing 28.9 %, and other method 19.3 %. The average age of onset for cutting was 13.55 years (SD=2.043) and the lifetime frequency of cutting ranged between 0 and 40 times with a mean of 5 times (SD=8.206). For 8.3 % of the sample, cutting had resulted in hospitalization or injury severe enough to require medical treatment at some point.

Confirmatory Factor Analysis of the DERS

To confirm the factor structure reported by Neumann et al. (2010) in a clinical adolescent sample, we used confirmatory factor analysis (CFA) for ordered-categorical variables based on polychoric correlations. CFA models with categorical indicators generally require large sample sizes in order to obtain accurate test statistics, parameter estimates, and standard errors (Brown 2006). However, for simpler models with a modest number of indicators (as in the present

investigation), sample sizes of 150–200 have been found to be sufficient (Brown 2006; Flora and Curran 2004).

This confirmatory model contained six latent factors: nonacceptance, goals, impulse, awareness, strategies, and clarity. All latent factors were allowed to correlate freely. The number of individual items loading on each factor varied between five and eight items (for the specific items loading on each factor, see Table 2). One item (33) was allowed to cross-load on two distinct factors, as reported by Neumann et al. (2010), and no item-residuals were allowed to correlate. This factor analysis was conducted with the Mplus 6.0 software program (Muthén and Muthén 1998–2010) using the weighted-least squares multivariate estimator. Model fit was evaluated using established recommendations for two well-known fit indices, Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA) and Weighted Root Mean Square Residual (WRMR). Good model fit is indicated by a CFI greater than or equal to .95, RMSEA values close to .06, and WRMR<.90 (Hu and Bentler 1999). Additional recommendations advise that RMSEA values of .08 or less indicate acceptable fit and values greater than .08 indicate poor model fit (Brown and Cudeck 1993). Inspection of most fit indices indicated that this model fit the data acceptably well (CFI=.95; RMSEA=.08), although WRMR=1.37. The vast majority of items loaded strongly on their respective latent factor (specific item loadings are available in Table 2). Additionally, all six latent factors (corresponding to the six subscales of the DERS) were significantly correlated with each other, with the exception of the correlation between awareness and goals which was nonsignificant; these correlations are presented in Table 3.

Preliminary Analyses of Bivariate Relations Between Key Study Variables

The second aim of the current study was to investigate the relations between aspects of difficulties in ER and NSSI. Because several other variables apart from difficulties in ER may account for this relation, we first explored potential confounding variables, including sex, age, and diagnoses of internalizing or externalizing disorders. The purpose of these analyses was to identify confounds that should be included in analyses related to the second aim. Chi-square analyses by sex revealed that females were significantly more likely to self-injure than males. Chi-square analyses by internalizing diagnosis were also conducted and showed that individuals with an internalizing diagnosis were significantly more likely to self-injure than those without an internalizing diagnoses. Finally, chi-square analyses by diagnosis of externalizing disorder revealed that individuals diagnosed with an externalizing disorder were more likely to self-injure than those without. Because NSSI status was found to differ significantly by sex, internalizing diagnosis, and externalizing diagnosis, all three variables were controlled for in subsequent analyses. In order to determine the relation between NSSI, age, and DERS subscale scores, independent samples *t*-tests comparing those who did and did not endorse NSSI were conducted. These results show that age did not differ significantly by NSSI group. All of these results are presented in Table 4.

The Relation Between DERS and NSSI Controlling for Sex, Age, and Psychopathology

To explore which aspects of emotion dysregulation were most relevant to NSSI at the cross-sectional level, while controlling for internalizing, externalizing, and sex, it was necessary to first establish whether multicollinearity existed for the all predictor variables given the high correlations between DERS subscale scores (see Table 3) and the previously established relation between psychopathology and ER. Multicollinearity was assessed by calculating the formal detection-tolerance and the variance inflation factor (VIF). Because multicollinearity was not a problem, with tolerance greater than 0.1 (Menard 1995) and a VIF less than 10 (Myers 1990) for every predictor, centering the predictor variables was not necessary (Aiken and West 1991; Holmbeck 2002).

Next, sex, internalizing disorder, externalizing disorder, nonacceptance, goals, impulse, awareness, strategies, and clarity were explored as predictor variables in binary logistic regression with the DSHI dichotomous variable as the outcome variable. Sex, internalizing, and externalizing were entered in the first step and the aforementioned DERS subscales were entered in the second step. These results are presented in Table 5. Only sex, internalizing disorder, and the DERS subscale assessing *limited access to emotion regulation strategies* retained significance in the second step. Addition of this subscale to the variables already included in the first step incrementally improved the model (Δ-2 Log Likelihood=12.322, $p<.001$).

The Clinical Utility Value of the DERS in Detecting Lifetime Presence of NSSI

To establish the clinical utility value of the DERS in detecting the presence of NSSI, we used Receiver Operating Characteristics (ROC) analysis. Specifically, we sought to assess the performance of the DERS *limited access to emotion regulation* subscale score in detecting lifetime NSSI status, thereby establishing a clinical cut-off score. A ROC curve is created when the true positive rate (sensitivity) is plotted against the false positive (1—specificity) rate. The area under the curve (AUC) can then be calculated using the non-parametric trapezoid method (Hanley and McNeil

Table 2 CFA item factor loadings

Factor	Item		Loading (SE)	
A. Awareness				
	2	I pay attention to how I feel	0.85	(0.025)
	6	I am attentive to my feelings	0.93	(0.022)
	8	I care about what I am feeling	0.76	(0.035)
	10	When I'm upset, I acknowledge my emotions	0.63	(0.049)
	17	When I'm upset, I believe my emotions are valid and important	0.67	(0.045)
	34	I take time to figure out what I am really feeling	0.59	(0.053)
B. Clarity				
	1	I am clear about my feelings	0.71	(0.041)
	4	I have no idea how I am feeling	0.74	(0.037)
	5	I have difficulty making sense out of my feelings	0.84	(0.031)
	7	I know exactly how I am feeling	0.76	(0.037)
	9	I am confused about how I am feeling	0.71	(0.039)
C. Impulse				
	3	I experience my emotions as overwhelming and out of control	0.82	(0.036)
	14	When I'm upset, I become out of control	0.93	(0.011)
	19	When I'm upset, I feel out of control	0.94	(0.011)
	24	When I'm upset, I feel I can remain in control over my behavior	0.62	(0.045)
	27	When I'm upset, I have difficulty controlling my behavior	0.95	(0.010)
	32	When I'm upset, I lose control over my behavior	0.97	(0.008)
D. Goals				
	13	When I'm upset, I have difficulty getting work done	0.85	(0.027)
	18	When I'm upset, I have difficulty focusing on other things	0.92	(0.019)
	20	When I'm upset, I can still get things done	0.54	(0.052)
	26	When I'm upset, I have difficulty concentrating	0.93	(0.020)
	33[a]	When I'm upset, I have difficulty thinking about anything else	0.56	(0.051)
E. Nonacceptance				
	11	When I'm upset, I become angry at myself for feeling that way	0.85	(0.028)
	12	When I'm upset, I become embarrassed	0.76	(0.036)
	21	When I'm upset, I feel ashamed with myself	0.90	(0.020)
	23	When I'm upset, I feel like I am weak	0.79	(0.041)
	25	When I'm upset, I feel guilty	0.80	(0.032)
	29	When I'm upset, I become irritated with myself	0.93	(0.018)
F. Strategies				
	15	When I'm upset, I believe I'll remain that way for a long time	0.85	(0.022)
	16	When I'm upset, I believe that I'll end up very depressed	0.82	(0.024)
	22	When I'm upset, I know that I can find a way to feel better	0.63	(0.043)
	28	When I'm upset, I believe there is nothing I can do to feel better	0.82	(0.026)
	30	When I'm upset, I start to feeling very bad about myself	0.90	(0.020)
	31	When I'm upset, I believe that wallowing in it is all I can do	0.80	(0.029)
	35	When I'm upset, it takes me a long time to feel better	0.84	(0.023)
	36	When I'm upset, my emotions feel overwhelming	0.89	(0.022)
	33[a]	When I'm upset, I have difficulty thinking about anything else	0.34	(0.058)

[a]Item loads on two distinct factors. All factor loadings are fully standardized

1982) that yields an index of accuracy which has been used in several other studies to establish criterion validity (Thapar and McGuffin 1998; Fombonne 1991). A measure is thought to have low diagnostic accuracy if its AUC is below .7, moderate accuracy from .7 to .9, and high accuracy when greater than .9 (Swets and Pickett 1982). The measure's cut-off score can be established by finding the intersection of the measure's sensitivity and specificity curves. These analyses were completed using SPSS (2009), Release 17.0.2.

Table 3 CFA factor covariances and correlations

Factor	Emotional awareness	Emotional clarity	Impulsivity	Goal-directed behavior	Nonacceptance	ER strategies
Awareness	0.71	**0.74**	**0.22**	**0.10***	**0.31**	**0.21**
Clarity	0.44	0.50	**0.44**	**0.40**	**0.46**	**0.58**
Impulse	0.15	0.25	0.68	**0.64**	**0.51**	**0.73**
Goals	0.07	0.24	0.45	0.72	**0.52**	**0.75**
Nonacceptance	0.22	0.28	0.37	0.38	0.73	**0.73**
Strategies	0.15	0.32	0.51	0.54	0.52	0.72

Factor correlations are presented above the diagonal in bold, with factor covariances below the diagonal and factor variances listed on the diagonal. All correlations are significant ($p<.01$) unless otherwise noted. *Correlation *not* significant at .05

The ROC curve with DERS *limited access to emotion regulation strategies* subscale and NSSI status is shown in Fig. 1. Both the AUC and standard error were significant ($p<.001$), with an AUC of 0.728, indicating moderate diagnostic accuracy. Additionally, plotting sensitivity and specificity (Fig. 2) at different cut-off scores on the DERS subscale score indicated that the optimal cut-point, the intersection of sensitivity and specificity, is 21.5 ($Se=.69$, $Sp=.70$) when assessing NSSI. Independent samples *t*-test and Chi-square analyses were used to explore differences in NSSI behavior using this cut-off score and revealed that adolescents above the cut-off used a greater number of methods to self-injure ($M_{above}=4.82$, $M_{below}=1.57$, $t=-8.04$, $p<.001$, $df=199.22$, $d=-1.07$) and were more likely to have been hospitalized as a result (13.30 % of those above the cut-off compared with 2.0 % of those below the cut-off had been hospitalized for NSSI before; $\chi^2=9.08$, $p=.003$, $df=1$, $\varphi=.204$, $p=.003$), though the two groups did not differ with regard to age of onset of self-injury ($M_{above}=13.46$, $M_{below}=13.52$, $t=.171$, $p=.865$).

Discussion

The current study had three aims. Since the underlying factor structure of the DERS had not yet been established in a clinical adolescent sample, our first aim was to confirm the six-factor structure previously reported for adults (Gratz and Roemer 2008) and for community-dwelling adolescents (Neumann et al. 2010). Given the adequate model fit indicated by two of the three fit indices and the previous work supporting this model, we interpret this model to show

Table 4 Comparison of NSSI and no NSSI groups (*t*-tests of Chi-square analyses) with regard to demographics, psychopathology, and emotion regulation

Chi-Square analyses	No NSSI % (*n*) endorsed	NSSI % (*n*) endorsed	χ^2 (df)	φ		
Female sex	25.00 (32)	75.00 (96)	14.46*** (1)	−0.258***		
Male sex	50.00 (45)	50.00 (45)				
With internalizing disorder	22.90 (30)	77.10 (101)	24.72*** (1)	0.346***		
Without internalizing disorder	57.33 (43)	42.67 (32)				
With externalizing disorder	24.10 (20)	75.90 (63)	7.55** (1)	0.193**		
Without externalizing disorder	42.86 (51)	57.14 (68)				
Independent samples *t*-tests	No NSSI *M* (*SD*)	NSSI *M* (*SD*)	*t*	*d*	*df*	r_{pb}
Age	15.95 (1.46)	15.92 (1.39)	0.113	0.02	216	−0.0008
DERS						
A. Nonacceptance	12.00 (5.96)	15.36 (6.81)	−3.78***	−0.53	174.67[a]	0.240***
B. Goals	16.69 (5.68)	19.15 (4.89)	−3.35**	−0.46	216	0.222**
C. Impulse	13.30 (5.76)	17.38 (6.94)	−4.40***	−0.64	216	0.286***
D. Awareness	16.12 (6.01)	17.97 (5.59)	−2.28*	−0.32	216	0.153*
E. Strategies	18.68 (8.34)	25.65 (8.29)	−5.93***	−0.84	216	0.374***
F. Clarity	12.36 (5.23)	14.55 (4.74)	−3.14**	−0.44	216	0.209**

C-DISC data was not available for the full sample

[a] Degrees of freedom are decreased because equal variances were not assumed due to a significant Levene Test for Equality of Variances. r_{pb} = Point Biserial correlation. *$p<.05$ **$p<.01$ ***$p<.001$

Table 5 Regression weights when predicting NSSI status

Predictor	*B*	*SE*	Exp(*B*)[a]	95% *CI*[b]	*p*
Step 1: Covariates					
Sex	−.99	0.33	0.37	0.20–.72	0.003**
Internalizing disorder	1.34	0.33	3.83	2.00–7.35	>.001***
Externalizing disorder	0.75	0.35	2.12	1.07–4.21	0.031*
Step 2: DERS subscales					
Nonacceptance	−0.03	0.04	0.97	0.90–1.04	0.454
Goals	−0.08	0.05	0.92	0.84–1.01	0.081
Impulse	0.01	0.04	1.01	0.94–1.09	0.795
Awareness	0.05	0.04	1.05	0.97–1.13	0.208
Strategies	0.12	0.04	1.12	1.04–1.21	0.002**
Clarity	−0.02	0.05	0.99	0.90–1.09	0.733

Sex and internalizing disorder retained significance in Step 2. Change in −2 Log Likelihood=12.322, $p<.001$

[a] Exp(B) = Odds ratio for each predictor

[b] Confidence interval is created around Exp(B), statistically significant if 1 is not in the interval. *$p<.05$ **$p<.01$

adequate fit. However, this should be replicated in other clinical adolescent samples.

Our second aim was to examine which of the components of difficulties in ER was most strongly associated with NSSI status in a clinical sample of adolescents, while controlling for possible confounding variables. As such, this is the first study to consider multiple dimensions of ER in the same sample of inpatient adolescents. Adrian et al. (2010) examined only overall ER difficulties, while other researchers have parceled out important features of ER while ignoring others when investigating NSSI. Sim et al. (2009), for instance, limited their exploration of difficulties in ER to emotional awareness and expression, thereby excluding several components of Gratz and Roemer's (2004) definition of ER. Similarly, Mikolajczak et al. (2009) explored the relation between emotional coping and NSSI, but did not directly investigate the behavioral component of ER. By using multiple dimensions of ER, we demonstrated that only one subscale (*limited access to emotion regulation strategies*, defined as the "belief that there is little that can be done to regulate emotions effectively once an individual is upset"; Gratz and Roemer 2004; p. 47) remained significantly associated with NSSI status after controlling for other aspects of emotion dysregulation, sex and psychopathology.

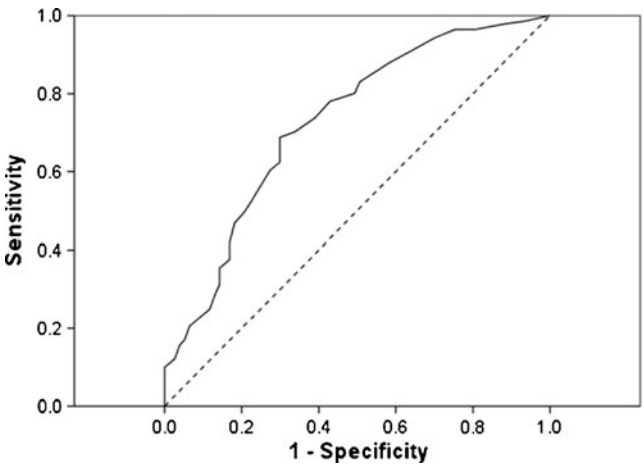

Fig. 1 ROC curve of DERS limited access to emotion regulation strategies subscale in detecting presence of lifetime self-injurious behavior. *Note.* There were 141 cases positive for self-injury and 77 cases negative for self-injury in this analysis. The AUC is 0.714 (*SE*=.037, $p<.001$), indicating moderate accuracy in discriminating adolescents who engage in self-injurious behaviors

This finding is consistent with previous research that found that this factor is an independent statistical predictor of NSSI when assessing difficulties in ER (Gratz and Roemer 2004, 2008; Gratz and Tull 2010). Our findings are also in line with research indicating that NSSI is often used as a maladaptive alternative (in the absence of adaptive strategies) to cope with unwanted feelings and emotions (Lloyd-Richardson et al. 2007; Rodham et al. 2004), as well as several prominent theories which posit that one of the functions of NSSI is as a means of emotion or affect regulation, such as the Experiential Avoidance Model mentioned previously (Chapman et al. 2006), Nock's (2010) intrapersonal model, and general affect-regulation models (Klonsky 2007). Because the DERS strategies subscale targets beliefs that emotion regulation strategies will not be effective and that negative emotions will continue and become overwhelming, the aforementioned research may suggest that rather than not having access to emotion regulation strategies, NSSI is associated with beliefs of inefficacy in emotion regulation. This distinction is highly important clinically, because it points to the possibility of restructuring cognitions surrounding emotion regulation efficacy as an important aspect of NSSI treatment.

Lastly, the third aim of the study was to determine the clinical utility value of the DERS in a clinical sample. This was accomplished by determining the sensitivity, specificity, and clinical cut-off score of the measure when used with inpatient adolescents. The DERS strategies subscale demonstrated adequate sensitivity and specificity and served as a moderate predictor in detecting the presence of NSSI. Additionally, plotting sensitivity and specificity at different cut-off scores on the DERS subscale score provided the optimal cut-point, the intersection of sensitivity and specificity, when assessing NSSI. When this cutoff was explored further, it revealed group differences with regard to whether NSSI had ever resulted in hospitalization and the number of methods of NSSI employed.

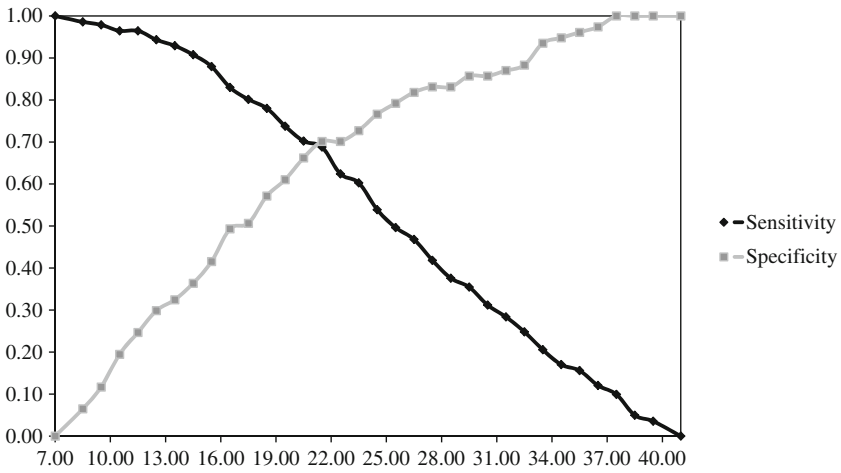

Fig. 2 Sensitivity and specificity plotted against different cut-off scores on the DERS limited access to emotion regulation strategies subscale in reference to self-injury. *Note.* The optimal cut-off score is determined by the intersection of the sensitivity and specificity lines. In predicting self-injury, the optimal cut-off score for the DERS *limited access to emotion regulation strategies* is 21.5 (*Sensitivity*=.69, *Specificity*=.70)

Taken together, the findings reported here are significant for several reasons. First, we confirm the factor structure and clinical utility of the DERS for the concurrent assessment of lifetime NSSI in clinical samples. Secondly, we provide further support for the relation between difficulties in ER and NSSI in adolescents and we provide information on the clinical utility of the *limited access to emotion regulation strategies* subscale of the DERS. Methodologically, the study focused on a relatively large clinical sample and built upon existing research with community samples. This allows us to place our results within the context of previous work with non-clinical adolescents with regard to measures of ER and NSSI. Furthermore, confirming the factor structure of the DERS in a clinical sample serves to expand its utility for clinical research. Similarly, the thorough investigation of many aspects of ER provided by the DERS allowed us to build upon existing research previously limited only to specific components of ER. Also, determining psychopathology on the basis of a structured clinical interview allowed us to confidently control for psychopathology in addition to demographic factors in our analyses. For these reasons, the present study makes a valuable contribution to the existing research on NSSI in adolescents while pointing to the importance of subsequent research in the area of ER strategies in order to understand its causal relation to NSSI and the extent to which it should be a target of clinical treatment.

However, the current study has several limitations of note. Perhaps most importantly, the present study seeks to draw conclusions about the role of limited ER strategies in NSSI while relying upon a cross-sectional design and self-report data. The fact that data is not collected at multiple time points prohibits conclusions about the causal importance of adequate ER strategies. Thus, the present study highlights the importance of further research to explore the temporal and potentially causal relation between ER strategies and NSSI. Similarly, the study design focused on the utility of the DERS *limited access to ER strategies* subscale in predicting lifetime NSSI, and therefore cannot speak to the validity of the DERS for predicting current NSSI nor the course of NSSI. Furthermore, the present sample was compromised of adolescents in a psychiatric hospital, which represent only a small, albeit extreme, part of the overall self-injuring population. Thus, our findings may not generalize to populations in which NSSI is presumably not as extreme. Additionally, the measure of NSSI employed in this study, while widely used and validated, does not collect information about individuals' motivations for self-injuring which is of great theoretical importance given findings that adolescents self-injure for a variety of reasons (see Nock 2010). Thus, we are unable to draw conclusions about potential differences in the relation between limited ER strategies and NSSI that may have emerged when motivation for self-injuring is examined more closely. Also, although we found that *limited access to ER strategies* was the only subscale of the DERS to independently predict history of NSSI, the exact nature of the dependent variable in this study needs to be considered. It is very possible that other components of emotion dysregulation may relate differently to other NSSI outcomes, for instance, severity of NSSI. Therefore, these findings cannot be used to recommend that clinicians exclusively focus on improving access to ER strategies at the cost of other components of ER. We merely suggest *that limited access to ER strategies* appears to be a very relevant facet of ER in determining the presence of NSSI. Relatedly, the present study made use of only Gratz and Roemer's (2004) model and assessment of ER and did not compare this model to others proposed in the existing literature. Therefore, these findings cannot speak to the validity of the Gratz and Roemer (2004) model of ER above another model of ER. Though this was not the aim of the present study it is a valuable area for future research.

Finally, future work may benefit from testing the hypotheses in the current study with more sophisticated data analytic approaches like Structural Equation Modeling.

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