



# Longitudinal Relations Between Childhood Maltreatment, Emotion Regulation Difficulties, and Suicidal Ideation and Non-Suicidal Self-Injury: An 18-Month Investigation of Psychiatrically Hospitalized Adolescents

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## Abstract

Within the Dimensional Model of Adversity and Psychopathology, extant research shows that exposure to threat—including emotional, physical, and sexual abuse—is linked to psychopathology among adolescents; problems with emotion regulation may, at least in part, explain this association. Both theoretical and empirical work also suggests that emotion regulation difficulties—particularly access to emotion regulation strategies—may mediate the relation between threat and self-injurious thoughts and behavior, though no studies to date have explicitly tested this model. The current study tested relations between threat, limited access to emotion regulation strategies, and self-injurious thoughts and behaviors among high-risk youth across an 18-month follow-up. The sample consisted of 180 adolescents ( $M_{\text{age}} = 14.89$ ;  $SD = 1.35$ ; ages 12–17; 71.7% female; 78.9% White; 55.0% heterosexual) recruited from an inpatient psychiatric unit. Threat was assessed at baseline using the abuse subscales from Childhood Trauma Questionnaire. Access to emotion regulation strategies was assessed using the Difficulties in Emotion Regulation Scale at baseline, 6-, and 12-months. Presence (versus absence) of non-suicidal self-injury and suicidal ideation severity were assessed at baseline, 12-, and 18-months using the Self-Injurious Thoughts and Behaviors Interview and the Suicidal Ideation Questionnaire-JR, respectively. After accounting for baseline levels of the mediator, outcome, and depressive symptoms, structural equation models supported the role of 12-month access to emotion regulation strategies as a mediator between baseline threat and 18-month suicidal ideation and non-suicidal self-injury. Treatment aimed at bolstering access to emotion regulation strategies may help reduce suicide risk among youth who have experienced childhood abuse.

**Keywords** Childhood maltreatment · Child abuse · Emotion regulation · Suicide · NSSI · Adolescents

## Introduction

Childhood maltreatment has consequences that reverberate across development. Both theoretical (e.g., Joiner et al., 2012; Van Orden et al., 2010) and empirical (e.g., Rabinovitch

et al., 2015; You et al., 2018) research link experiences of physical, sexual, and/or emotional abuse to self-injurious thoughts and behaviors (SITBs), including suicidal ideation (SI), suicide attempts, and non-suicidal self-injury (NSSI). For instance, a study of youth with Borderline Personality Disorder found that child abuse prospectively predicted SI across a 2-month follow-up period (Kaplan et al., 2016). Notably, emotion regulation (ER) difficulties are also associated with SITB (Hatkevich et al., 2019). Prior research has revealed that ER problems partially explain the link between childhood abuse and the subsequent psychopathology (e.g., McLaughlin et al., 2012). Despite this, scant research has examined ER as a potential mechanism through which experiencing abuse may subsequently lead to SITBs.

The Dimensional Model of Adversity & Psychopathology (DMAP) conceptualizes and classifies childhood maltreatment as falling into one of two dimensions: exposure to *threat* vs. *deprivation* (Sheridan & McLaughlin, 2014). Relevant to

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the current study, threat and deprivation broadly map onto experiences of childhood abuse and neglect, respectively (Sheridan & McLaughlin, 2014). While deprivation-related experiences (i.e., neglect) rob youth of expected inputs necessary for healthy development, experiences of threat (e.g., childhood abuse) lead to increased stress reactivity (Gunnar & Quevedo, 2007). By thwarting their ability to develop foundational skills that pave the way for advanced skills needed to navigate the increasingly complex world of adolescence, these threat-driven disruptions cascade throughout life, potentiating ER difficulties which, in turn, contribute to risk of SITBs in adolescence (Masten & Cicchetti, 2010; McLaughlin et al., 2019).

Threat exposure has been associated with deficits in both automatic (i.e., involuntary) as well as conscious ER abilities (Kim et al., 2023)—including heightened emotional reactivity, suppression, and rumination (Weissman et al., 2019)—as well as poorer behavioral inhibition in emotion-laden contexts among adolescents (Lambert et al., 2017). Relatedly, there has been a wealth of research documenting links between childhood exposure to interpersonal trauma (including threat), ER, and psychiatric comorbidities in childhood (see Dvir et al., 2014 for a review). For example, Cloitre et al. (2005) found that women with a history of abuse evidenced emotional dysregulation and interpersonal problems which, together, had just as much of an adverse influence on the women's functional impairment as their PTSD symptoms (Cloitre et al., 2005), suggesting ER may be a promising construct of interest. Although they did not examine ER, another study found that threat exposure in childhood was related to both internalizing and externalizing symptomology in a community sample of youth (Miller et al., 2018). It is important to differentiate between different sources and dimensions of adversity (e.g., threat, deprivation) and examine transdiagnostic mechanisms like ER in order to better elucidate the specific mechanisms underlying SITBs among high-risk adolescents (Sheridan & McLaughlin, 2014). It is particularly important to examine how these resulting ER skill deficits may contribute to psychopathology among inpatient adolescents with a history of maltreatment during high-risk periods, including the post-hospitalization transition period.

One mechanism through which childhood exposure to threatening experiences (e.g., childhood abuse) may confer risk for subsequent SITBs is through its negative impact on the neurobiological processes underlying children's developing ER abilities (Thompson, 1994). Adaptive ER skills have been linked to positive adjustment among youth, including favorable health, psychological, social, and academic outcomes (Campos et al., 1989; Cole et al., 2004; John & Gross, 2004; Zeman et al., 2006). Conversely, ER difficulties—or

the inability to effectively regulate one's emotions—have been conceptualized and empirically validated as a transdiagnostic factor implicated in many forms of psychopathology and SITBs (Aldao et al., 2010; Cole, 2014; You et al., 2018). ER is especially relevant in adolescence, a developmental period characterized by greater emotional arousal, heightened emotional reactivity, and more frequent and intense experiences of negative affect compared to those of children and adults (Larson et al., 2002).

Across all the specific aspects of ER, theoretical models of SITBs suggest that *lacking access* to adaptive ER strategies may be particularly associated with SITBs (Linehan et al., 1993; Rasmussen et al., 2010; Selby et al., 2008). Indeed, this has been borne out empirically in samples of high-risk youth (e.g., Hatkevich et al., 2019; You et al., 2018). For example, one study of adolescent inpatients found that lack of access to effective regulatory strategies predicted past-year SI. Of note, this study was cross-sectional, precluding our ability to draw any conclusions regarding the directionality of these relations. Another adolescent inpatient study found a limited repertoire of ER strategies was associated with chronic SI over a six-month post-hospitalization period (Wolff et al., 2018). Finally, regarding NSSI, a meta-analysis examining emotion dysregulation and NSSI revealed that limited access to effective ER strategies was most strongly associated with NSSI (You et al., 2018).

Few studies have examined ER difficulties as a mediator of the relation between childhood maltreatment and SITBs. A cross-sectional study found that emotion dysregulation mediated the relation between childhood maltreatment and the frequency of NSSI in an adolescent inpatient sample (Titelius et al., 2018). While they did not explicitly examine ER as a mechanism, another study found that adolescents with a history of maltreatment reported higher levels of SITBs compared to their non-maltreated counterparts. Furthermore, teens with trauma histories were more likely to endorse engaging in NSSI and other SITBs primarily as a means of ER (Babcock Fernici et al., 2022).

Several important limitations of existing research should be noted. Treating abuse and neglect as a unitary construct prevents examining how threat (i.e., abuse) may uniquely contribute to ER difficulties and SITBs. Additionally, longitudinal studies are critical to evaluate how early maltreatment may be related to subsequent ER problems and SITBs, especially during crucial transition periods (e.g., following psychiatric admission). The post-hospitalization period is a particularly crucial time to examine given that adolescents remain at high risk for SITBs for at least a year following discharge (Goldston et al., 2001; King et al., 2010; Yen et al., 2013).

## Current Study

The current study aims to address these gaps by examining whether ER difficulties may operate as a temporally mediating mechanism in the relation between the experience of threat in childhood and SITBs among adolescent inpatients across an 18-month post-hospitalization follow-up period. Understanding the longitudinal relation between threat and SITBs is key to developing and tailoring effective prevention and intervention strategies for clinical populations of youth. We hypothesized that ER difficulties—specifically, limited access to ER strategies—would mediate the relation between early exposure to threat in the form of childhood abuse and engagement in SITBs among psychiatrically-hospitalized adolescents across an 18-month follow-up period.

## Method

### Participants and Procedures

The sample consisted of 180 adolescents ( $M_{\text{age}} = 14.89$ ;  $SD = 1.35$ ; range: 13–17) from a pediatric psychiatric inpatient facility. Most participants identified as female (71.7%). Almost one-half of the sample identified as a sexual minority (41.7%). Most identified as White (78.9%). Other racial identities endorsed included Black (8.9%), Multiracial (8.9%), and Asian (3.3). Additionally, 17.8% of the sample identified as Hispanic. These data are consistent with recent census data of the broader region, showing that 71.3% of the population identifies as White (non-Hispanic), with 18.7% identifying as Hispanic. Of note, attempts were made to enrich for minority representation in that, whenever there was a minority and non-Hispanic White patient admission, we prioritized recruiting and consenting of the minority patient. With an overall consent rate over 75%, the representation of minority participants recruited and consented in the current study reflected the broader racial and ethnic minority representation characteristic of the region. The median family income range was \$50,000–\$74,000. Participants were assessed during hospitalization and 6-, 12-, and 18-months post-discharge. At each timepoint, youth completed measures of NSSI, SI, emotion regulation, childhood threat exposure, and depressive symptoms.

## Measures

### Suicidal Ideation

The Suicidal Ideation Questionnaire-JR (SIQ-JR; Reynolds, 1987) is a 15-item, self-report that was used to measure past month SI severity. All items were summed, with greater total

scores indicating greater SI severity. The SIQ-JR demonstrated excellent internal consistency at baseline ( $\omega = 0.95$ ) as well as 12- ( $\omega = 0.96$ ) and 18-month ( $\omega = 0.94$ ) assessments.

### Non-Suicidal Self-Injury

The Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock et al., 2007) was used to assess lifetime history of NSSI at baseline, and NSSI during the prior 6 months at the 12- and 18-month assessments. The SITBI has strong psychometric properties in clinical adolescent samples (Nock et al., 2007; Venta & Sharp, 2014). In addition to ongoing supervision, all SITBI interviewers (primarily post-baccalaureate research assistants and postdoctoral fellows) received 10 h of training over 3–4 months from the senior author. The SITBI demonstrated excellent interrater reliability in the current study ( $\kappa = 0.89$ ).

### Emotion Regulation

The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item, self-report measure that was used to measure different facets of ER. The 7-item limited access to ER strategies subscale was employed in the present study for two reasons. First, this subscale most directly assesses an adolescent's perceptions of their ability to use strategies to regulate their emotional responses (Gratz & Roemer, 2004), which was the focus of the current study. Second, this subscale has demonstrated relations to adolescent self-injurious thoughts and behaviors over and above other DERS subscales (see Hatkevich et al., 2019; Perez et al., 2012). Greater scores indicate more difficulties accessing ER strategies. These scores demonstrated satisfactory internal consistency at baseline ( $\omega = 0.87$ ) as well as at 6- ( $\omega = 0.92$ ), and 12-month ( $\omega = 0.92$ ) assessments.

### Threat

The Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998) is a 28-item, self-report used to measure lifetime childhood abuse (i.e., sexual, emotional, physical) and neglect (i.e., emotional, physical). Greater scores indicate greater severity of childhood maltreatment. Given the focus of the present study, only the childhood abuse subscales were used to create a composite latent variable (see Data Analysis Plan for details). Youth completed the emotional ( $\omega = 0.82$ ), sexual ( $\omega = 0.94$ ), and physical ( $\omega = 0.87$ ) subscales at baseline; each of the subscale scores demonstrated satisfactory internal consistency.

## Depressive Symptoms

The Children's Depression Inventory-2 (CDI-2) is a 28-item, self-report measure that was used to measure adolescents' depressive symptom severity during the past two weeks (Kovacs, 2011). Greater scores indicated greater depressive symptom severity. To prevent overlap between this measure and the SIQ-JR, the single item assessing SI on the CDI-2 was excluded in the present study (range: 0–54). Internal consistency ( $\omega=0.91$ ) was high in the current sample.

## Data Analysis Plan

Descriptive statistics and bivariate correlations were calculated with SPSS 28. Given the longitudinal design of the study, missing data were expected, though patterns of missingness can bias path estimates (Little & Rubin, 2020). To determine if data were missing completely at random (MCAR), Little's (1988) test was performed using all the variables of interest and covariate (i.e., depressive symptom severity). A non-significant result suggests that the observed missingness does not differ from what would be expected when data are MCAR (Little, 1988).

Separate structural equation models (SEM) were created using Mplus 8.4 (Muthén & Muthén, 1998–2017) for each outcome (i.e., SI severity and NSSI) at each time point available of the outcome that allowed for prospective tests of mediation (i.e., 12- and 18-months; see Figs. 1 and 2). This was done for several reasons. To the author's knowledge, there are currently no methodological guidelines on how much time should or should not occur between measurements (Cain et al., 2018). Instead, theory is perhaps most helpful in determining the measurement interval (Cain et al., 2018). Currently, the theoretical basis for our models do not explicitly outline the time course for the relation between threat, ER difficulties, and SITB (see Sheridan & McLaughlin, 2014). Therefore, two models with differing time points for the mediator and outcome were evaluated. This allows for greater transparency in the research process and for a better understanding of how analytic decisions may impact study conclusions (Harder, 2020; Steegen et al., 2016). Baseline levels of the mediator (i.e., access to ER strategies) and the outcome (i.e., presence of NSSI; SI severity) were accounted for in all models. Consistent with existing research on the relation between threat and psychopathology (e.g., Miller et al., 2018), a latent "threat" factor was created in each model by regressing each of the CTQ abuse subscales onto the latent factor. Creation of a composite latent variable also allows for effective modeling of experiences that often co-occur and are therefore moderately to strongly correlated (Kline, 2016; Miller et al., 2013). For identification

purposes, the variance of this latent factor was constrained to one and all factor loadings freely estimated. All residual variances for the indicators were freely estimated.<sup>1</sup> All variables at baseline were allowed to covary.

Four separate path models were first created with all paths freely estimated (see Figs. 1 and 2).<sup>2</sup> Then, to create parsimonious models, non-significant paths were constrained to zero. Nested model comparisons were conducted to ensure that constraining paths to zero did not significantly degrade model fit (Kline, 2016). Specifically, a non-significant, adjusted chi-square difference test suggest that the model with constrained paths (i.e., the more parsimonious model) represent the data equally well as the fully unconstrained model (Satorra & Bentler, 2010). Indirect paths were calculated in the most parsimonious models using bias-corrected bootstrapping with 10,000 bootstrapped re-samples (Kline, 2016). To address missing data and potential non-normality, models with SI severity as the outcome utilized robust maximum likelihood estimation (MLR; Muthén & Muthén, 1998–2017). Conversely, models with presence (versus absence) of NSSI as the outcome utilized a robust weighted least squares estimator (WLSMV; Muthén & Muthén, 1998–2017) to account for the categorical nature of this outcome. Nevertheless, this estimator also addresses missing data (Muthén & Muthén, 1998–2017).

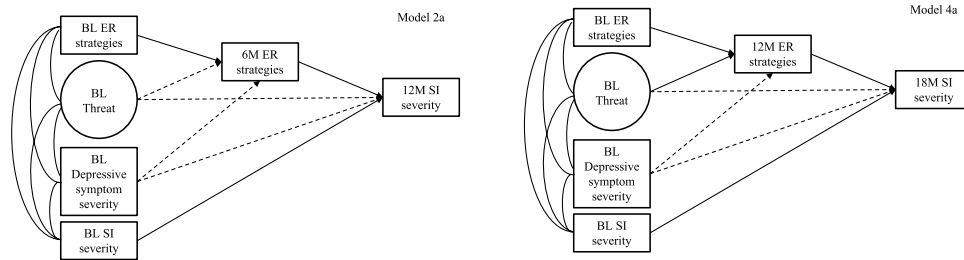
## Results

### Descriptive Statistics and Bivariate Correlations

Table 1 presents an overview of means and standard deviations for continuous variables and bivariate correlations between study variables. Most adolescents endorsed a lifetime history of NSSI (68.9%). The number of adolescents who endorsed NSSI in the 6 months prior to each follow-up was smaller at the 12- (28.9%) and 18-month (22.8%) assessments. Retention was 88% at 6-month, 89% at 12-month, and 87% at 18-month follow-ups. Little's test was not significant ( $\chi^2(117)=98.78, p=0.89$ ), suggesting the data were MCAR (Little, 1988).

<sup>1</sup> Using this procedure, the 12-month SI model initially calculated a small, non-significant negative residual variance for baseline emotional abuse ( $\sigma=-0.18, p=0.978$ ). In line with SEM conventions, this residual was constrained to zero, which did not significantly degrade model fit (S-B  $\Delta\chi^2(1)=0.002, p=0.969$ ; see Kolenikov & Bollen, 2012). Therefore, this altered model with a constrained residual variance for baseline emotional abuse became the model from which the most parsimonious model was obtained for the 12-month SI outcome.

<sup>2</sup> As significant predictors of SITBs (Cha et al., 2018), sex and sexual identity were included in the initial models. However, the pattern of results was equivalent to those presented here. For parsimony and space considerations, results were reported without these predictors in the model.



**Fig. 1** Visual representation of final structural models for suicidal ideation severity as the outcome. *Note.* 18 M=18-month; 12 M=12-month; 6 M=6-month; BL=baseline. ER strategies=limited access to emotion regulation strategies; SI=suicidal ideation; Threat=latent variable com-

prised of baseline emotional, sexual, and physical abuse severity (indicators are omitted for ease of interpretation though are discussed in the manuscript). Dashed paths were non-significant and constrained to zero to create final model. See Tables 3 and 4 for path estimates

### Suicidal Ideation Models

Table 2 provides an overview of fit indices for all models with SI severity as an outcome at 12- and 18-month assessments. For 12-month SI severity as the outcome, three non-significant paths were constrained to zero in the model with all paths freely estimated (i.e., Model 1a) to create the most parsimonious model (i.e., Model 2a). Model 2a demonstrated equivalent fit to Model 1a ( $\Delta\chi^2(3)=6.23, p=0.10$ ). For 18-month SI severity as the outcome, in the model with all paths freely estimated (i.e., Model 3a), three non-significant paths were similarly constrained to zero to create the most parsimonious model (i.e., Model 4a). Model 4a demonstrated equivalent fit to Model 3a ( $\Delta\chi^2(3)=1.35, p=0.72$ ). Therefore, Models 2a and 4a were selected as the most parsimonious and accurate representation of data with 12- and 18-month SI severity as the outcome, respectively (see Fig. 1).

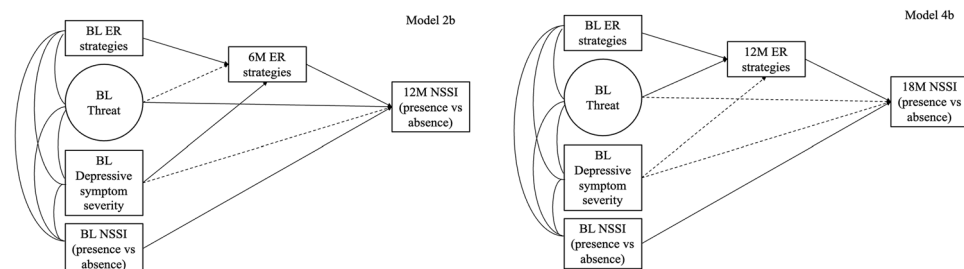
Table 3 provides an overview of all concurrent and longitudinal path estimates for the most parsimonious model that utilized 12-month SI severity as the outcome (i.e., Model 2a; Fig. 1). Baseline threat did not predict 6-month access to ER strategies ( $\beta=0.5, p=0.490$ ), though 6-month access to ER strategies predicted 12-month SI severity ( $\beta=0.19,$

$p=0.18$ ). The indirect path from baseline threat to 12-month SI severity through 6-month access to ER strategies was not significant:  $\beta=0.1, 95\% \text{ CI } [-0.1, 0.6]$ . Model 2a accounted for 23% of the variance in 12-month SI severity ( $R^2=0.23; p<0.01$ ), a medium effect ( $f=0.30$ ; Cohen, 1992).

Table 3 also provides an overview of all concurrent and longitudinal path estimates for the most parsimonious model that included 18-month SI severity as the outcome (i.e., Model 4a; Fig. 1). In this model, baseline threat did predict 12-month access to ER strategies ( $\beta=0.22, p=0.008$ ) and 12-month access to ER strategies predicted 18-month SI severity ( $\beta=0.31, p<0.001$ ). The indirect path from baseline threat to 18-month SI severity through 12-month access to ER strategies was significant:  $\beta=0.07, 95\% \text{ CI } [0.02, 0.15]$ . Model 4a accounted for 20% of the variance in 18-month SI severity ( $R^2=0.20; p<0.01$ ), a medium effect ( $f=0.25$ ; Cohen, 1992).

### Non-Suicidal Self-Injury Models

Table 2 provides an overview of fit indices for all models with presence (versus absence) of NSSI as an outcome at 12- and 18-month assessments. For 12-month NSSI as the



**Fig. 2** Visual representation of final structural models for non-suicidal self-injury as the outcome. *Note.* 18 M=18-month; 12 M=12-month; 6 M=6-month; BL=baseline. ER strategies=limited access to emotion regulation strategies; NSSI=non-suicidal self-injury (0=absence; 1=presence); Threat=latent variable comprised of baseline emotional, sexual, and

physical abuse severity (indicators are omitted for ease of interpretation though are discussed in the manuscript). Dashed paths were non-significant and constrained to zero to create final model. Path estimates presented here are standardized. See Tables 3 and 4 for path estimates

**Table 1** Means, standard deviations, and bivariate correlations for all study variables ( $N = 180$ )

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. BL SI severity	44.88 (24.30)	–											
2. 12 M SI severity	20.06 (19.16)	0.46***	–										
3. 18 M SI severity	20.21 (14.69)	0.37***	0.62***	–									
4. BL NSSI	–	0.39***	0.34***	0.33***	–								
5. 12 M NSSI	–	0.31***	0.53***	0.43***	0.25***	–							
6. 18 M NSSI	–	0.37***	0.48***	0.54***	0.25***	0.61***	–						
7. BL ER strategies	26.60 (7.40)	0.53***	0.24***	0.27***	0.22***	0.19*	0.17*	–					
8. 6 M ER strategies	24.41 (8.94)	0.38***	0.34***	0.34***	0.25***	0.24**	0.22*	0.53***	–				
9. 12 M ER strategies	21.32 (8.37)	0.40***	0.56***	0.41***	0.20*	0.40***	0.39***	0.56***	0.56***	–			
10. BL Emotional abuse	11.29 (5.05)	0.39***	0.30***	0.20*	0.15*	0.29***	0.21*	0.28***	0.20	0.32***	–		
11. BL Physical abuse	6.60 (3.33)	0.15*	0.10	0.9	-0.1	0.12	0.13	0.16*	0.7	0.11	0.51***	–	
12. BL Sexual abuse	6.69 (4.90)	0.13	0.7	0.14	0.15*	0.2	0.1	0.6	0.16	0.12	0.30***	0.26***	–
13. BL Depressive symptoms	21.48 (10.54)	0.64***	0.29***	0.31***	0.36***	0.20*	0.21*	0.55***	0.43***	0.31***	0.43***	0.13	0.21**

18 M 18-month, 12 M 12-month, 6 M 6-month, BL baseline, SI suicidal ideation, NSSI/non-suicidal self-injury (0 = absence; 1 = presence), ER strategies/limited access to emotion regulation strategies

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

outcome, a single non-significant path was constrained to zero in the model with all paths freely estimated (i.e., Model 1b) to create the most parsimonious model (i.e., Model 2b). Model 2b demonstrated equivalent fit to Model 1b ( $\chi^2(1) = 0.30, p = 0.58$ ). For 18-month NSSI as the outcome, in the model with all paths freely estimated (i.e., Model 3b), three non-significant paths were similarly constrained to zero to create the most parsimonious model (i.e., Model 4b). Model 4b demonstrated equivalent fit to Model 3b ( $\Delta\chi^2(3) = 2.54, p = 0.47$ ). Therefore, Models 2b and 4b were selected as the most parsimonious and accurate representation of data with 12- and 18-month presence (versus absence) of NSSI as the outcome, respectively (see Fig. 2).

Table 4 provides an overview of all concurrent and longitudinal path estimates for the most parsimonious mode that included 12-month presence (versus absence) of NSSI as the outcome (i.e., Model 2b; Fig. 2). Baseline threat did not predict 6-month access to ER strategies ( $\beta = -0.01, p = 0.969$ ), and 6-month access to ER strategies did not predict 12-month NSSI ( $\beta = 0.19, p = 0.059$ ). While the indirect path from baseline threat to 12-month NSSI through 6-month access to ER strategies was not significant ( $\beta = -0.01, 95\% \text{ CI } [-0.05, 0.04]$ ), baseline threat had a direct effect on 12-month NSSI ( $\beta = 0.28, p = 0.018$ ). Model 2b accounted for 22% of the variance in 12-month NSSI ( $R^2 = 0.22; p = 0.016$ ), a medium effect ( $f = 0.28$ ; Cohen, 1992).

Table 4 also provides an overview of all concurrent and longitudinal path estimates for the most parsimonious model that included 18-month presence of NSSI as the outcome (i.e., Model 4b; Fig. 2). In this model, baseline threat did predict 12-month access to ER strategies ( $\beta = 0.23, p = 0.025$ ). Twelve-month access to ER strategies subsequently predicted 18-month NSSI ( $\beta = 0.41, p < 0.001$ ). The indirect path from baseline threat to 18-month NSSI through 12-month access to ER strategies was significant:  $\beta = 0.09, 95\% \text{ CI } [0.02, 0.25]$ . Model 4b accounted for 33% of the variance in 18-month NSSI ( $R^2 = 0.33; p = 0.008$ ), a large effect ( $f = 0.49$ ; Cohen, 1992).

### Discussion

Existing theoretical and empirical work proposes that ER difficulties are an important mediator of the relation between childhood threat exposure and symptoms of psychopathology. Notably, however, no studies have examined whether ER difficulties—particularly difficulties accessing ER strategies—mediate the relation between threat and SITBs, especially within a temporal framework. The current study utilized a longitudinal design to assess relations among these constructs in a high-risk, adolescent inpatient sample.

Consistent with hypotheses, youth who reported greater threat at baseline reported greater difficulties in accessing ER strategies at month 12, which, in turn, resulted in greater SI

**Table 2** Nested model comparisons and fit indices

Model number & description	Model fit indices					Model comparison	
	$\chi^2$ (df)	<i>p</i>	CFI	TLI	RMSEA (90% CI)	$\Delta\chi^2$ ( $\Delta$ df)	<i>p</i>
<i>12-month suicidal ideation models</i>							
1a. Model with all paths freely estimated	15.95 (13)	0.252	0.98	0.97	0.4 (0.0, 0.9)	–	–
2a. Non-significant paths constrained to zero: BL Depressive symptom severity → 6 M ER strategies BL Depressive symptom severity → 12 M SI severity BL Threat → 12 M SI severity	22.40 (16)	0.131	0.96	0.94	0.5 (0.0, 0.9)	6.23 (3)	0.101
<i>18-month suicidal ideation models</i>							
3a. Model with all paths freely estimated	19.44 (12)	0.79	0.96	0.91	0.6 (0.0, 0.11)	–	–
4a. Non-significant paths constrained to zero: BL Depressive symptom severity → 12 M ER strategies BL Depressive symptom severity → 18 M SI severity BL Threat → 18 M SI severity	20.51 (15)	0.153	0.97	0.94	0.5 (0.0, 0.9)	1.35 (3)	0.716
<i>12-month non-suicidal self-injury models</i>							
1b. Model with all paths freely estimated	18.03 (12)	0.114	0.96	0.91	0.5 (0.0, 0.10)	–	–
2b. Non-significant paths constrained to zero: BL Depressive symptom severity → 12 M NSSI	18.55 (13)	0.137	0.97	0.93	0.5 (0.0, 0.10)	0.30 (1)	0.583
<i>18-month non-suicidal self-injury models</i>							
3b. Model with all paths freely estimated	16.22 (12)	0.182	0.97	0.93	0.4 (0.0, 0.9)	–	–
4b. Non-significant paths constrained to zero: BL Depressive symptom severity → 6 M ER strategies BL Depressive symptom severity → 18 M NSSI BL Threat → 18 M NSSI	180.59 (15)	0.233	0.98	0.96	0.4 (0.0, 0.8)	20.54 (3)	0.468

*18 M* 18-month, *12 M* 12-month, *6 M* 6-month, *BL* baseline, *Threat* latent variable comprised of emotional, sexual, and physical abuse severity, *ER strategies* limited access to emotion regulation strategies, *SI* suicidal ideation, *NSSI* non-suicidal self-injury (0 = absence; 1 = presence),  $\chi^2$  Satorra-Bentler adjusted chi-square, *df* degrees of freedom, *CFI* comparative fit index, *TLI* Tucker-Lewis index, *RMSEA* root mean square error of approximation, *CI* confidence interval,  $\Delta$  change in parameter

severity and odds of engaging in NSSI by month 18. This is consistent with extant theoretical (e.g., Linehan et al., 1993) and empirical (e.g., Titelius et al., 2018) work linking ER difficulties and SITB. Indeed, the literature suggests that adolescents who lack access to adaptive ER strategies are at particularly increased risk for SITBs (Rasmussen et al., 2010; Selby et al., 2008). Our results are also consistent with prior cross-sectional and longitudinal research revealing that high-risk, psychiatrically hospitalized adolescents’ perceived lack of access to effective regulatory strategies is associated with poorer outcomes, including SI (e.g., Hatkevich et al., 2019; Wolff et al., 2018) and NSSI (see You et al., 2018 for a review).

Current results are also consistent with prior longitudinal research with high-risk youth suggesting that ER difficulties mediate the relation between childhood maltreatment and psychopathology (Weissman et al., 2019) as well as NSSI frequency (Titelius et al., 2018). These prospective relations are particularly important to examine in inpatient samples given the high prevalence of both the experience of threat in childhood (Keeshin et al., 2014) and SITBs in this population. Furthermore, prior research has documented that adolescents with a history of threat exposure are more likely to engage in SITBs as a means of ER compared to their non-maltreated counterparts (Babcock Fernici et al., 2022). Overall, the findings of the current study replicate and extend prior work in this area

and provide compelling, albeit preliminary, evidence that early exposure to experiences of interpersonal threat may disrupt development in ways that compromise the effective deployment of adaptive ER strategies which, in turn, may contribute to the onset and/or maintenance of adolescent SITBs.

Inconsistent with hypotheses, difficulties accessing ER strategies at month 6 did not mediate the relation between threat at baseline and SI severity or NSSI at month 12. These discrepant results may help inform our understanding of the temporal relation among these constructs. As noted previously, there are currently no methodological guidelines for the amount of time that should transpire between waves to test for mediation, and the theoretical basis for the current study does not describe a specific time course for the unfolding of this mechanism (see Cain et al., 2018; Sheridan & McLaughlin, 2014). Therefore, we examined two separate models for each outcome (i.e., SI severity and NSSI) using all available time-points. The non-significant 6-month ER mediation models can be interpreted in several ways. First, because this was an inpatient sample, our sample was selectively comprised of youth amid acute psychiatric crises, which are highly related to—or at the very least, accompanied by—high levels of ER difficulties at baseline (Hatkevitch et al., 2019). Over time, as adolescents are discharged from the hospital and return to their daily lives and routines, their levels of ER difficulties

**Table 3** Parameter estimates for paths in the final models with 12- and 18-month suicidal ideation severity assessment data as respective outcomes

12-month suicidal ideation severity (Model 2a)				
<i>Longitudinal paths</i>	$\beta$	b (se)	<i>p</i>	95% CI
BL Threat → 6 M ER strategies	0.5	0.46 (0.67)	0.490	-0.10, 0.20
6 M ER strategies → 12 M SI severity	0.19	0.41 (0.17)	0.18	0.4, 0.34
BL ER strategies → 6 M ER strategies	0.51	0.61 (0.09)	<0.01	0.37, 0.64
BL SI severity → 12 M SI severity	0.39	0.30 (0.59)	<0.01	0.25, 0.52
<i>Contemporaneous paths</i>	<i>r</i>		<i>p</i>	95% CI
BL Threat ↔ BL ER strategies	0.28		<0.01	0.14, 0.41
BL Threat ↔ BL SI severity	0.39		<0.01	0.27, 0.51
BL Threat ↔ BL Depressive symptom severity	0.43		<0.01	0.31, 0.55
BL ER strategies ↔ BL SI severity	0.54		<0.01	0.42, 0.65
BL ER strategies ↔ BL Depressive symptom severity	0.55		<0.01	0.43, 0.67
BL SI severity ↔ BL Depressive symptom severity	0.64		<0.01	0.55, 0.73
18-month suicidal ideation severity (Model 4a)				
<i>Longitudinal paths</i>	$\beta$	b (se)	<i>p</i>	95% CI
BL Threat → 12 M ER strategies	0.22	1.85 (0.70)	0.08	0.6, 0.38
12 M ER strategies → 18 M SI severity	0.31	0.54 (0.14)	<0.01	0.16, 0.46
BL ER strategies → 12 M ER strategies	0.33	0.37 (0.9)	<0.001	0.18, 0.48
BL SI severity → 18 M SI severity	0.25	0.15 (0.04)	0.01	0.11, 0.38
<i>Contemporaneous paths</i>	<i>r</i>		<i>p</i>	95% CI
BL Threat ↔ BL ER strategies	0.28		<0.01	0.13, 0.43
BL Threat ↔ BL SI severity	0.40		<0.01	0.25, 0.54
BL Threat ↔ BL Depressive symptom severity	0.44		<0.01	0.29, 0.58
BL ER strategies ↔ BL SI severity	0.53		<0.01	0.42, 0.65
BL ER strategies ↔ BL Depressive symptom severity	0.55		<0.01	0.42, 0.67
BL SI severity ↔ BL Depressive symptom severity	0.64		<0.01	0.55, 0.73

12 M 12-month, 6 M 6-month, BL baseline, Threat latent variable comprised of emotional, sexual, and physical abuse severity, ER strategies limited access to emotion regulation strategies, SI suicidal ideation, se robust standard error, CI confidence interval for standardized parameter estimate

may gradually revert to each individual's ER "set point." With increasing change in ER since baseline over time, it may be reasonable to expect greater unique variance in ER at follow-up that could be explained by baseline threat and left unaccounted for by baseline ER. Our results suggest subsequent SITB risk post-hospitalization may be contingent upon the increased variability observed in ER capabilities as youth return to their set point over time. From a statistical perspective, this may mean that much of the variance in 6-month access to ER strategies was accounted for by baseline levels, leaving little variance for baseline threat to predict.

It is also possible that non-significant findings are due to moderating effects in this relation. For example, a large body of research (e.g., Elliot & Carnes, 2001) has documented that parents' responses to children's abuse are strongly associated with the child's subsequent psychological functioning and well-being. Children whose parents report disbelief and/or fail to provide protection or communicate support in response to their child's experience of threat are more likely to develop symptoms of psychopathology and maladjustment (Elliot & Carnes, 2001). Additionally, invalidating social (e.g., familial) environments are

central to the development of ER difficulties (Godbout et al., 2014; Linehan et al., 1993), so it is possible that youth living in more chronically invalidating environments were more likely to endorse greater difficulties accessing ER strategies at 6-months. These youth would then be more likely to experience SI or engage in NSSI at 12-months. This may be particularly important to examine in subpopulations at high risk for parental rejection and abuse, such as transgender and gender non-conforming adolescents (Grossman et al., 2021). Incorporating assessments of invalidation in a youth's environment in future longitudinal studies may help improve our temporal understanding of the relation between threat, access to ER strategies, and SITBs.

Other limitations of the current study point to avenues for future research. First, while almost half of the youth in the current sample identified as a sexual minority, youth also mostly identified as White, female, and as non-Latino/a/x. It is important for future studies with similar designs to draw their samples from more racially and ethnically diverse populations. Second, the use of a well-established measure of ER is a strength, but this measure was limited to self-report. To better understand if youth experienced difficulties accessing ER strategies or,



**Table 4** Parameter estimates for paths in the final models with 12- and 18-month NSSI assessment data as respective outcomes

12-month non-suicidal self-injury (Model 2b)				
	$\beta$	b (se)	p	95% CI
<i>Longitudinal paths</i>				
BL Threat → 6 M ER strategies	-0.1	-0.3 (0.76)	0.969	-0.7, 0.7
6 M ER strategies → 12 M NSSI	0.9	0.02 (0.01)	0.59	-0.1, 0.40
BL Threat → 12 M NSSI	0.3	0.3 (0.10)	0.18	0.4, 0.43
BL ER strategies → 6 M ER strategies	0.41	0.50 (0.10)	<0.001	0.7, 0.56
BL Depressive symptoms → M6 ER strategies	0.4	0.20 (0.07)	0.05	0.9, 0.39
BL NSSI 12 M NSSI	0.8	0.60 (0.22)	0.07	0.8, 0.48
<i>Contemporaneous paths</i>				
	r		p	95% CI
BL Threat ↔ BL ER strategies	0.8		<0.01	0.1, 0.44
BL Threat ↔ BL NSSI	0.3		0.15	-0.3, 0.8
BL Threat ↔ BL Depressive symptom severity	0.41		<0.01	0.5, 0.58
BL ER strategies ↔ BL NSSI	0.5		<0.01	0.1, 0.38
BL ER strategies ↔ BL Depressive symptom severity	0.53		<0.01	0.43, 0.64
BL NSSI ↔ BL Depressive symptom severity	0.37		<0.01	0.4, 0.50
18-month non-suicidal self-injury (Model 4b)				
	$\beta$	b (se)	p	95% CI
<i>Longitudinal paths</i>				
BL Threat → 12 M ER strategies	0.3	1.89 (0.84)	0.25	0.3, 0.43
12 M ER strategies → 18 M NSSI	0.41	0.5 (0.01)	<0.01	0.23, 0.58
BL ER strategies → 12 M ER strategies	0.36	0.41 (0.1)	<0.01	0.9, 0.54
BL NSSI → 18 M NSSI	0.36	0.77 (0.23)	0.01	0.5, 0.56
<i>Contemporaneous paths</i>				
	r		p	95% CI
BL Threat ↔ BL ER strategies	0.27		0.02	0.0, 0.44
BL Threat ↔ BL NSSI	0.5		0.76	-0.2, 0.31
BL Threat ↔ BL Depressive symptom severity	0.42		<0.01	0.26, 0.59
BL ER strategies ↔ BL NSSI	0.24		0.02	0.0, 0.38
BL ER strategies ↔ BL Depressive symptom severity	0.56		<0.01	0.46, 0.67
BL NSSI ↔ BL Depressive symptom severity	0.36		<0.01	0.23, 0.49

18 M 18-month, 12 M 12-month, BL baseline, Threat latent variable comprised of emotional, sexual, and physical abuse severity, ER strategies limited access to emotion regulation strategies, NSSI non-suicidal self-injury (0 = absence; 1 = presence), se standard error, CI confidence interval for standardized parameter estimate

rather, perceived themselves to be limited in their ability to access ER strategies, it will be important for future studies to utilize multi-method measures of ER difficulties. Third, future studies should strive to consider how one’s social context may influence subsequent SITB engagement by assessing the nature of the relationship between the child and the source of threat (i.e., the perpetrator of the abuse). For example, past research has found that, perhaps unsurprisingly, chronic abuse by a parent or immediate family member is linked to more severe psychological consequences than a single exposure by someone unknown to the child or outside the family (Gómez, 2019).

### Clinical Implications

Conceptualizing ER as a key etiological process underlying SITBs is consistent with extensive research documenting ER strategies as a core mechanism of change underlying

Dialectical Behavior Therapy (DBT), the most efficacious empirically supported treatment for SITBs in adolescents (Linehan et al., 1993; Rathus & Miller, 2002). Linehan’s biosocial model contends that an adolescent’s heightened, biologically driven emotional vulnerability interacts with an invalidating environment, ultimately resulting in myriad ER skills deficit. These deficits, in turn, drive engagement in life-threatening behaviors such as SITBs. Experiencing overt threat constitutes one of the most extreme manifestations of an invalidating environment. By altering the developing child’s sense of safety, security, and physiology, childhood abuse directly contributes to ER problems. Over time, these dynamic transactions between one’s biology and a pathological environmental context can inadvertently lead to the onset and maintenance of SITBs in adolescence. However, targeting ER difficulties by helping teens learn, select, and practice adaptive ER skills may decrease SITBs. Additionally, developing a broad repertoire of ER

strategies will invariably support adolescents who engage in exposure-based, empirically supported treatments such as Adolescent Dialectical Behavior Therapy (Rathus & Miller, 2014). Given the high prevalence of childhood maltreatment and level of comorbidity among psychiatrically hospitalized adolescents, clinicians may also consider using the transdiagnostic Unified Protocol for Adolescents (Ehrenreich et al., 2009) when working with this population.

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## Compliance with Ethical Standards

**Conflicts of Interest** None.

**Ethical Approval** This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the the Rhode Island Hospital Institutional Review Board.

**Informed Consent** Informed consent was obtained from parents/legal guardians and child assent was obtained from all adolescent participants.

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