



# Fluctuations in emotion regulation as a mechanism linking stress and internalizing psychopathology among adolescents: An intensive longitudinal study

Yuri-Grace B. Ohashi<sup>a,\*</sup>, Alexandra M. Rodman<sup>b</sup>, Katie A. McLaughlin<sup>a,c</sup>

<sup>a</sup> Department of Psychology, Harvard University, Cambridge, MA, USA

<sup>b</sup> Department of Psychology, Northeastern University, Boston, MA, USA

<sup>c</sup> Ballmer Institute, University of Oregon, Portland, OR, USA

## ARTICLE INFO

### Keywords:

Stress  
Emotion regulation  
Depression  
Anxiety  
Adolescence  
Longitudinal

## ABSTRACT

Stressful life events (SLEs) are tightly coupled with the emergence of anxiety and depression symptoms among adolescents, but the mechanisms underlying this relationship remain poorly understood. We investigated within-person fluctuations in emotion regulation as a mechanism linking SLEs and internalizing psychopathology in an intensive longitudinal study. We examined how monthly fluctuations in SLEs were related to engagement in three emotion regulation strategies—acceptance, reappraisal, and rumination—and whether these strategies were associated with changes in internalizing symptoms in adolescents followed for one year ( $N = 30$ ;  $n = 355$  monthly observations). Bayesian hierarchical models revealed that on months when adolescents experienced more SLEs than was typical for them, they also engaged in more rumination, which, in turn, was associated with higher anxiety and depression symptoms and mediated the prospective relationship between SLEs and internalizing symptoms. In contrast, greater use of acceptance and reappraisal selectively moderated the association between stressors and internalizing symptoms, resulting in stronger links between SLEs and symptoms. These results suggest that emotion regulation strategies play different roles in the stress-psychopathology relationship. Understanding how changes in emotion regulation contribute to increases in internalizing symptoms following experiences of stress may provide novel targets for interventions aimed at reducing stress-related psychopathology.

Internalizing problems like anxiety and depression often emerge during adolescence (Hankin et al., 1998; Kessler et al., 2005; Paus et al., 2008). Among adolescents, both chronic stressors and stressful life events (SLEs) are associated with risk for developing internalizing symptoms (Chaby et al., 2015; Espejo et al., 2007; Grant et al., 2003, 2004; Larson & Ham, 1993; McLaughlin et al., 2012; M. Monroe et al., 1999). However, the presence of daily life stressors is not deterministically linked to psychopathology, as stress can also be associated with stronger coping skills or resilience (Lazarus & Folkman, 1987). This suggests the presence of other factors which may make adolescents more vulnerable to stress at times, and less so at others. Stress-related changes in emotion regulation are a candidate mechanism linking SLEs and internalizing symptoms. However, to date we have a limited understanding of how within-person fluctuations in SLEs influence use of different emotion regulation strategies, and how these variations in

emotion regulation contribute to the emergence of internalizing problems. Here, we investigate the role of emotion regulation as a potential mechanism linking SLEs and internalizing symptoms in an intensive longitudinal study of adolescents.

Emotion regulation refers to the ability to implement strategies to modify an emotional response in alignment with one's goals (Gross, 1998; Gross & John, 2003). Rumination, acceptance, and reappraisal are three emotion regulation strategies that have been frequently linked to risk for psychopathology (Aldao et al., 2010; McRae & Gross, 2020). Rumination refers to repetitive and passive focus on the causes and consequences of distress, without moving into problem solving or active coping, and it is associated with developing and maintaining symptoms of both depression and anxiety (Nolen-Hoeksema et al., 2008). Acceptance involves ceasing efforts to evaluate and change a negative event, and instead, enduring the circumstances and emotions caused by the

\* Corresponding author.

E-mail address: [yohashi@g.harvard.edu](mailto:yohashi@g.harvard.edu) (Y.-G.B. Ohashi).

<https://doi.org/10.1016/j.brat.2024.104551>

Received 17 February 2023; Received in revised form 15 April 2024; Accepted 24 April 2024

Available online 8 May 2024

0005-7967/© 2024 Elsevier Ltd. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

event (Aldao et al., 2010). Lastly, reappraisal involves thinking about a situation in a way that alters its meaning and thus modifies the emotional experience (Goldin et al., 2008; Ochsner et al., 2002). In contrast to rumination, greater use of acceptance and reappraisal are modestly negatively associated with internalizing psychopathology symptoms (Aldao et al., 2010).

Exposure to stressors can disrupt adolescents' ability to effectively regulate emotions (Evans & Kim, 2013; Repetti et al., 2002). Stress contributes to the development of repetitive thoughts, which underpin and maintain regulatory processes that may not align with a desired goal such as rumination (Michl et al., 2013). Indeed, greater exposure to stressors is associated with increased engagement in rumination over time (Adrian et al., 2019; Kim et al., 2023; McLaughlin et al., 2009; McLaughlin & Hatzenbuehler, 2009; Michl et al., 2013). Greater rumination is a mediating mechanism linking SLEs with heightened internalizing symptoms at the between-person level (Hatzenbuehler et al., 2009; McLaughlin & Hatzenbuehler, 2009; Michl et al., 2013). Conversely, increased use of acceptance and reappraisal may buffer against the increases in psychopathology following stress exposure (Troy et al., 2018). In some cases, use of acceptance and reappraisal has been shown to reduce the association of SLEs with internalizing symptoms, suggesting their potential moderating effect (Flouri & Mavroveli, 2013; Rodman et al., 2019; Troy et al., 2010). Overall, however, acceptance and reappraisal have weak—or absent—associations with stress (Stikkelbroek et al., 2016; Zuzama et al., 2023), and they also have generally weak direct associations with psychopathology (Aldao et al., 2010), meriting further investigation of these relationships. In sum, different emotion regulation strategies demonstrate varying risk and protective roles in the development of internalizing symptoms following exposure to stressors (Weissman et al., 2021).

Prior work linking emotion regulation to SLEs and anxiety and depression symptoms has largely emerged in between-person studies (Kraaij et al., 2003; McLaughlin & Hatzenbuehler, 2009; Michl et al., 2013; Stikkelbroek et al., 2016). However, recent work suggests substantially greater variability in associations between numerous psychological constructs at the within-person level than what has been commonly observed across individuals (Fisher et al., 2018). As emotion regulation varies within-individuals with time, across contexts, and in response to changes in the environment (Cole et al., 2019; McKone et al., 2022), longitudinal within-person examination of the links between stress, emotion regulation, and symptoms of psychopathology could help illuminate how these relationships unfold over time within individuals. Increases in stress are positively associated with heightened rumination at the daily level using experience-sampling (Hatzenbuehler et al., 2009). Momentary-level changes in rumination are also linked to increases in negative affect (Moberly & Watkins, 2008). Although there is theoretical reason to expect that within-person fluctuations in stress may be linked to changes in emotion regulation and, in turn, internalizing symptoms, limited work has examined these types of longitudinal associations at the within-person level.

In the current study, we utilized an intensive, longitudinal design to examine the dynamic associations between fluctuations in SLEs at the monthly level and use of acceptance, reappraisal, and rumination over the course of one year. We additionally evaluated whether within-person changes in use of these emotion regulation strategies were linked to changes in internalizing psychopathology among adolescents across one year. In pre-registered analyses, we hypothesized that within-person fluctuations in emotion regulation would reflect trends similar to those established in former studies at the between-person level. More specifically, we expected that rumination would mediate the positive relationship between SLEs and internalizing symptoms, whereas acceptance and reappraisal would have a moderating effect and weaken the relationship between SLEs and internalizing symptoms at the within-person level. Thus, we first examined whether changes in rumination, acceptance, and reappraisal served as a mechanism linking monthly fluctuations in SLEs with anxiety and depression symptoms. For

strategies that did not emerge as a mediator, we examined whether use of these strategies in a given month moderated the within-person relationship between SLEs and internalizing symptoms.

## 1. Method

### 1.1. Participants

Our sample was designed to examine within-person associations of SLEs, internalizing psychopathology, and various cognitive, social, affective, and neurobiological variables. A sample of 30 female adolescents aged 15–17 years old ( $M = 16.36$ ,  $SD = 0.73$ ) participated in a year-long longitudinal study that included 12 monthly assessments ( $n = 355$ ). Our study was well-powered to examine within-person associations with sufficient power ( $>80\%$ ) to detect small within-person effects (as small as  $\beta = 0.11$ ; see Supplement). Participants were recruited from the Seattle, Washington general community via community flyers, in-person methods (e.g., recruitment tables at community events), and an internal lab database of former eligible study participants between April 2016 and April 2018. Inclusion criteria included age 15–17 years, female sex, and English fluency. Our sample focused on adolescent girls given that this group is at elevated risk for anxiety and depression and exhibits strong coupling between stress and psychopathology (Hankin et al., 1998; Lewinsohn et al., 1995). Exclusion criteria for the study included IQ less than 80, active substance dependence, psychosis, pervasive developmental disorders (e.g., autism), MRI ineligibility (e.g., metal implants, metal braces, claustrophobia, pregnancy), psychotropic medication use, active safety concerns, and inability to commit to the 12-month study duration.

Participants included 22 who identified as White (73%), four as Asian (13%), two as Black (7%), and two as mixed race (7%). Participants' income-to-needs ratios were computed using parent-reported total household income and household size. Four participants were considered below the poverty line (i.e., income-to-needs ratio below 1; 13%), 12 had ratios between 1 and 3 (30%), 13 between 3 and 10 (33%), and one participant did not disclose household income. Mood and anxiety disorders were assessed at baseline sessions using the Kiddie Schedule for Affective Disorders and Schizophrenia (K-SADS; Kaufman et al., 1997). Over half of the sample ( $n = 18$ , 60%) had experienced a lifetime mood or anxiety disorder at the initial study visit, and 12 participants (40%) met criteria for an internalizing disorder during the year of study. We obtained written informed consent from legal guardians and written assent from adolescents. Participation was compensated in increasing monthly amounts, accruing to \$905 in possible earnings over the course of study. All procedures were approved by the International Review Board at the University of Washington.

### 1.2. Procedures

We administered assessments of SLEs, emotion regulation strategies, and internalizing symptoms at each of the 12 monthly visits. The intensive longitudinal design yielded a total of 360 possible month-level observations over the duration of the study period, of which participants attended 355 study visits (98.6% completion rate; see Table 1).

### 1.3. Assessments

#### 1.3.1. Stressful life events

Exposure to SLEs occurring in the past month were assessed during the UCLA Life Stress Interview (Hammen, 1988). This semi-structured interview assesses both chronic stress (e.g., ongoing interpersonal conflict, long-term medical conditions) as well as episodic stressors or acute life events (e.g., failing a test, breakup of a romantic relationship) using a contextual threat approach aimed to objectively measure stress impact. Widely regarded as the gold-standard approach for assessing SLEs, the interview has been extensively validated and adapted for

**Table 1**  
Descriptive statistics and ICCs for each dependent variable.

Dependent Variable	N	n	M	SD	Range	Possible range	ICC
Stress							
Stressful Life Events	30	356	2.5	3.33	0–19		0.246
Emotion Regulation							
Acceptance	30	355	5.62	1.94	2–10	2–10	0.625
Reappraisal	30	355	5.64	2.28	2–10	2–10	0.677
Rumination	30	355	5.09	1.86	2–10	2–10	0.613
Clinical Symptoms							
Generalized Anxiety	30	355	5.11	3.83	0–14	0–21	0.613
Depression	30	355	5.41	4.06	0–17	0–27	0.630

Note: *N* = number of subjects; *n* = number of observations; ICC = intraclass correlation; GAD-7 = Generalized Anxiety Disorder-7 (Spitzer et al., 2006); PHQ-9 = Patient Health Questionnaire-9 (Kroenke et al., 2001).

children and adolescents (Daley et al., 1997; Hammen, 1991; Hammen et al., 2000). Structured prompts are designed to query multiple domains of the participant's life (i.e., academics, school, peers, parents, household/extended family, neighborhood, health, finances, and discrimination). Each episodic stressor is probed to determine timing, duration, impact, and coping resources. Trained researchers objectively coded the severity of each experience for a child of that age and sex on a 9-point scale from 1 (no negative impact) to 5 (extremely severe), including half points. These values were converted to an integer scale from 0 to 8 for analytic purposes. Following prior work, we computed a total stress impact score by summing the severity scores of all reported episodic events (SLEs), which captures both number and severity of episodic stressors for the month (Hammen et al., 2000). The interview was administered at initial baseline and each of the subsequent monthly visits, measuring SLEs occurring between the monthly visits.

### 1.3.2. Emotion regulation

Emotion regulation strategy use was measured at each monthly visit using the Cognitive Emotion Regulation Questionnaire Short version (CERQ-short), an 18-item scale which assesses emotion regulation across nine different conceptual subscales (Garnefski & Kraaij, 2006). Items are scored on a Likert scale ranging from 1 ("almost never") to 5 ("almost always"), with higher scores indicating greater endorsement. The CERQ-short is a well-validated version of the full 36-item CERQ measure (Araujo et al., 2020; Garnefski & Kraaij, 2006; Ireland et al., 2017), retaining the same original nine subscales with similar reliability. The CERQ-short was selected, in particular, as the original assessment was developed specifically to measure of emotion regulation among adolescents (Garnefski & Kraaij, 2006). In pre-registered analyses, we focus on three subscales, which have been widely studied in relation to psychopathology (Aldao et al., 2010; McRae & Gross, 2020): rumination, acceptance, and reappraisal.

### 1.3.3. Internalizing psychopathology

Generalized anxiety symptoms were measured at each monthly study visit using the Generalized Anxiety Disorder-7 (GAD-7), a 7-item scale which assesses anxiety symptoms that have occurred in the preceding 2 weeks (Spitzer et al., 2006). Items are scored on a Likert scale ranging from 0 ("not at all") to 3 ("nearly every day"), with higher scores indicating greater symptom severity. The GAD-7 is a well-validated and reliable measure (Spitzer et al., 2006).

Depression symptoms were measured at each monthly study visit using the Patient Health Questionnaire-9 (PHQ-9) a 9-item scale which assesses depression symptoms that have occurred in the preceding 2 weeks (Kroenke et al., 2001). Items are scored on a Likert scale ranging from 0 ("not at all") to 3 ("nearly every day"), with higher scores indicating greater symptom severity. The PHQ-9 is a well-validated and reliable measure (Kroenke et al., 2001).

## 1.4. Statistical analysis

All hypotheses and analyses were pre-registered: <https://osf.io/wmp35/>. To determine whether fluctuations in emotion regulation mediated the association of SLEs with psychopathology, we evaluated the within-person associations of SLEs with anxiety and depression symptoms and engagement in each emotion regulation strategy, and of monthly emotion regulation strategy use with anxiety and depression symptoms. We performed a mediation analysis evaluating whether fluctuations in emotion regulation strategies served as a mechanism linking SLEs with internalizing symptoms, regardless of whether both the stress-emotion regulation and emotion regulation-psychopathology links were statistically significant (Hayes, 2009; MacKinnon et al., 2007). Emotion regulation strategies that did not mediate the relationship between stress and psychopathology were subsequently tested as potential moderators.

To disaggregate between- and within-person effects of predictors of interest, we used between-subjects centering at the year level (i.e., centering each participant's mean level across the duration of the study period, relative to the overall sample mean) and within-person centering at the monthly level (i.e., centering each participant's observations around their individual mean across the duration of the study period). This approach orthogonalizes variation in a given predictor into between- and within-person variability (Enders & Tofghi, 2007). This allowed us to test whether emotion regulation either mediates or moderates the association between within-person fluctuations in stress with internalizing symptoms while accounting for the dependent nature of our data, both in terms of temporal and trait-level associations. The base model for our analyses was as follows:

$$Y_i = \beta_0 + \beta_1 X_{1ij} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + b_{0i} + \epsilon_i$$

All regression, mediation, and moderation analyses were carried out in a Bayesian framework. This modeling approach was selected given its flexibility in computing within-person (1-1-1) mediation analyses. We conducted Bayesian hierarchical linear models with a random intercept allowed to vary across sample subjects. Nuisance covariates were included in all models to account for study month and school status (i.e., months coded 0 = out-of-school summer sessions; 1 = in-school sessions). These associations were assessed at both the current month and the subsequent month.

Models were estimated using the *brms* (Version 2.12.0; Bürkner, 2017) and *sjstats* (Version 0.18.2; Lüdtke, 2022) packages in R (Version 4.3.1; R Core Team, 2022). Weakly informative priors specifying a Gaussian distribution ( $M = 0$ ,  $SD = 10$ ) were used to represent our diffuse prior knowledge of the fixed and random effects. For each parameter, we sampled from four stationary Markov chains that approximate the posterior distribution using the Monte Carlo no U-turn sampler (Hoffman & Gelman, 2011). Each Markov chain comprised 15,000 sampling iterations, including a burn-in period of 2500 iterations, which were discarded. Convergence of the four chains to a single stationary distribution were assessed via the Gelman-Rubin convergence statistic (Gelman & Rubin, 1992). Highest posterior density (HPD) 95% credible interval (CR) for all parameters were then calculated from these samples and carried forward for inference, in which CRs that did not contain zero were considered statistically significant.

## 1.5. Mediation analyses

Bayesian hierarchical mediation models were estimated when significant associations were found between the predictor and the putative mediator, and between the mediator and outcome. Mediation models were computed with predictor (SLEs), mediator (emotion regulation), and outcomes (anxiety and depressive symptoms), all measured at the within-person level (i.e., a Level 1-1-1) by combining the coefficients from two separate Bayesian hierarchical models. The first model, from

predictor to mediator, yielded an estimate of the coefficient for the proximal indirect path (a). The second model, and the dependent variable, was regressed on the predictor and mediator, yielding coefficients for the distal indirect path (b), and the direct path (c'). Coefficients from the a and b paths were multiplied to calculate the indirect effect, and this was in turn divided by the total effect (indirect + c') to quantify the proportion of variance mediated. Next, HPD 95% CR was calculated from these samples for the indirect effect and for the proportion of variance mediated and used to determine statistical significance. We have used this Bayesian approach to estimating within-person mediation in prior studies (Rodman et al., 2020; Vidal Bustamante et al., 2020).

1.6. Moderation analyses

Emotion regulation strategies that did not mediate the relationship between stress and psychopathology were subsequently tested as moderators. Bayesian hierarchical models were estimated to test whether emotion regulation moderated the association of SLEs with anxiety or depression symptoms. Again, HPD 95% CR was calculated from these samples and used to determine statistical significance.

2. Results

We report on the significant relationships in the following text. Please note that results for all calculations (both significant and non-significant) are included in the tables provided (i.e., Tables 2–4).

2.1. SLEs and internalizing symptoms

We examined the association between fluctuations in SLEs and internalizing symptoms (Table 2). Within-person increases in SLEs were associated with increased anxiety symptoms the following month

**Table 2**  
Bayesian hierarchical model outcomes for stressful life events predicting internalizing symptoms & emotion regulation.

Model	Within-person effects					
	Same Month			Subsequent Month		
	b	SE	95% CR	b	SE	95% CR
Generalized anxiety (GAD-7)	<b>0.133</b>	<b>0.05</b>	<b>[0.04, 0.22]</b>	0.028	0.05	[-0.07, 0.13]
Depression (PHQ-9)	0.087	0.05	[-0.01, 0.18]	<b>0.129</b>	<b>0.05</b>	<b>[0.03, 0.23]</b>
Acceptance	0.004	0.02	[-0.04, 0.05]	0.004	0.02	[-0.04, 0.05]
Reappraisal	0.006	0.03	[-0.04, 0.06]	0.001	0.03	[-0.05, 0.05]
Rumination	<b>0.052</b>	<b>0.02</b>	<b>[0.01, 0.10]</b>	0.019	0.02	[-0.03, 0.06]

Model	Between-person effects					
	Same Month			Subsequent Month		
	b	SE	95% CR	b	SE	95% CR
Generalized anxiety (GAD-7)	<b>0.709</b>	<b>0.29</b>	<b>[0.13, 1.29]</b>	<b>0.728</b>	<b>0.30</b>	<b>[0.14, 1.31]</b>
Depression (PHQ-9)	<b>0.095</b>	<b>0.30</b>	<b>[0.36, 1.55]</b>	<b>0.936</b>	<b>0.30</b>	<b>[0.35, 1.53]</b>
Acceptance	<b>0.370</b>	<b>0.15</b>	<b>[0.07, 0.67]</b>	<b>0.368</b>	<b>0.15</b>	<b>[0.06, 0.67]</b>
Reappraisal	0.366	0.19	[-0.02, 0.75]	0.364	0.19	[-0.02, 0.74]
Rumination	0.125	0.16	[-0.19, 0.43]	0.122	0.16	[-0.20, 0.44]

Note: Boldface type denotes significant effects. b = unstandardized coefficient; CR = credible interval (15,000 samples); GAD-7 = Generalized Anxiety Disorder-7 (Spitzer et al., 2006); PHQ-9 = Patient Health Questionnaire-9 (Kroenke et al., 2001). We were not powered to detect between-person effects but report these results for reference.

**Table 3**  
Bayesian hierarchical model outcomes for emotion regulation predicting internalizing symptoms.

Model	Within-person effects					
	Same Month			Subsequent Month		
	b	SE	95% CR	b	SE	95% CR
Acceptance						
Generalized anxiety (GAD-7)	0.201	0.11	[-0.01, 0.41]	<b>0.278</b>	<b>0.11</b>	<b>[0.06, 0.50]</b>
Depression (PHQ-9)	0.000	0.12	[-0.23, 0.23]	0.147	0.12	[-0.09, 0.38]
Reappraisal						
Generalized anxiety (GAD-7)	0.063	0.10	[-0.14, 0.26]	-0.046	0.11	[-0.25, 0.16]
Depression (PHQ-9)	-0.102	0.10	[-0.31, 0.11]	-0.056	0.11	[-0.27, 0.16]
Rumination						
Generalized anxiety (GAD-7)	<b>0.487</b>	<b>0.11</b>	<b>[0.27, 0.70]</b>	0.138	0.12	[-0.10, 0.37]
Depression (PHQ-9)	<b>0.400</b>	<b>0.12</b>	<b>[0.17, 0.63]</b>	<b>0.359</b>	<b>0.12</b>	<b>[0.12, 0.60]</b>

Model	Between-person effects					
	Same Month			Subsequent Month		
	b	SE	95% CR	b	SE	95% CR
Acceptance						
Generalized anxiety (GAD-7)	0.351	0.38	[-0.37, 1.13]	0.393	0.39	[-0.36, 1.16]
Depression (PHQ-9)	0.253	0.41	[-0.58, 1.04]	0.232	0.42	[-0.58, 1.06]
Reappraisal						
Generalized anxiety (GAD-7)	0.206	0.31	[-0.40, 0.81]	0.216	0.32	[-0.42, 0.82]
Depression (PHQ-9)	0.144	0.34	[-0.51, 0.84]	0.127	0.34	[-0.52, 0.82]
Rumination						
Generalized anxiety (GAD-7)	<b>1.138</b>	<b>0.34</b>	<b>[0.48, 1.80]</b>	<b>1.195</b>	<b>0.33</b>	<b>[0.53, 1.85]</b>
Depression (PHQ-9)	0.722	0.40	[-0.02, 1.58]	<b>0.839</b>	<b>0.41</b>	<b>[0.02, 1.64]</b>

Note: Boldface type denotes significant effects. b = unstandardized coefficient; CR = credible interval (15,000 samples); GAD-7 = Generalized Anxiety Disorder-7 (Spitzer et al., 2006); PHQ-9 = Patient Health Questionnaire-9 (Kroenke et al., 2001). We were not powered to detect between-person effects but report these results for reference.

**Table 4**  
Bayesian hierarchical model outcomes for emotion regulation moderating stressful life events & internalizing symptoms.

Model	Within-person effects					
	Same Month			Subsequent Month		
	b	SE	95% CR	b	SE	95% CR
Generalized anxiety (GAD-7)						
Acceptance	<b>0.072</b>	<b>0.04</b>	<b>[0.00, 0.14]</b>	-0.034	0.04	[-0.11, 0.04]
Reappraisal	0.068	0.04	[-0.00, 0.14]	0.048	0.04	[-0.02, 0.12]
Depression (PHQ-9)						
Acceptance	-0.011	0.04	[-0.09, 0.06]	-0.024	0.04	[-0.10, 0.06]
Reappraisal	0.009	0.04	[-0.06, 0.08]	<b>0.073</b>	<b>0.04</b>	<b>[0.00, 0.15]</b>

Note: Boldface type denotes significant effects. b = unstandardized coefficient; CR = credible interval (15,000 samples); GAD-7 = Generalized Anxiety Disorder-7 (Spitzer et al., 2006); PHQ-9 = Patient Health Questionnaire-9 (Kroenke et al., 2001).

( $b=0.13$ ,  $CR=[0.04, 0.11]$ ) but not the subsequent month. Increases in SLEs were not associated with depression symptoms the following month but predicted worsening depression symptoms in the subsequent month ( $b=0.13$ ,  $CR=[0.03, 0.23]$ ). These results have been reported in previous papers from our group (Nook et al., 2021; Rodman et al., 2020; Vidal Bustamante et al., 2020).

### 2.2. SLEs and emotion regulation

Next, we examined the association between fluctuations in SLEs and changes in emotion regulation use (Table 2). Within-person increases in SLEs were associated with higher endorsement of rumination ( $b=0.05$ ,  $CR=[0.01, 0.10]$ ). That is, adolescents engaged in higher levels of rumination following months when they experienced more SLEs than was typical for them. Fluctuations in SLEs were not associated with changes in use of acceptance and reappraisal, or in use of emotion regulation a month later.

### 2.3. Emotion regulation and internalizing symptoms

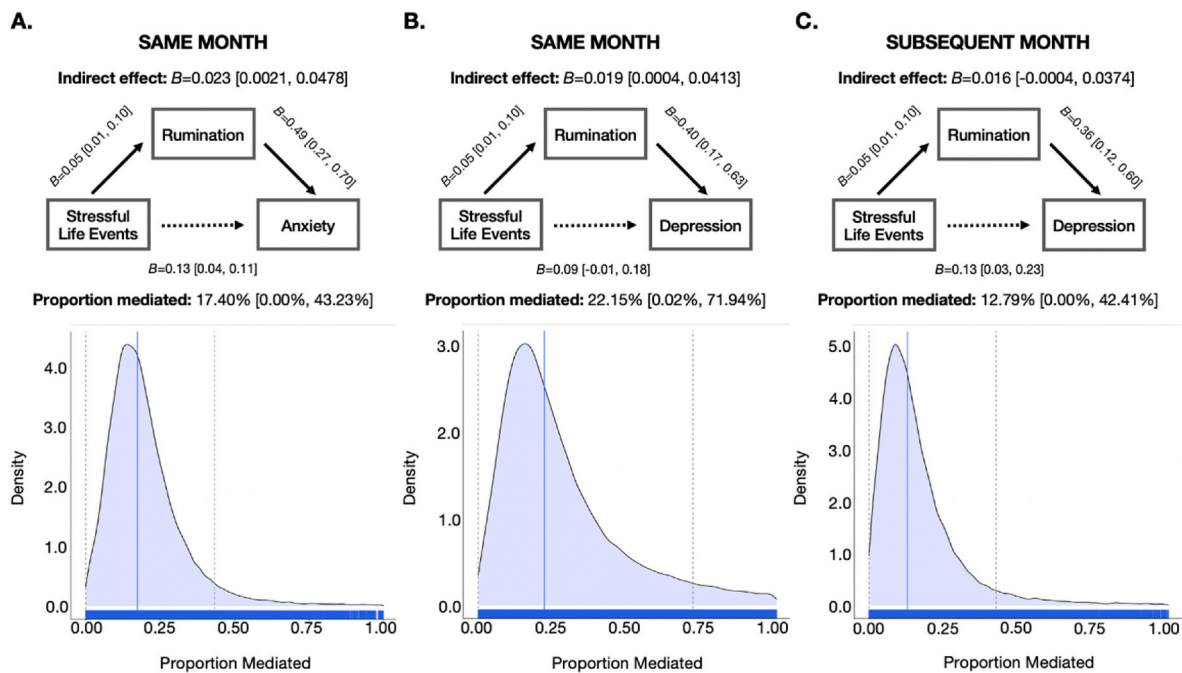
Within-person fluctuations in emotion regulation were related to changes in internalizing symptoms (Table 3). When adolescents reported greater use of rumination than typical, they also experienced higher levels of anxiety symptoms that month ( $b=0.49$ ,  $CR=[0.27, 0.70]$ ), and increased depression symptoms during both that month ( $b=0.40$ ,  $CR=[0.17, 0.63]$ ) and the subsequent month ( $b=0.36$ ,  $CR=[0.12, 0.60]$ ). Finally, adolescents who reported using more acceptance than usual exhibited increases in anxiety symptoms the subsequent month ( $b=0.28$ ,  $CR=[0.06, 0.50]$ ).

### 2.4. Emotion regulation as a mechanism linking stressful life events and internalizing symptoms

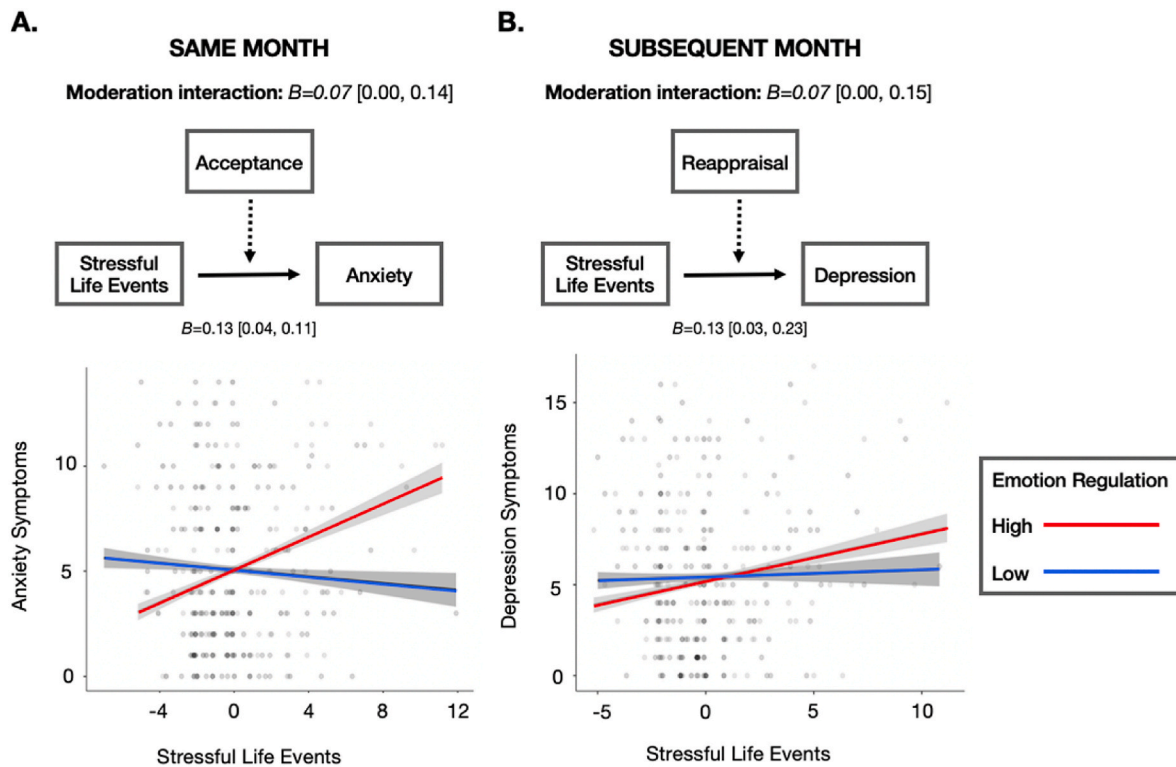
We examined all potential mediating relationships between SLEs and emotion regulation with both anxiety and depression in the same month and subsequent month. We specifically report on three of these results with both significant  $a$  and  $b$  paths in the main article: whether rumination mediated the association of SLEs with anxiety (same month) and depression symptoms (same month and subsequent month). The mediated effects of the other non-significant pathways range from 0.009 to 0.149 and are reported in the Supplement. Fluctuations in rumination partially mediated the within-person association between SLEs and anxiety symptoms in the same month, accounting for 17.4% of this relationship (Fig. 1). Additionally, fluctuations in rumination partially mediated the within-person relationship between SLEs and depression symptoms in the same month, accounting for 22.15% of the total effect (Fig. 1). Fluctuations in rumination only mediated 12.79% of the relationship between SLEs and depression symptoms in the subsequent month, for which the effect was on the cusp of significance ( $b=0.016$ ,  $CR=[-0.0004, 0.0374]$ ; Fig. 1).

### 2.5. Emotion regulation as a moderator of stress and internalizing symptoms

Given that SLEs were not associated with fluctuations in acceptance and reappraisal, we examined whether they moderated the associations between SLEs and symptoms of anxiety and depression. Interestingly, greater use of these strategies was associated with a stronger relationship between SLEs and internalizing symptoms (Table 4; Fig. 2). When participants endorsed greater use of acceptance, the positive coupling between SLEs and anxiety symptoms that month was higher ( $b=0.07$ ,  $CR=[0.00, 0.14]$ ), as was the case for reappraisal and a positive coupling between SLEs and depression symptoms in the subsequent month



**Fig. 1.** Within-persons fluctuations in rumination mediate the within-person association of SLEs with anxiety and depression symptoms. The mediation models show the degree to which fluctuations in rumination mediate the within-person association of SLEs during the month leading up to the study visit with: (a) symptoms of anxiety during the same month; (b) symptoms of depression during the same month; and (c) symptoms of depression during the subsequent month. Symptoms of anxiety during the subsequent month was not examined for mediation analysis (i.e., Fig. 1 only includes the three mediation effects plots which had significant main effects). Bayesian mediation model results are given, along with highest posterior density (HPD) 95% credible intervals (CRs), displayed in brackets (15,000 samples). Density and rug plots display the posterior density of the estimated proportion mediated (vertical blue lines indicate median estimates; vertical gray dashed lines indicate 95% CR).



**Fig. 2.** Fig 2. Within-persons fluctuations in emotion regulation (i.e., acceptance, reappraisal) and changes in stress and anxiety and depression symptoms. The moderation models show the effect of (a) SLEs on symptoms of anxiety in the same month, moderated by within-person fluctuations in endorsement of acceptance; and (b) SLEs on symptoms of depression in the subsequent month, moderated by within-persons fluctuations in endorsement of acceptance. Participant emotion regulation was grouped as “High Emotion Regulation” if  $> 0$  and “Low Emotion Regulation” if  $\leq 0$ .

( $b=0.07$ ,  $CR=[0.00, 0.15]$ ).

### 3. Discussion

Identifying mechanisms linking stress and psychopathology, as well as factors that may reduce the magnitude of this association, is critical for developing interventions to prevent stress-related psychopathology. In a pre-registered analysis, within-person increases in SLEs were associated with increases in engagement in rumination. Specifically, when adolescents reported more stressors than usual for them in a given month, they also endorsed engaging in more rumination than usual that same month. Within-person increases in rumination were associated with increases in anxiety and depression symptoms that month, and depression symptoms in the subsequent month. Greater engagement in rumination mediated the within-person association of SLEs with both anxiety and depression symptoms. In contrast, fluctuations in SLEs were unrelated to use of acceptance or reappraisal. Unexpectedly, within-person increases in use of acceptance and reappraisal magnified the link between SLEs and internalizing psychopathology.

We observe a coupling between exposure to SLEs and anxiety symptoms in the same month but a delayed emergence of depressive symptoms. When depression onsets following SLEs, it typically emerges in the 1–6 months following the stressor (Kendler et al., 1999; Mazure, 1998; S. Monroe and Reid, 2009)—consistent with our findings in which SLEs are significantly associated with increased depression symptoms in the subsequent month.

The associations between stressors and rumination and between rumination and internalizing symptoms in our study at the within-person level mirror findings from between-person studies. Within-person increases in SLEs were associated with increases in rumination. In turn, increases in rumination were associated with increases in both anxiety and depression that same month, as well as elevated depression symptoms the subsequent month (Aldao et al., 2010; McLaughlin et al.,

2011; McLaughlin & Nolen-Hoeksema, 2011; Nolen-Hoeksema & Aldao, 2011). As hypothesized, rumination mediated the within-person association of stressors with internalizing symptoms, which replicates and extends between-person findings (Hatzenbuehler et al., 2009; McLaughlin et al., 2009; Michl et al., 2013).

Whereas prior research has observed consistent associations between SLEs and rumination, stress may not be as likely to increase engagement in reappraisal and acceptance. Indeed, prior studies have similarly found non-significant association at the between-person level between stressors and reappraisal use (Troy et al., 2017). Our findings provide similar evidence at the within-person level. We also did not observe a significant association of reappraisal with anxiety or depression symptoms in either the same month or subsequent month. Though such associations have been demonstrated previously at the between-person level (Chahar Mahali et al., 2021; Deplancke et al., 2022) reappraisal has not been consistently associated with significant changes in either anxiety or depression symptoms over time at the within-person level (Brozovich et al., 2015; Everaert & Joormann, 2020). This may suggest that while individuals who use reappraisal more on average also report less anxiety and depression symptoms on average than those who do use reappraisal less frequently, the same relationship does not exist at the within-person level. At the within-person level, adolescents may variably endorse using acceptance and reappraisal when faced with life stress. There may be certain types of life stressors that elicit engagement in acceptance and reappraisal to cope, or certain times when these strategies are less accessible. Further, there may be instances for which acceptance and reappraisal are more adaptive, and others in which they are rather maladaptive (e.g., engaging in acceptance when the stressor would benefit from problem-solving). This might suggest that for a given individual, there are instances or times during which use of acceptance and reappraisal are associated with more positive outcomes, and others when they are linked to increases in depression and anxiety (Aldao, 2013). Overall, the possibility stressor-dependent and time-variant

relationships supports the absence of mechanistic relationships between acceptance and reappraisal strategies with stress and internalizing symptoms.

In subsequent moderation analyses, adolescents who endorsed greater use of acceptance and reappraisal also experienced an *increase* in internalizing symptoms following an uptick in stressors. These findings were counterintuitive to our hypothesis that these regulatory processes would reduce the magnitude of the association between exposure to SLEs and internalizing symptoms (Compas et al., 2017; Flouri & Mavroveli, 2013; Rodman et al., 2019; Troy et al., 2010). Our findings could suggest that the within-person links between these emotion regulation strategies and internalizing symptoms diverge from between-person observations, a pattern that has been documented in a range of psychological constructs (Fisher et al., 2018). Though individuals who regulate their emotions using strategies like acceptance and reappraisal may be less prone to endorsing internalizing symptoms on average compared to people who do not engage in as much emotion regulation (between-person), it is possible that heightened engagement in these regulation strategies from one's own baseline may prompt increases in anxiety and depression (within-person).

Although acceptance and reappraisal may be considered advantageous overall, it is also possible that adolescents sometimes recruit these strategies in situations where they are not appropriate for the stressor at hand. Indeed, the utility of any emotion regulation strategy is likely to be contextually dependent (Aldao, 2013), and this ability to employ different regulatory strategies depending on present demands—rather than broadly utilizing a specific strategy—has been coined *emotion regulation flexibility* (Aldao et al., 2015). Individuals with depression demonstrate lower emotion regulation flexibility and a broader diversity of traditionally maladaptive emotion regulation strategies (Wen et al., 2021). High emotion regulation flexibility has been associated with improved well-being and emotional functioning among individuals with anxiety (Conroy et al., 2020), and attenuated PTSD symptoms following trauma exposure (Levy-Gigi et al., 2016). Some previous research highlights contextual dependencies with stressor controllability or personal agency that make some emotion regulation strategies more, or less, beneficial in a specific situation (Forsythe & Compas, 1987; McKone et al., 2022; Wenzel et al., 2020). For example, an individual faced with academic difficulties may recruit acceptance strategies when, instead, they would benefit more from attempting to problem-solve and change the situation. Regarding reappraisal, it is possible that when a stressful event is reappraised with the expectation that the situation will improve, greater disappointment may occur when the situation is unchanged. In the context of our findings, the positive moderating effect we observe at the within-person level could reflect that when individuals are faced with more SLEs than usual, those who overutilize acceptance and reappraisal strategies—i.e., attempt to regulate their emotions using a strategy that is unfit for the stressor and goal—may not be successful in regulating and thus still experience heightened anxiety and depression symptoms.

Critically, emotion regulation flexibility has important implications for prevention and intervention efforts, as it indicates that emotion regulation strategies like acceptance and reappraisal—which are traditionally employed in affective therapies—may not *always* be useful in every context or for every individual. Further research investigating emotion regulation flexibility and the contextual qualities of stressful experiences would provide valuable insights regarding the universal, versus specific, benefits of different emotion regulation strategies in various situations. Clinical implications of these broader findings may point us to primarily target and reduce rumination, rather than to teach patients to practice acceptance and reappraisal. As such, forthcoming research has developed CBT interventions to specifically target rumination (Watkins, 2015). Also, as our findings suggest that rumination meaningfully links stress with internalizing symptoms on the individual level, rumination-based intervention methods may benefit anyone regardless of clinical risk level.

Our work involves several notable strengths. The most novel aspect of this work lies in the within-person design. While most questions are inherently concerned with within-person effects, most research utilizes between-person methods. Our approach allows us to address how processes like exposure to stress, emotion regulation, and internalizing symptoms vary and relate to one another over time within-individuals. Another notable strength is our use of the UCLA Life Stress Interview (Hammen, 1988), a well-validated measure designed to capture the impact of SLEs using a contextual threat approach (Cohen et al., 1997; Dohrenwend & Shrout, 1985; Monroe, 2008). Unlike stress checklists that involve meaningful reporting biases and for which responses may be heavily influenced by subjective appraisals to an event, the UCLA Life Stress Interview provides more objective evaluation of the severity of life events by taking into consideration the context in which they occur and coding severity by trained researchers (Cohen et al., 1997; Monroe, 2008).

Overall, our findings should be considered alongside the following limitations. First, although we focus on within-person associations across 12 monthly assessments, our sample was small and only included older female adolescents. We deliberately designed our study to include females between the ages of 15–17 years of age to both capture a group at particular risk for internalizing psychopathology (Hankin et al., 1998; Lewinsohn et al., 1995), though notably the sample encompasses community members representative of a wide range of risk for psychopathology and socioeconomic status. However, the restricted demographics of our sample limit the representativeness of our findings beyond adolescent females. It will be important for future work to replicate these analyses in larger samples with more diversity across age, sex, and other characteristics. Additionally, the smaller sample size means we are not powered to draw conclusions regarding between-person associations in our variables of interest, nor are we able to discern whether our within-person findings vary across subgroups of individuals. Second, another possible limitation of the present study is our examination of only three emotion regulation strategies. Though rumination, appraisal, and reappraisal are among the most well-studied strategies, other emotion regulation strategies may also underlie the link between SLEs and internalizing symptoms, such as suppression (Hatzembuehler et al., 2009). Last, we assessed emotion regulation using the self-report CERQ-short, a well-established and validated tool for measuring these constructs among adolescents (Araujo et al., 2020; Garnefski & Kraaij, 2006; Ireland et al., 2017). Still, we highlight the fact that our selected measure of emotion regulation can only capture self-reported endorsement for each strategy and does not provide information on how successful participants were in recruiting each of these strategies. We note the lack of an emotion regulation performance assessment may limit the interpretability of these findings. The link between emotion regulation use and internalizing symptoms could indeed be due to strategy use as self-reported, or from a deficit or lack of success applying the respective strategy. Future studies may address this limitation by including additional self-report measures, ecological momentary assessment surveys, physiological or neural methods.

#### 4. Conclusion

We examined how rumination, acceptance, and reappraisal influence the link between SLEs and internalizing symptoms in a high-frequency longitudinal study of adolescents followed monthly for an entire year. Within-person fluctuations in rumination served as a mechanism linking stressors with both anxiety and depression symptoms, which is consistent with findings observed in between-person studies. We also observed that fluctuations in acceptance and reappraisal strengthened the association between stressors and internalizing symptoms, which contrasts with findings at the between-person level and merits replication in future studies. Ultimately, these insights provide novel contributions to our understanding of the dynamic links between SLEs, engagement in emotion regulation strategies, and internalizing symptoms as they

unfold for an individual over time.

### CRedit authorship contribution statement

**Yuri-Grace B. Ohashi:** Writing – review & editing, Writing – original draft, Visualization, Formal analysis, Conceptualization. **Alexandra M. Rodman:** Writing – review & editing, Supervision, Resources, Formal analysis. **Katie A. McLaughlin:** Writing – review & editing, Supervision, Resources, Project administration, Investigation, Funding acquisition, Conceptualization.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

The authors have made the data available on Open Science Framework at <https://osf.io/wmp35/>

### Acknowledgements

This paper has been posted as a preprint on PsyArXiv [10.31234/osf.io/vkbw9]. This research was funded by a Rising Star Award from One Mind and AIM Youth Mental Health to K.M., and the National Institute of Mental Health to K.M. (R56-MH119194; R37-MH119194) and to A.R. (K99-MH126163).

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.brat.2024.104551>.

### References

- Adrian, M., Jenness, J. L., Kuehn, K. S., Smith, M. R., & McLaughlin, K. A. (2019). Emotion regulation processes linking peer victimization to anxiety and depression symptoms in adolescence. *Development and Psychopathology*, 31(3), 999–1009. <https://doi.org/10.1017/S0954579419000543>
- Aldao, A. (2013). The future of emotion regulation research: Capturing context. *Perspectives on Psychological Science*, 8(2), 155–172. <https://doi.org/10.1177/1745691612459518>
- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, 30(2), 217–237. <https://doi.org/10.1016/j.cpr.2009.11.004>
- Aldao, A., Sheppes, G., & Gross, J. J. (2015). Emotion regulation flexibility. *Cognitive Therapy and Research*, 39(3), 263–278. <https://doi.org/10.1007/s10608-014-9662-4>
- Araujo, A. P. D. C., Gadelha, M. J. N., & Melo, R. L. P. D. (2020). Evidence of validity, reliability and psychometric parameters of the items of the Cognitive Emotion Regulation Questionnaire-Short (CERQ-Short). *Psico-USF*, 25(3), 547–559. <https://doi.org/10.1590/1413-82712020250312>
- Brozovich, F. A., Goldin, P., Lee, I., Jazaieri, H., Heimberg, R. G., & Gross, J. J. (2015). The effect of rumination and reappraisal on social anxiety symptoms during cognitive-behavioral therapy for social anxiety disorder: Rumination, reappraisal, and social anxiety. *Journal of Clinical Psychology*, 71(3), 208–218. <https://doi.org/10.1002/jclp.22132>
- Bürkner, P.-C. (2017). brms: An R package for Bayesian multilevel models using stan. *Journal of Statistical Software*, 80(1). <https://doi.org/10.18637/jss.v080.i01>
- Chaby, L. E., Cavigelli, S. A., Hirrlinger, A. M., Caruso, M. J., & Braithwaite, V. A. (2015). Chronic unpredictable stress during adolescence causes long-term anxiety. *Behavioural Brain Research*, 278, 492–495. <https://doi.org/10.1016/j.bbr.2014.09.003>
- Chahar Mahali, S., Beshai, S., & Wolfe, W. L. (2021). The associations of dispositional mindfulness, self-compassion, and reappraisal with symptoms of depression and anxiety among a sample of Indigenous students in Canada. *Journal of American College Health*, 69(8), 872–880. <https://doi.org/10.1080/07448481.2020.1711764>
- Cohen, S., Kessler, R. C., & Gordon, L. U. (Eds.). (1997). *Measuring stress: A guide for health and social scientists*. Oxford University Press.
- Cole, P. M., Ashana Ramsook, K., & Ram, N. (2019). Emotion dysregulation as a dynamic process. *Development and Psychopathology*, 31(3), 1191–1201. <https://doi.org/10.1017/S0954579419000695>
- Compas, B. E., Jaser, S. S., Bettis, A. H., Watson, K. H., Gruhn, M. A., Dunbar, J. P., Williams, E., & Thigpen, J. C. (2017). Coping, emotion regulation, and psychopathology in childhood and adolescence: A meta-analysis and narrative review. *Psychological Bulletin*, 143(9), 939–991. <https://doi.org/10.1037/bul0000110>
- Conroy, K., Curtiss, J. E., Barthel, A. L., Lubin, R., Wieman, S., Bui, E., Simon, N. M., & Hofmann, S. G. (2020). Emotion regulation flexibility in Generalized anxiety disorder. *Journal of Psychopathology and Behavioral Assessment*, 42(1), 93–100. <https://doi.org/10.1007/s10862-019-09773-8>
- Daley, S. E., Hammen, C., Burge, D., Davila, J., Paley, B., Lindberg, N., & Herzberg, D. S. (1997). Predictors of the Generation of episodic stress: A longitudinal study of late adolescent women. *Journal of Abnormal Psychology*, 106(2), 251–259.
- Deplancke, C., Somerville, M. P., Harrison, A., & Vuillier, L. (2022). It's all about beliefs: Believing emotions are uncontrollable is linked to symptoms of anxiety and depression through cognitive reappraisal and expressive suppression. *Current Psychology*. <https://doi.org/10.1007/s12144-022-03252-2>
- Dohrenwend, B. P., & Shrout, P. E. (1985). "Hassles" in the Conceptualization and Measurement of life stress variables. *American Psychologist*.
- Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods*, 12(2), 121–138. <https://doi.org/10.1037/1082-989X.12.2.121>
- Espejo, E. P., Hammen, C. L., Connolly, N. P., Brennan, P. A., Najman, J. M., & Bor, W. (2007). Stress sensitization and adolescent depressive severity as a function of childhood adversity: A link to anxiety disorders. *Journal of Abnormal Child Psychology*, 35(2), 287–299. <https://doi.org/10.1007/s10802-006-9090-3>
- Evans, G. W., & Kim, P. (2013). Childhood poverty, chronic stress, self-regulation, and coping. *Child Development Perspectives*, 7(1), 43–48. <https://doi.org/10.1111/cdep.12013>
- Everaert, J., & Joormann, J. (2020). Emotion regulation habits related to depression: A longitudinal investigation of stability and change in repetitive negative thinking and positive reappraisal. *Journal of Affective Disorders*, 276, 738–747. <https://doi.org/10.1016/j.jad.2020.07.058>
- Fisher, A. J., Medaglia, J. D., & Jeronimus, B. F. (2018). Lack of group-to-individual generalizability is a threat to human subjects research. *Proceedings of the National Academy of Sciences*, 115(27). <https://doi.org/10.1073/pnas.1711978115>
- Flouri, E., & Mavroveli, S. (2013). Adverse life events and emotional and Behavioural problems in adolescence: The role of coping and emotion regulation: Adverse life events and resilience in adolescence. *Stress and Health*, 29(5), 360–368. <https://doi.org/10.1002/smi.2478>
- Forsythe, C. J., & Compas, B. E. (1987). Interaction of cognitive appraisals of stressful events and coping: Testing the Goodness of Fit hypothesis. *Cognitive Therapy and Research*, 11(4), 473–485. <https://doi.org/10.1007/BF01175357>
- Garnefski, N., & Kraaij, V. (2006). Cognitive emotion regulation questionnaire – development of a short 18-item version (CERQ-short). *Personality and Individual Differences*, 41(6), 1045–1053. <https://doi.org/10.1016/j.paid.2006.04.010>
- Gelman, A., & Rubin, D. B. (1992). Inference from iterative Simulation using multiple Sequences. *Statistical Science*, 7(4), 457–472. <https://doi.org/10.1214/ss/1177011136>
- Goldin, P. R., McRae, K., Ramel, W., & Gross, J. J. (2008). The neural bases of emotion regulation: Reappraisal and suppression of negative emotion. *Biological Psychiatry*, 63(6), 577–586. <https://doi.org/10.1016/j.biopsych.2007.05.031>
- Grant, K. E., Compas, B. E., Stuhlmacher, A. F., Thurm, A. E., McMahon, S. D., & Halpert, J. A. (2003). Stressors and child and adolescent psychopathology: Moving from markers to mechanisms of risk. *Psychological Bulletin*, 129(3), 447–466. <https://doi.org/10.1037/0033-2909.129.3.447>
- Grant, K. E., Compas, B. E., Thurm, A. E., McMahon, S. D., & Gipson, P. Y. (2004). Stressors and child and adolescent psychopathology: Measurement issues and prospective effects. *Journal of Clinical Child and Adolescent Psychology*, 33(2), 412–425. [https://doi.org/10.1207/s15374424jccp3302\\_23](https://doi.org/10.1207/s15374424jccp3302_23)
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2, 271–299. <https://doi.org/10.1037/1089-2680.2.3.271>
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85(2), 348–362. <https://doi.org/10.1037/0022-3514.85.2.348>
- Hammen, C. (1988). Self-cognitions, stressful events, and the prediction of depression in children of depressed mothers. *Journal of Abnormal Child Psychology*, 16(3), 347–360. <https://doi.org/10.1007/BF00913805>
- Hammen, C. (1991). Generation of stress in the course of Unipolar depression. *Journal of Abnormal Psychology*, 100(4), 555–561.
- Hammen, C., Henry, R., & Daley, S. E. (2000). Depression and sensitization to stressors among young women as a function of childhood adversity. *Journal of Consulting and Clinical Psychology*, 68(5), 782–787. <https://doi.org/10.1037/0022-006X.68.5.782>
- Hankin, B. L., Abramson, L. Y., Moffitt, T. E., Silva, P. A., McGee, R., & Angell, K. E. (1998). Development of depression from Preadolescence to Adulthood: Emerging Gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology*, 107(1), 128–140. <https://doi.org/10.1037/0021-843X.107.1.128>
- Hatzenbuehler, M. L., Nolen-Hoeksema, S., & Dovidio, J. (2009). How does Stigma "Get under the Skin"? The mediating role of emotion regulation. *Psychological Science*, 20(10), 1282–1289. <https://doi.org/10.1111/j.1467-9280.2009.02441.x>
- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new Millennium. *Communication Monographs*, 76(4), 408–420. <https://doi.org/10.1080/03637750903310360>
- Hoffman, M. D., & Gelman, A. (2011). *The No-U-turn sampler: Adaptively Setting path Lengths in Hamiltonian Monte Carlo* (arXiv:1111.4246). [arXiv:1111.4246](http://arxiv.org/abs/1111.4246).

- Ireland, M. J., Clough, B. A., & Day, J. J. (2017). The cognitive emotion regulation questionnaire: Factorial, convergent, and criterion validity analyses of the full and short versions. *Personality and Individual Differences, 110*, 90–95. <https://doi.org/10.1016/j.paid.2017.01.035>
- Kaufman, J., Birmaher, B., Brent, D., Rao, U., Flynn, C., Moreci, P., Williamson, D., & Ryan, N. (1997). Schedule for affective disorders and Schizophrenia for school-age children-present and lifetime version (K-SADS-PL): Initial reliability and validity data. *Journal of the American Academy of Child & Adolescent Psychiatry, 36*(7), 980–988. <https://doi.org/10.1097/00004583-199707000-00021>
- Kendler, K. S., Karkowski, L. M., & Prescott, C. A. (1999). Causal relationship between stressful life events and the onset of Major depression. *American Journal of Psychiatry, 156*(6), 837–841. <https://doi.org/10.1176/ajp.156.6.837>
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime Prevalence and age-of-Onset distributions of DSM-IV disorders in the National Comorbidity survey replication. *Archives of General Psychiatry, 62*(6), 593. <https://doi.org/10.1001/archpsyc.62.6.593>
- Kim, S. G., Weissman, D. G., Sheridan, M. A., & McLaughlin, K. A. (2023). Child abuse and automatic emotion regulation in children and adolescents. *Development and Psychopathology, 35*(1), 157–167. <https://doi.org/10.1017/S0954579421000663>
- Kraaij, V., Garnefski, N., De Wilde, E. J., Dijkstra, A., Gebhardt, W., Maes, S., & Ter Doest, L. (2003). Negative life events and depressive symptoms in late adolescence: Bonding and cognitive coping as Vulnerability factors? *Journal of Youth and Adolescence, 32*(3), 185–193. <https://doi.org/10.1023/A:1022543419747>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606–613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- Larson, R., & Ham, M. (1993). Stress and “Storm and stress” in early adolescence: The relationship of negative events with Dysphoric affect. *Developmental Psychology, 29*(1), 130–140. <https://doi.org/10.1037/0012-1649.29.1.130>
- Levy-Gigi, E., Bonanno, G. A., Shapiro, A. R., Richter-Levin, G., Kéri, S., & Sheppes, G. (2016). Emotion regulatory flexibility Sheds Light on the Elusive relationship between Repeated Traumatic exposure and Posttraumatic stress disorder symptoms. *Clinical Psychological Science, 4*(1), 28–39. <https://doi.org/10.1177/2167702615577783>
- Lewinsohn, P. M., Gotlib, I. H., & Seeley, J. R. (1995). Adolescent psychopathology: IV. Specificity of Psychosocial risk factors for depression and substance abuse in older adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry, 34*(9), 1221–1229. <https://doi.org/10.1097/00004583-199509000-00021>
- Lüdtke, D. (2022). sjstats: Statistical Functions for regression models [Computer software] Version 0.18.2. <https://CRAN.R-project.org/package=sjstats>.
- MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology, 58*(1), 593–614. <https://doi.org/10.1146/annurev.psych.58.110405.085542>
- Mazure, C. M. (1998). Life stressors as risk factors in depression. *Clinical Psychology: Science and Practice, 5*(3), 291–313. <https://doi.org/10.1111/j.1468-2850.1998.tb00151.x>
- McKone, K. M. P., Edershire, E. A., Ladouceur, C. D., & Silk, J. S. (2022). Real-world flexibility in adolescent girls’ emotion regulation strategy selection: An investigation of strategy switching. *Development and Psychopathology, 1–15*. <https://doi.org/10.1017/S0954579422001079>
- McLaughlin, K. A., Greif Green, J., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2012). Childhood Adversities and first onset of psychiatric disorders in a National sample of US adolescents. *Archives of General Psychiatry, 69*(11), 1151. <https://doi.org/10.1001/archgenpsychiatry.2011.2277>
- McLaughlin, K. A., & Hatzenbuehler, M. L. (2009). Mechanisms linking stressful life events and Mental health problems in a prospective, community-based sample of adolescents. *Journal of Adolescent Health, 44*(2), 153–160. <https://doi.org/10.1016/j.jadohealth.2008.06.019>
- McLaughlin, K. A., Hatzenbuehler, M. L., & Hilt, L. M. (2009). Emotion dysregulation as a mechanism linking peer victimization to internalizing symptoms in adolescents. *Journal of Consulting and Clinical Psychology, 77*(5), 894–904. <https://doi.org/10.1037/a0015760>
- McLaughlin, K. A., Hatzenbuehler, M. L., Mennin, D. S., & Nolen-Hoeksema, S. (2011). Emotion dysregulation and adolescent psychopathology: A prospective study. *Behaviour Research and Therapy, 49*(9), 544–554. <https://doi.org/10.1016/j.brat.2011.06.003>
- McLaughlin, K. A., & Nolen-Hoeksema, S. (2011). Rumination as a transdiagnostic factor in depression and anxiety. *Behaviour Research and Therapy, 49*(3), 186–193. <https://doi.org/10.1016/j.brat.2010.12.006>
- McRae, K., & Gross, J. J. (2020). Emotion regulation. *Emotion, 20*(1), 1–9. <https://doi.org/10.1037/emo0000703>
- Michl, L. C., McLaughlin, K. A., Shepherd, K., & Nolen-Hoeksema, S. (2013). Rumination as a mechanism linking stressful life events to symptoms of depression and anxiety: Longitudinal evidence in early adolescents and adults. *Journal of Abnormal Psychology, 122*(2), 339–352. <https://doi.org/10.1037/a0031994>
- Moberly, N. J., & Watkins, E. R. (2008). Ruminative self-focus and negative affect: An experience sampling study. *Journal of Abnormal Psychology, 117*(2), 314–323. <https://doi.org/10.1037/0021-843X.117.2.314>
- Monroe, S. M. (2008). Modern approaches to conceptualizing and measuring human life stress. *Annual Review of Clinical Psychology, 4*(1), 33–52. <https://doi.org/10.1146/annurev.clinpsy.4.022007.141207>
- Monroe, S. M., & Reid, M. W. (2009). Life stress and Major depression. *Current Directions in Psychological Science, 18*(2), 68–72. <https://doi.org/10.1111/j.1467-8721.2009.01611.x>
- Monroe, M., Rohde, P., Seeley, J. R., & Lewinsohn, P. M. (1999). Life events and depression in adolescence: Relationship Loss as a prospective risk factor for first onset of Major depressive disorder. *Journal of Abnormal Psychology, 108*(4), 606–614.
- Nolen-Hoeksema, S., & Aldao, A. (2011). Gender and age differences in emotion regulation strategies and their relationship to depressive symptoms. *Personality and Individual Differences, 51*(6), 704–708. <https://doi.org/10.1016/j.paid.2011.06.012>
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science, 3*(5), 400–424. <https://doi.org/10.1111/j.1745-6924.2008.00088.x>
- Nook, E. C., Flournoy, J. C., Rodman, A. M., Mair, P., & McLaughlin, K. A. (2021). High emotion differentiation buffers against internalizing symptoms following exposure to stressful life events in adolescence: An intensive longitudinal study. *Clinical Psychological Science, 9*(4), 699–718.
- Ochsner, K. N., Bunge, S. A., Gross, J. J., & Gabrieli, J. D. E. (2002). Rethinking feelings: An fMRI study of the cognitive regulation of emotion. *Journal of Cognitive Neuroscience, 14*(8), 1215–1229. <https://doi.org/10.1162/089892902760807212>
- Paus, T., Keshavan, M., & Giedd, J. N. (2008). Why do many psychiatric disorders emerge during adolescence? *Nature Reviews Neuroscience, 9*(12), 947–957. <https://doi.org/10.1038/nrn2513>
- R Core Team. (2022). R: A language and environment for statistical ## computing. *R Foundation for Statistical Computing, 4*(3.1) [Computer software] <https://www.R-project.org/>.
- Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin, 128*, 330–336.
- Rodman, A. M., Jenness, J. L., Weissman, D. G., Pine, D. S., & McLaughlin, K. A. (2019). Neurobiological markers of resilience to depression following childhood Maltreatment: The role of neural Circuits supporting the cognitive Control of emotion. *Biological Psychiatry, 86*(6), 464–473. <https://doi.org/10.1016/j.biopsych.2019.04.033>
- Rodman, A. M., Vidal Bustamante, C. M., Dennison, M., Flournoy, J. C., Coppersmith, D. D. L., Nook, E. C., Worthington, S., Mair, P., & McLaughlin, K. A. (2020). A year in the social life of a teenager: Within-person fluctuations in stress, phone communication, and anxiety and depression. *PsyArXiv*. <https://doi.org/10.31234/osf.io/aekjt> [Preprint].
- Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing Generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine, 166*(10), 1092. <https://doi.org/10.1001/archinte.166.10.1092>
- Stikkelbroek, Y., Bodden, D. H. M., Kleinjan, M., Reijnders, M., & Van Baar, A. L. (2016). Adolescent depression and negative life events, the mediating role of cognitive emotion regulation. *PLoS One, 11*(8), Article e0161062. <https://doi.org/10.1371/journal.pone.0161062>
- Troy, A. S., Ford, B. Q., McRae, K., Zorola, P., & Mauss, I. B. (2017). Change the things you can: Emotion regulation is more beneficial for people from lower than from higher socioeconomic status. *Emotion, 17*(1), 141–154. <https://doi.org/10.1037/emo0000210>
- Troy, A. S., Shallcross, A. J., Brunner, A., Friedman, R., & Jones, M. C. (2018). Cognitive reappraisal and acceptance: Effects on emotion, physiology, and perceived cognitive costs. *Emotion, 18*(1), 58–74. <https://doi.org/10.1037/emo0000371>
- Troy, A. S., Wilhelm, F. H., Shallcross, A. J., & Mauss, I. B. (2010). Seeing the silver lining: Cognitive reappraisal ability moderates the relationship between stress and depressive symptoms. *Emotion, 10*(6), 783–795. <https://doi.org/10.1037/a0020262>
- Vidal Bustamante, C. M., Rodman, A. M., Dennison, M. J., Flournoy, J. C., Mair, P., & McLaughlin, K. A. (2020). Within-person fluctuations in stressful life events, sleep, and anxiety and depression symptoms during adolescence: A multiwave prospective study. *Journal of Child Psychology and Psychiatry, 61*(10), 1116–1125. <https://doi.org/10.1111/jcpp.13234>
- Watkins, E. (2015). Psychological treatment of depressive rumination. *Current Opinion in Psychology, 4*, 32–36. <https://doi.org/10.1016/j.copsyc.2015.01.020>
- Weissman, D. G., Rodman, A. M., Rosen, M. L., Kasparek, S., Mayes, M., Sheridan, M. A., Lengua, L. J., Meltzoff, A. N., & McLaughlin, K. A. (2021). Contributions of emotion regulation and Brain structure and function to adolescent internalizing problems and stress Vulnerability during the COVID-19 Pandemic: A longitudinal study. *Biological Psychiatry Global Open Science, 1*(4), 272–282. <https://doi.org/10.1016/j.bpsgos.2021.06.001>
- Wenzel, M., Rowland, Z., Weber, H., & Kubiak, T. (2020). A round peg in a square hole: Strategy-situation fit of intra- and interpersonal emotion regulation strategies and controllability. *Cognition & Emotion, 34*(5), 1003–1009. <https://doi.org/10.1080/02699931.2019.1697209>
- Zuzama, N., Roman-Juan, J., Fiol-Veny, A., & Balle, M. (2023). The Use of rumination and reappraisal in adolescents daily life: Links to affect and emotion regulation Style. *Child Psychiatry and Human Development, 54*(3), 837–848. <https://doi.org/10.1007/s10578-021-01302-7>