ORIGINAL ARTICLE

Risk for Depressive Symptoms Among Adolescents with a History of Adversity: Unique Role of Stress Appraisals

Megan M. Davis[1] · Divya M. Surabhi[2] · Eva H. Telzer[1] · Karen D. Rudolph[3]

Abstract

Lifetime social adversity predicts elevated depressive symptoms in adolescence. However, most adversity-exposed youth do not develop depression, highlighting the importance of examining risk and protective factors. The present study leveraged a multi-method approach, incorporating self-report, interview, and independent coding to examine whether appraisals of recent stressors moderate the effect of social adversity on depressive symptoms in 81 adolescent girls ($M_{age} = 16.30$ years, $SD = .85$). We utilized semi-structured interviews of lifetime adversity and recent stressors and semi-structured interviews and self-reports of depressive symptoms. Stress appraisals were calculated by regressing youths' subjective estimations of event stressfulness and dependence on estimations of independent coders. Lifetime social adversity predicted elevated depressive symptoms more strongly in girls who appraised interpersonal events as more stressful and dependent on their actions, providing insight into individual differences in depressive symptoms in adversity-exposed adolescents.

Lifetime Social Adversity and Adolescent Depressive Symptoms: Moderation by Stress Appraisals

Adolescence is a time of rapid change in biological, emotional, and social development, one consequence of which is an increase in depressive symptoms [1], particularly among girls [2]. Youth exposed to adversity are at particularly high risk for the development of depression during this stage [3–5]. However, the majority of youth exposed to childhood adversity do not develop depression. This multifinality in outcomes highlights the importance of examining risk and protective factors that may alter risk for psychopathology following adversity. The present study tested the novel hypothesis that adolescent girls' appraisals of personally experienced stressful events may augment or diminish the effect of adversity exposure on depressive symptoms. By examining the independent and interactive effects of adversity and appraisals of recent stressful events on depressive symptoms, this research can help identify which youth may be at greatest risk for the emergence of depression during this critical developmental period.

Social Adversity and Risk for Depression

Growing up in unsupportive or threatening environments predisposes youth to many adverse outcomes, including depression. According to developmental perspectives on early experience, such as the adaptive calibration [6, 7] and toxic stress [8] theories, adversity during childhood sensitizes the stress response system in ways that promote adaptation to threatening environments but may also overwhelm emerging coping abilities, leading to prolonged stress reactivity [9]. Adversity within the family (e.g., separation from primary caregivers, witnessing parent conflict, family financial difficulties) and peer group (e.g., friendlessness, chronic victimization, severe or ongoing conflict) may exert a particularly strong impact on risk for future depressive symptoms by depriving youth of a sense of safety and social connectedness and impairing

✉ Megan M. Davis
  davismeg@unc.edu

[1] Department of Psychology and Neuroscience, University of North Carolina at Chapel Hill, 235 E. Cameron Street, Chapel Hill, NC 27599, USA

[2] University of Illinois College of Medicine at Chicago, 1853 W. Polk Street, Chicago, IL, USA

[3] University of Illinois at Urbana-Champaign, 606 E. Daniel Street, Champaign, IL, USA

🖄 Springer

the development of interpersonal and self-regulatory skills necessary for healthy emotional development [4]. Over time, the cumulative effect of social adversity (i.e., adversity in family and peer contexts) may prime youth to react more to everyday stressors, leading to physiological [10] and emotional [11] dysregulation. This may set the stage for chronic low mood, hopelessness about the future, and eventual depression, as evidenced by a wealth of research linking adversity in family [4, 12] and peer [13, 14] contexts to subsequent depression.

Moderating Effect of Stress Appraisals

To understand multifinality in outcomes following adversity, it is essential to consider factors that amplify or mitigate the effect of social adversity on levels of depressive symptoms. Several prominent theories of depression, including cognitive [15], helplessness/hopelessness [16], and cognitive vulnerability-stress [2] models, suggest that the inferences individuals make about events moderate risk for depression in the context of social stressors. Specifically, when exposed to stress, those who attribute negative events to stable, internal causes are more likely to show elevations in depressive symptoms [17–19]. Further, these theories suggest that a history of adversity may interact with cognitive vulnerabilities (e.g., negative attitudes and attributions), such that past adversity may predict depression more strongly in youth with more versus less negative cognitive styles [2].

Despite the significant empirical attention focused on general cognitive vulnerabilities (e.g., hopelessness; [16, 17]) or interpretations of hypothetical events (e.g., negative attributional style; [18, 19]) as moderators of the effects of stress, one important and understudied cognitive vulnerability is the way individuals interpret the impact and self-relevance of events that have actually occurred in their lives (i.e., naturally occurring stressors). Coping theories suggest that appraisals of specific events (how stressful events are and whether the individual contributed to, or can change, them) influence the coping strategies individuals employ, shaping how they respond to specific stressors and altering the link between stress exposure and depression [20]. Building on these theories, a small body of research explores the discrepancy between individuals' and objective raters' appraisals of naturally occurring stressors, revealing that appraising events as particularly stressful and dependent on one's own actions, relative to the ratings of independent coders, is associated with elevated depression [21–23]. For youth with a history of adversity, having a tendency to appraise recent stressors as particularly impactful and dependent on their actions may lead to rumination about past adverse events, thereby increasing depressive symptoms relative to those with more benign stress appraisals.

Context Specificity of Appraisals

Consistent with interpersonal theories of depression [24, 25], the moderating effect of stress appraisals on risk for depression in adolescents with a history of social adversity may be especially pronounced in the context of interpersonal (e.g., fights with family or friends) versus noninterpersonal (e.g., academic difficulties) stressors. Because of their past negative social experiences, adversity-exposed youth may be especially sensitive to stressful interpersonal events and more likely to feel distress if they appraise these events as particularly impactful or personally meaningful. Relative to noninterpersonal stressors, interpersonal stressors are more closely linked to depressive symptoms [26], and lifetime social adversity sensitizes youth to the depressogenic effects of interpersonal but not noninterpersonal stressors [27], suggesting that appraisals of interpersonal events as particularly stressful and dependent may be an especially potent moderator of the effects of lifetime social adversity.

Effects of Social Adversity and Stress Appraisals in Adolescent Girls

Adolescence may be an especially important stage during which to examine the interactive effects of adversity and stress appraisals. The adolescent years are characterized by heightened emotional reactivity [28], especially in social contexts [29], as well as increases in depressive symptoms [30]. Exposure to adversity impairs the development of stress-response [31] and emotion regulation [32] systems and is associated with more emotional and physiological dysregulation [33, 34] and depression [35, 36] during adolescence. Normative adolescent development is also characterized by an increasing stability of beliefs about the self and the world [37], which may lead to rumination and elevated depressive symptoms in youth who appraise stressful life events as especially impactful and dependent on their own actions. Indeed, previous research reveals that while stressors alone predict depressive symptoms during childhood, cognitive styles [38] and appraisals of stressors [39] amplify or attenuate this effect beginning in adolescence. While adolescence is a time of heightened emotional reactivity and depressive symptoms for all youth, adolescent girls are more reactive to social stressors and prone to depression than adolescent boys [2]. The interactive effect of social adversity and stress appraisals may be especially pronounced among adolescent girls, who are more likely than boys to experience social stressors [40] and show a stronger link between interpersonal stressors and depressive symptoms [41], potentially because they are expected

to manage emotional reactions to stress in more mature ways [42, 43]. Accordingly, the present study focused on the interactive effect of social adversity and stress appraisals specifically in adolescent girls.

Study Overview

This research investigated the novel hypothesis that appraisals of recently occurring stressors, particularly interpersonal stressors, would amplify or attenuate the effect of lifetime social adversity on depressive symptoms in adolescent girls. To assess adversity and stress appraisals, we utilized intensive semi-structured interviews that allowed us to disentangle objective details about adversities and stressful events from subjective interpretations. Depressive symptoms were assessed via a semi-structured diagnostic interview and a self-report measure, allowing us to create a more comprehensive composite of depressive symptoms reflecting both clinician-based judgments and self-reported levels of symptoms in everyday life. We hypothesized that: (1) exposure to lifetime social adversity would predict elevated depressive symptoms; (2) stress appraisals would moderate this association, such that adversity would predict higher depressive symptoms in youth with higher estimations of the stressfulness and dependence of recent events relative to those with more benign stress appraisals; and (3) this moderating effect would be stronger in the context of interpersonal than noninterpersonal events.

Method

Participants and Procedures

Participants were 81 adolescent girls ($M_{age} = 16.30$ years, $SD = 0.85$, range 14.85–17.73) from several ethnic groups (65.4% White, 22.2% African American, 1.2% Asian American, 3.7% Latina/Hispanic, 7.4% multiracial/other) and socioeconomic classes (family income: $0–29,999 [18.3%], $30–59,999 [24.7%], $60–89,999 [14.8%], and more than $90,000 [30.9%]). Participants were drawn from a sample of 90 adolescent girls who participated in a larger study based on data availability. One participant from the larger study was excluded because she did not complete the lifetime adversity interview and eight were excluded because they either did not report stressful events within the past three months ($n = 7$) or did not provide stress and dependence ratings ($n = 1$), making it impossible to calculate stress and dependence estimation scores. Girls with and without relevant data did not differ in age, $t(88) = 0.50$, $p = 0.62$, ethnicity, $\chi^2(4) = 1.30$, $p = 0.86$, family income, $\chi^2(7) = 2.14$, $p = 0.95$, or depressive symptoms, $t(88) = 0.06$, $p = 0.95$. Of 81 participants, 74 reported the occurrence of interpersonal

life events and 71 reported the occurrence of noninterpersonal life events. Those included and excluded for analyses involving appraisals of interpersonal events did not differ in age, $t(88) = 0.15$, $p = 0.88$, ethnicity, $\chi^2(4) = 2.09$, $p = 0.72$, family income, $\chi^2(7) = 4.54$, $p = 0.72$, or depressive symptoms, $t(88) = -0.94$, $p = 0.35$. Similarly, those included and excluded for analyses involving appraisals of noninterpersonal events did not differ in age, $t(88) = -0.18$, $p = 0.86$, ethnicity, $\chi^2(4) = 1.23$, $p = 0.87$, family income, $\chi^2(7) = 6.58$, $p = 0.47$, or depressive symptoms, $t(88) = 0.11$, $p = 0.91$.

Adolescents were recruited from a larger study that took place in local schools. Interested families attended a two- to three-hour laboratory visit during which they completed interviews and self-report measures. Caregivers and adolescents provided written consent and assent, respectively, and youth completed a semi-structured interview to measure lifetime social adversity and stress appraisals, a diagnostic interview of depressive symptoms, and a self-report measure of depressive symptoms. Trained graduate and undergraduate students and research staff conducted the interviews and administered the questionnaire. All members of the coding teams for the adversity and life stress interviews first listened to at least five interviews and compared their codes to those of expert coders to ensure consensus. Coding of symptom severity on the diagnostic interview was conducted in consultation with a clinical psychologist. Adolescents were given cash or gift cards in exchange for their participation. All procedures were approved by the university Institutional Review Board.

Measures

Table 1 presents psychometrics of all measures.

Lifetime Social Adversity

An updated version of the lifetime adversity section of the Youth Life Stress Interview [27] was used to assess exposure to adverse events and circumstances. Interviewers first helped youth create a timeline of major events (e.g., starting school, moving houses) in their lifetimes, in order to confirm the timing of reported adversities and ensure that youth only reported on adverse events that occurred until a year before the interview (so that the timing of adversity and recent stressors did not overlap). Interviewers used a general probe to assess the occurrence of particularly adverse events or circumstances ("Has anything happened to you that has been very stressful, not just everyday problems, but something that was particularly hard for you?"). They then probed about the occurrence of specific adversities in family (e.g., "Was there ever a time when your parents or other people in your home were fighting a lot or did not get along?" "Was there ever a time when you were separated from your parents

for a long period of time or when you did not have contact with one of your parents?") and peer (e.g., "Have you been left out by the rest of the kids at school for a long period of time, when no one wanted to hang out with you?" "Have you ever had serious problems (violence, extreme arguments) with someone you were dating?") domains. Timelines were used to establish the onset and duration of each exposure, and follow-up questions provided contextual information about the impact of each adversity on the youth's life. All interviews were audio-recorded and presented to a team of graduate and undergraduate students and research staff who were trained in interview administration and coding. Based on the number and impact of adversities, the independent coding team provided two separate ratings on a 10-point scale reflecting the overall level of lifetime family and peer adversity. Scores in the present sample for family adversity ranged from 1 (youth did not report exposure to any adversity) to 9 (youth reported a history of physical abuse and witnessing domestic violence, the arrest of her father, and separation from her mother); scores in the present sample for peer adversity ranged from 1 (youth did not report exposure to any adversity) to 9 (ongoing verbal and cyber victimization, physical and mental abuse by romantic partner). The majority of youth (71%) reported exposure to at least one adverse childhood event as defined by the Centers for Disease Control and Prevention, rates in line with national estimates [44]. To establish reliability, 25% of interviews were independently coded by trained coders who had not interacted with the youth and had no knowledge of their diagnostic status. Strong reliability (intraclass correlation coefficient; ICC) was found for ratings of family (ICC=0.98) and peer (ICC=0.99) adversity. In line with a wealth of research that finds a cumulative effect of exposure to multiple types of adversity [45, 46], we created a composite score of lifetime social adversity by averaging standardized ratings of family and peer adversity.[1]

Stress Appraisals

The episodic events section of the Youth Life Stress Interview [27] was used to assess exposure to stressors in the three months prior to the interview using a timeline to ensure that the timing of recent stressors did not overlap with the timeframe probed in the lifetime adversity section. First, interviewers asked a general open-ended question about the occurrence of stressful events within the past three months (e.g., "Has anything happened in the past three months that has upset you or caused you trouble, or have there been any

big changes in your family or in your life?"). Interviewers then asked youth about the occurrence of specific stressors in several domains including academic (e.g., "Have you failed any classes?"), behavioral (e.g., "Have you received suspensions or expulsions?"), peer (e.g., "Were you excluded from something important?"), romantic (e.g., "Did you like someone who didn't like you back?") family (e.g., "Has there been problems in parents' relationship or between family members?"), and other key life domains (e.g., "Did you have problems with neighbors?" "Was there something that you really wanted but didn't get?"). Follow-up questions assessed details (e.g., consequences, duration) of the event in order to provide contextual information to coders.

For each event, adolescents rated its stressfulness ("How stressful or how much of a problem was [the event]?") and the extent to which they contributed to the event ("How much do you think that [the event] was caused by something that you did?") on a 5-point scale. All interviews were presented to a team of trained coders with no knowledge of the adolescents' subjective reactions or mental health history. The coding team provided (a) a stress rating, reflecting the negative impact that a typical adolescent in the same circumstances would experience (1=none to 5=severe); and (b) a dependence rating, reflecting the extent to which the adolescent contributed to the occurrence of the event (1=almost completely independent to 5=almost completely dependent). To establish reliability, 25% of interviews were independently coded by trained coders with no knowledge of adolescents' ratings or diagnostic status. Strong inter-rater reliability was found for ratings of episodic stress impact (ICC=0.94) and dependence (ICC=0.91). In line with past work, we calculated stress appraisals for each event by regressing adolescents' own stress ratings for each event onto those of the coding team [21, 23, 47]. We then averaged the residualized scores from each event to create an overall stressfulness and dependence appraisal score for each participant. We confirmed that these residualized scores were approximately normally distributed through visual inspection of the distributions, absence of skewness and kurtosis, and non-significance on Shapiro–Wilk tests of normality before further analyses. Higher standardized residual scores reflect overestimation of stress and dependence relative to coder ratings, allowing us to probe the role of youths' own stress and dependence appraisals adjusting for coder-rated level of stressfulness and dependence. Separate scores were created by calculating the mean of residualized scores across interpersonal (e.g., fight with a family member or friend, end of a friendship or romantic relationship) and noninterpersonal (e.g., failing a class at school, illness or injury) events, yielding four indices of stress appraisals: interpersonal stress appraisals, interpersonal dependence appraisals, noninterpersonal stress appraisals, and noninterpersonal dependence appraisals.

[1] Analyses on separate indices of family and peer adversity yielded very similar results, further supporting the use of a composite measure of lifetime social adversity for parsimony.

Depressive Symptoms

We assessed depressive symptoms with two measures. First, we administered a modified version of the Mini International Neuropsychiatric Interview (MINI-KID; [48]) to assess recent (within the past three months) symptoms of major depressive disorder (MDD) and dysthymia. The original structured interview was modified into a semi-structured format so interviewers could ask detailed follow-up questions about the timing, duration, and impact of symptoms [49]. Interviewers first probed for the presence of each DSM-5-defined symptom of MDD and then dysthymia (e.g., "At any time in the past three months, did you feel sad or depressed?") and then used a timeline of the past three months to establish the onset and duration of each symptom and its impact on the participant's life (e.g., "Did these sad, depressed feelings cause a lot of problems at home, at school, or with friends?"). These questions enabled interviewers to rate each symptom on a 2-point severity scale (0 = symptom absent, 1 = symptom present at sub-diagnostic threshold levels, 2 = symptom present at diagnostic levels). Severity scores (i.e., 0, 1, or 2) for each symptom of MDD and dysthymia were summed to create a total depressive symptom score. To establish reliability of interview coding, all interviews were audio-recorded and 25% were independently coded by a graduate student trained in diagnostic assessment who did not conduct the interview. Strong inter-rater reliability was found for the total depressive symptom score (ICC = 0.94).

Second, adolescents completed the Short Mood and Feelings Questionnaire (SMFQ; 50), a 13-item self-report measure assessing recent (within the past two weeks) depressive symptoms (e.g., "I felt unhappy or miserable"). The SMFQ was modified from a 3-point (*Never, Sometimes, Always*) to a 4-point (*Not At All, A Little Bit, Pretty Much, Very Much*) scale. A mean score was calculated ($\alpha = 0.94$). In clinical [50] and community [51] samples, the SMFQ demonstrates strong internal consistency and convergent and discriminant validity. To provide a comprehensive measure of depressive symptoms that included both interviewer-assessment and self-reported depressive symptoms, we created a composite score by standardizing and averaging the MINI depression summary score and the mean SMFQ score. Supporting the use of a composite score, interview and self-report measures overlap conceptually [52] and empirically [53], including in our sample ($r = 0.56$, $p < 0.001$).

Results

Preliminary Analyses

Among participants in the present sample, 14 (17.28%) met diagnostic criteria for MDD or Dysthymia, and an additional 15 (18.52%) reported moderate sub-threshold symptoms of

Table 1 Descriptive statistics and psychometric information for the measures

Variable	M	SD	Range
Lifetime family adversity	3.94	2.04	1–9
Lifetime peer adversity	3.03	1.98	1–9
Interpersonal stress estimation	− 0.11	0.71	− 2.11–1.32
Interpersonal dependence estimation	− 0.12	0.55	− 1–1
Noninterpersonal stress estimation	0.07	0.83	− 1.54–1.69
Noninterpersonal dependence estimation	0.10	1.01	− 2.60–2.27
Depressive symptoms (diagnostic interview)	5.57	7.38	0–34
Depressive symptoms (self-reported)	1.68	0.66	1–4

MDD or Dysthymia. These results are in line with national rates of depressive disorders among adolescent girls, who tend to be a population of particularly high risk for depression [54, 55]. Table 2 presents bivariate correlations among the variables. Depressive symptoms were positively correlated with lifetime adversity, interpersonal and noninterpersonal stress appraisals, and interpersonal dependence appraisals. Additionally, lifetime adversity was positively correlated with noninterpersonal dependence appraisals, and interpersonal stress appraisals were positively correlated with interpersonal dependence appraisals and noninterpersonal stress appraisals.

Lifetime Adversity and Stress Appraisals Predicting Depression

Separate hierarchical linear regression analyses were used to examine the independent and interactive contribution of lifetime adversity and each of the four stress appraisal scores to adolescent depressive symptoms (Table 3). Variables were standardized, and their interaction was calculated as the product of the standardized variables. Main effects of lifetime adversity and stress appraisals were entered in the first step, and the interaction was entered in the second step. Significant interactions were decomposed using simple slopes analysis at relatively low (-1 SD), moderate (mean), and high (+ 1 SD) levels of stress or dependence appraisals [56].

Lifetime Adversity x Interpersonal Stress Appraisals

The regression analysis revealed significant main effects of lifetime adversity and interpersonal stress appraisals and a significant lifetime adversity x interpersonal stress appraisals interaction (Table 3). Decomposition of the interaction revealed that more adversity predicted higher levels of depressive symptoms in girls with relatively high ($\beta = 0.58$, $t(70) = 5.12$, $p < 0.001$) and moderate ($\beta = 0.36$, $t(70) = 4.35$,

Table 2 Bivariate correlations among the variables

Variable	1	2	3	4	5
1. Lifetime adversity	–	–	–	–	–
2. Interpersonal stress appraisals	0.15	–	–	–	–
3. Interpersonal dependence appraisals	0.07	0.24[*]	–	–	–
4. Noninterpersonal stress appraisals	0.20[+]	0.29[*]	0.21[+]	–	–
5. Noninterpersonal dependence appraisals	0.24[*]	− 0.15	0.16	− 0.05	–
6. Composite score of depressive symptoms	0.56[**]	0.34[**]	0.25[*]	0.27[*]	0.15

$^{+}p<.10$, $^{*}p<.05$, $^{**}p<.01$

Table 3 Predicting depressive symptoms from lifetime adversity and stress appraisals

Predictors	Interpersonal stress estimation		Interpersonal dependence estimation		Noninterpersonal stress estimation		Noninterpersonal dependence estimation	
	β	t	β	t	β	t	β	t
Step 1								
Adversity	0.48	4.87[**]	0.50	5.08[**]	0.51	4.91[***]	0.53	5.00[***]
Stress appraisals	0.29	2.96[**]	0.23	2.34[*]	0.17	1.63	0.02	0.22
Step 2								
Adversity	0.43	4.46[***]	0.46	4.76[***]	0.49	4.69[***]	0.53	4.98[***]
Stress appraisals	0.28	2.90[**]	0.21	2.25[*]	0.17	1.65	0.03	0.27
Adversity x appraisals	0.24	2.52[*]	0.26	2.65[*]	0.06	0.61	− 0.04	− 0.33

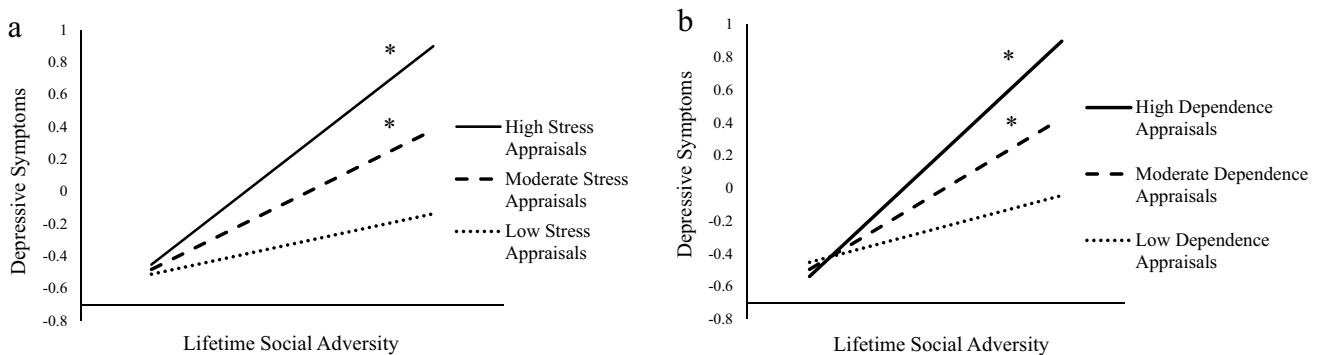$^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$

Fig. 1 Effect of lifetime adversity on depressive symptoms moderated by **a** stress and **b** dependence appraisals

$p<0.001$) but not low ($\beta=0.14$, $t(70)=1.10$, $p=0.27$) interpersonal stress appraisals (Fig. 1a).

Lifetime Adversity x Interpersonal Dependence Appraisals

The regression analysis revealed significant main effects of lifetime adversity and interpersonal dependence appraisals and a significant lifetime adversity x interpersonal dependence appraisals interaction (Table 3). Decomposition of the interaction revealed that more adversity predicted higher levels of depressive symptoms in girls

with relatively high ($\beta=0.62$, $t(70)=5.46$, $p<0.001$) and moderate ($\beta=0.39$, $t(70)=4.65$, $p<0.001$) but not low ($\beta=0.16$, $t(70)=1.20$, $p=0.24$) interpersonal dependence appraisals (Fig. 1b).

Lifetime Adversity x Noninterpersonal Stress Appraisals

The regression analysis revealed a significant main effect of lifetime adversity, a nonsignificant main effect of noninterpersonal stress appraisals, and a nonsignificant lifetime

adversity x noninterpersonal stress appraisals interaction (Table 3).

Lifetime Adversity x Noninterpersonal Dependence Appraisals

The regression analysis revealed a significant main effect of lifetime adversity, a nonsignificant main effect of noninterpersonal dependence appraisals, and a nonsignificant lifetime adversity x noninterpersonal dependence appraisals interaction (Table 3).

Discussion

This study examined the interactive contributions of lifetime social adversity and stress appraisals to depressive symptoms in adolescent girls. We drew from cognitive vulnerability-stress models of depression, which theorize that exposure to stressors contributes to elevated depression more strongly in those who interpret adverse life events as more stressful and dependent on internal factors [2, 15]. In line with many past studies (e.g., [4]), we found that exposure to higher levels of adversity was linked to elevated depressive symptoms in adolescent girls. However, this association was contingent on girls' appraisals of recent personally experienced stressors, identifying an important factor that amplifies or attenuates risk in the face of adversity.

The Interactive Role of Adversity and Stress Appraisals in Adolescent Depression

Appraisals of the stressfulness and dependence of recent interpersonal events moderated the association between lifetime social adversity and depressive symptoms in adolescent girls, such that adversity predicted depressive symptoms more strongly in girls who overestimated relative to those who underestimated the impact of recent interpersonal stressors and their role in generating them. Overestimating the stressfulness of events may exacerbate the effects of lifetime adversity by reminding girls of past interpersonal difficulties and potentially fostering greater emotional reactivity, rumination, and feelings of hopelessness, leading to depressive symptoms [57]. Similarly, overestimating how much of a role an individual played in the occurrence of stressful events may augment the impact of past social adversity by increasing rumination about the self and prompting declines in self-worth, which are linked to increases in depressive symptoms [58].

This study makes several novel contributions to theory and research regarding early adversity, cognitive vulnerabilities for depression, and adolescent stress sensitivity. First, it helps explain why only some youth experience elevated depressive symptoms following earlier social adversity. Specifically, we found a link between past adversity and depressive symptoms among girls with relatively higher stress and dependence appraisals but *not* among girls with relatively lower stress and dependence appraisals, suggesting that the ways youth interpret the impact and dependence of stressful events may moderate the risk posed by adversity exposure. Second, this study expands on previous studies examining how cognitive biases contribute to the development of depressive symptoms. Most prior research on stress appraisals and depression is limited by a focus on general cognitive styles (e.g., hopelessness, negative and self-referential attributional style; [16, 19]), which overlook the role of context, or attributions about hypothetical events (e.g., [59, 60]), which require youth to imagine scenarios and correctly predict how they might respond to those scenarios in their own life. In this study, girls reflected on personally experienced events, providing a more ecologically valid measure of how they evaluate specific stressors and identifying how particular aspects of stress appraisals —stress and dependence overestimation—amplify the effect of past adversity on depressive symptoms during adolescence.

This research also contributes to interpersonal theories of depression by revealing context-specificity in the effects of stress appraisals. Specifically, we found that the moderating effect of stress appraisals on the adversity-depression link was unique to interpersonal, but not noninterpersonal, stressors. Adolescents who appraise interpersonal events as especially stressful and personally dependent may be more likely to disengage from family and peer networks. This lack of social connection at a time when parental support and attunement to peer networks are especially important could deprive adolescents of opportunities for social learning and lead to further isolation, increasing their risk for depressive symptoms.

Stress appraisals might increase risk for depression in youth with a history of lifetime social adversity through several potential mechanisms. Among those who have experienced high levels of social adversity, perceiving events as particularly stressful might exacerbate their physiological and emotional reactions to stressors. For example, overestimating the stressfulness of, and danger posed by, stressors is associated with elevated reactivity and less effective regulation of the hypothalamic pituitary axis, a core biological stress-response system [61, 62], and stress appraisals interact with a gene implicated in hypothalamic-pituitary-axis function to predict depression [63]. Youth who have experienced adversity and interpret events as especially stressful may be less likely to use adaptive emotion regulation strategies [27] and more likely to engage in rumination [64]. Although past research has not examined the impact of dependence overestimations, more general negative self-cognitions predict elevated shame and hopelessness [15, 65] as well

as avoidance [66]. Future research is warranted to better understand mechanisms through which stress appraisals might augment or decrease the impact of adversity on risk for depression.

Innovations, Limitations, and Future Directions

A strength of this study is the use of semi-structured interviews to assess lifetime social adversity, recent stressors, and depressive symptoms. Using open-ended and structured questions and detailed timelines allowed us to obtain more accurate recall of past events and current mood and to probe for the occurrence of specific stressors and symptoms, decreasing the likelihood that our results were biased by individuals' tendencies to report only memorable or mood-congruent events. Moreover, we supplemented interview-based assessment of depressive symptoms with self-report, allowing us to better capture the entirety of depressive symptoms in daily life. Despite these strengths, leveraging other methods of assessing adversity, stress appraisals, and depression, such as informant-report, would provide a richer perspective on youths' experiences and reactions to these experiences. Additionally, our adversity interview did not specifically probe for maltreatment, although several participants did report exposure to abuse or neglect; examining whether effects would be similar within the context of maltreatment specifically would complement a broad literature in this domain (e.g., [34, 67]). Finally, leveraging prospective longitudinal designs would allow researchers to overcome limitations of retrospective report of adversity in adolescence.

Considering the role of appraisals of personally experienced stressors may be especially meaningful during adolescence, when youth begin to receive less parental support in dealing with stressors, and rates of depression increase sharply [1]. Supporting this idea, stress appraisals begin to moderate the effect of stress on depressive symptoms during adolescence [38, 39]. However, it would be informative to examine whether appraisals of stressors moderate the impact of earlier adversity specifically during this period or across development. Our study focused on mid-adolescent girls in particular because they experience elevated depressive symptoms [2] and show a stronger link between stress exposure and depression [41], potentially because they experience more social stressors [68] than boys and are expected to manage emotional reactions to stressors in more mature ways [43]. However, examining the moderating role of stress appraisals in boys could help clarify origins of the gender difference in depression that emerges during adolescence [2]. Additionally, although over 25% of our sample met criteria for either a diagnosable depressive disorder or moderate, subthreshold depressive symptoms, in line with typically found rates among adolescent girls [55], it would

be informative to explore the interactive effect of social adversity and stress appraisals in a clinical sample of youth.

Results of this study can inform strategies to prevent or decrease depression following adversity. While it may not be possible to prevent some forms of social adversity (e.g., separation from caregivers or friends), it is possible to mitigate the effects of exposure to these adversities by modifying the way individuals appraise subsequent interpersonal stressors. Interventions based on cognitive theories of depression target interpretations of events and aim to decrease negative attributions. These interventions work through several mechanisms, including improving youth's ability to challenge their own interpretations of events and reappraise them in less personally impactful ways [69] and increasing youths' ability to mindfully reflect on their thoughts about stressors as mental events rather than core truths about themselves [70]. The present findings suggest that shaping cognitive appraisals of and metacognition about stressors may be particularly beneficial to youth exposed to social adversity. Teaching youth to more accurately appraise events could decrease their tendency to ruminate about stressors and their reactivity not only to current interpersonal stressors, but also to reminders of past social adversity. More accurate stress appraisals could disrupt the exacerbation of adversity-related emotion dysregulation and improve outcomes for youth with a history of adversity.

Conclusion

Using a multi-method approach that leveraged interview and self-report measures of adversity, stress appraisals, and depressive symptoms, the present study found that social adversity predicted elevated depressive symptoms more strongly in adolescent girls who overestimated the stressfulness and dependence of interpersonal (but not noninterpersonal) stressors. This research can help identify which girls may be at greatest risk for depression following adversity. Further, it suggests that modifying girls' tendencies to overestimate the impact and dependence of stressful interpersonal events may mitigate the effects of past adversity and decrease risk for depression in adolescence.

Summary

Adversity is associated with a range of negative health outcomes, including elevated risk for depressive symptoms [4]. While rates of depression increase during adolescence among all youth [1], this trend is especially prominent among youth who have been exposed to social adversities such as family separation and conflict or peer victimization [3]. At the same time, most adversity-exposed youth

do not develop depression, highlighting the importance of examining protective factors that support adjustment among those with a history of social adversity. The present study explored the role of stress appraisals, interpretations of the impact and personal dependence of recently experienced stressors, in amplifying or attenuating the effect of lifetime social adversity exposure on depressive symptoms in a sample of 81 adolescent girls. We leveraged data from a semi-structured interview in which youth provided a detailed life history, reporting on exposure to social adversities as well as recently occurring (i.e., within the past three months) stressors. For each stressor reported, adolescents' ratings of the stressor's impact and dependence on their own actions were regressed on ratings provided by an independent team of trained coders in order to create scores reflecting the extent to which adolescents overestimate event stressfulness and dependence relative to independent coders. Depressive symptoms were measured via semi-structured interview and self-report in order to capture a richer measure of depressed mood and impairment in daily life.

Results revealed a significant main effect of social adversity on depressive symptoms. However, this effect was moderated by stress appraisals such that adversity predicted more depressive symptoms in girls with high and moderate, but not low, relative stress and dependence appraisals. Further, this moderating effect was unique to appraisals of interpersonal but not non-interpersonal stressors. These results suggest that the way girls think about current interpersonal stressors shapes the impact of previous adversity exposure on their tendency to experience depressive symptoms. The present findings have implications for identifying which youth may be at greatest risk for depression following adversity due to their interpretations of current stressors. Additionally, they highlight one important mechanism—stress appraisals—that can be targeted by interventions designed to prevent or address depressive symptoms among adversity-exposed adolescents.

Declarations

References

1. Rudolph KD (2014) Puberty as a developmental context of risk for psychopathology. In: Lewis M, Rudolph KD (eds) Handbook of developmental psychopathology, 3rd edn. Springer, Boston, MA, pp 331–354. https://doi.org/10.1007/978-1-4614-9608-3_17

2. Hankin BL, Abramson LY (2010) Development of gender differences in depression: an elaborated cognitive vulnerability–transactional stress theory. Psychol Bull 127(6):773–796. https://doi.org/10.1037//0033-2909.127.6.773

3. Jaffee SR (2017) Child maltreatment and risk for psychopathology in childhood and adulthood. Annu Rev Clin Psychol 13:525–551. https://doi.org/10.1146/annurev-clinpsy-032816-045005

4. McLaughlin KA, Sheridan MA (2016) Beyond cumulative risk: a dimensional approach to childhood adversity. Curr Dir Psychol Sci 25(4):239–245. https://doi.org/10.1177/0963721416655883

5. Slavich GM, Irwin MR (2014) From stress to inflammation and major depressive disorder: a social signal transduction theory of depression. Psychol Bull 140(3):774–815. https://doi.org/10.1037/a0035302

6. Del Giudice M, Ellis BJ, Shirtcliff EA (2011) The adaptive calibration model of stress responsivity. Neurosci Biobehav Rev 35(7):1562–1592. https://doi.org/10.1016/j.neubiorev.2010.11.007

7. Ellis BJ, Bianchi J, Griskevicius V, Frankenhuis WE (2017) Beyond risk and protective factors: an adaptation-based approach to resilience. Perspect Psychol Sci 12(4):561–587. https://doi.org/10.1177/1745691617693054

8. Shonkoff JP, Garner AS, Siegel BS, Dobbins MI, Earls MF, McGuinn L, Wood DL (2012) The lifelong effects of early childhood adversity and toxic stress. Pediatrics 129(1):e232–e246. https://doi.org/10.1542/peds.2011-2663

9. Ellis BJ, Oldehinkel AJ, Nederhof E (2017) The adaptive calibration model of stress responsivity: an empirical test in the tracking adolescents' individual lives survey study. Dev Psychopathol 29(3):1001–1021. https://doi.org/10.1017/S0954579416000985

10. Giletta M, Slavich GM, Rudolph KD, Hastings PD, Nock MK, Prinstein MJ (2018) Peer victimization predicts heightened inflammatory reactivity to social stress in cognitively vulnerable adolescents. J Child Psychol Psychiatry 59(2):129–139. https://doi.org/10.1111/jcpp.12804

11. Kim J, Cicchetti D (2010) Longitudinal pathways linking child maltreatment, emotion regulation, peer relations, and psychopathology. J Child Psychol Psychiatry 51(6):706–716. https://doi.org/10.1111/j.1469-7610.2009.02202.x

12. Abaied JL, Rudolph KD (2014) Family relationships, emotional processes, and adolescent depression. In: Richards CS, O'Hara MW (eds) The Oxford handbook of depression and comorbidity. Oxford University Press, Oxford, pp 460–475

13. Brent DA, Moritz G, Bridge J, Perper J, Canobbio R (1996) Long-term impact of exposure to suicide: a three-year controlled follow-up. J Am Acad Child Adolesc Psychiatry 35(5):646–653. https://doi.org/10.1097/00004583-199605000-00020

14. La Greca AM, Harrison HM (2005) Adolescent peer relations, friendships, and romantic relationships: do they predict social anxiety and depression? J Clin Child Adolesc Psychol 34(1):49–61. https://doi.org/10.1207/s15374424jccp3401_5

15. Beck AT (1987) Cognitive models of depression. J Cogn Psychother 1:5–37. https://doi.org/10.1016/j.tics.2010.06.007

16. Abramson LY, Metalsky GI, Alloy LB (1989) Hopelessness depression: a theory-based subtype of depression. Psychol Rev 96(2):358–372. https://doi.org/10.1037/0033-295X.96.2.358

17. Alloy LB, Black SK, Young ME, Goldstein KE, Shapero BG, Stange JP, Abramson LY (2012) Cognitive vulnerabilities and depression versus other psychopathology symptoms and diagnoses in early adolescence. J Clin Child Adolesc Psychol 41(5):539–560. https://doi.org/10.1080/15374416.2012.703123

18. Hankin BL, Snyder HR, Gulley LD (2016) Cognitive risks in developmental psychopathology. In: Cicchetti D (ed) Developmental psychopathology: Maladaptation and psychopathology. Wiley, New York, NY, pp 312–385. https://doi.org/10.1002/9781119125556.devpsy308

19. Platt B, Waters AM, Schulte-Koerne G, Engelmann L, Salemink E (2017) A review of cognitive biases in youth depression: attention, interpretation and memory. Cogn Emot 31(3):462–483. https://doi.org/10.1080/02699931.2015.1127215

20. Folkman S, Lazarus RS (1986) Stress processes and depressive symptomatology. J Abnorm Psychol 95(2):107–113. https://doi.org/10.1037/0021-843X.95.2.107

21. Conway CC, Starr LR, Espejo EP, Brennan PA, Hammen C (2016) Stress responsivity and the structure of common mental disorders: Transdiagnostic internalizing and externalizing dimensions are associated with contrasting stress appraisal biases. J Abnorm Psychol 125(8):1079–1089. https://doi.org/10.1037/abn0000163

22. Espejo EP, Hammen C, Brennan PA (2012) Elevated appraisals of the negative impact of naturally occurring life events: a risk factor for depressive and anxiety disorders. J Abnorm Child Psychol 40(2):303–315. https://doi.org/10.1007/s10802-011-9552-0

23. Krackow E, Rudolph KD (2008) Life stress and the accuracy of cognitive appraisals in depressed youth. J Clin Child Adolesc Psychol 37(2):376–385. https://doi.org/10.1080/15374410801955797

24. Joiner T, Coyne J, Blalock J (1999) On the interpersonal nature of depression: overview and synthesis. In: Coyne JC, Joiner T (eds) The interactional nature of depression: advances in interpersonal approaches. American Psychological Association, Washington, pp 3–19

25. Rudolph KD, Flynn M, Abaied JL (2008) A developmental perspective on interpersonal theories of youth depression. In: Abela JRZ, Hankin BL (eds) Handbook of depression in children and adolescents. Guilford, New York, NY, pp 79–102

26. Flynn M, Rudolph KD (2011) Stress generation and adolescent depression: contribution of interpersonal stress responses. J Abnorm Child Psychol 39(8):1187–1198. https://doi.org/10.1007/s10802-011-9527-1

27. Rudolph KD, Flynn M (2007) Childhood adversity and youth depression: the role of gender and pubertal status. Dev Psychopathol 19:497–521. https://doi.org/10.1017/S0954579407070241

28. Silk JS, Siegle GJ, Whalen DJ, Ostapenko LJ, Ladouceur CD, Dahl RE (2009) Pubertal changes in emotional information processing: pupillary, behavioral, and subjective evidence during emotional word identification. Dev Psychopathol 21(1):7–26. https://doi.org/10.1017/S0954579409000029

29. Somerville LH (2013) The teenage brain: Sensitivity to social evaluation. Dir Psychol Sci 22(2):121–127. https://doi.org/10.1177/0963721413476512

30. Rudolph KD (2002) Gender differences in emotional responses to interpersonal stress during adolescence. J of Adolesc Health 30:3–13. https://doi.org/10.1016/S1054-139X(01)00383-4

31. Miller GE, Chen E, Zhou ES (2007) If it goes up, must it come down? Chronic stress and the hypothalamic-pituitary-adrenocortical axis in humans. Psychol Bull 133(1):25–45. https://doi.org/10.1037/0033-2909.133.1.25

32. Tottenham N, Sheridan MA (2010) A review of adversity, the amygdala and the hippocampus: a consideration of developmental timing. Front Hum Neurosci 3:68. https://doi.org/10.3389/neuro.09.068.2009

33. Pechtel P, Pizzagalli DA (2011) Effects of early life stress on cognitive and affective function: an integrated review of human literature. Psychopharmacol 214(1):55–70. https://doi.org/10.1007/s00213-010-2009-2

34. Teicher MH, Samson JA (2016) Annual research review: enduring neurobiological effects of childhood abuse and neglect. J Child Psychol Psychiatr 57(3):241–266. https://doi.org/10.1111/jcpp.12507

35. Andersen SL, Teicher MH (2008) Stress, sensitive periods and maturational events in adolescent depression. Trends Neurosci 31(4):183–191. https://doi.org/10.1016/j.tins.2008.01.004

36. Goff B, Gee DG, Telzer EH, Humphreys KL, Gabard-Durnam L, Flannery J, Tottenham N (2013) Reduced nucleus accumbens reactivity and adolescent depression following early-life stress. Neurosci 249:129–138. https://doi.org/10.1016/j.neuroscience.2012.12.010

37. Cole DA, Ciesla JA, Dallaire DH, Jacquez FM, Pineda AQ, LaGrange B, Felton JW (2008) Emergence of attributional style and its relation to depressive symptoms. J Abnorm Psychol 117(1):16–31

38. Turner JE, Cole DA (1994) Developmental differences in cognitive diatheses for child depression. J Abnorm Child Psychol 22(1):15–32. https://doi.org/10.1007/BF02169254

39. Nolen-Hoeksema S, Girgus JS, Seligman ME (1992) Predictors and consequences of childhood depressive symptoms: a 5-year longitudinal study. J Abnorm Psychol 101(3):405–422. https://doi.org/10.1037/0021-843X.101.3.405

40. Compas BE, Davis GE, Forsythe CJ (1985) Characteristics of life events during adolescence. Am J Community Psychol 13(6):677–691

41. Rudolph KD, Flynn M, Abaied JL, Groot A, Thompson R (2009) Why is past depression the best predictor of future depression? Stress generation as a mechanism of depression continuity in girls. J Clin Child Adolesc Psychol 38:473–485. https://doi.org/10.1080/15374410902976296

42. Cassano MC, Zeman JL (2010) Parental socialization of sadness regulation in middle childhood: the role of expectations and gender. Dev Psychol 46(5):1214–2136. https://doi.org/10.1016/j.appdev.2011.02.001

43. Dedovic K, Wadiwalla M, Engert V, Pruessner JC (2009) The role of sex and gender socialization in stress reactivity. Dev Psychol 45(1):45–55. https://doi.org/10.1037/a0014433

44. Merrick MT, Ford DC, Ports KA, Guinn AS (2018) Prevalence of adverse childhood experiences from the 2011–2014 behavioral risk factor surveillance system in 23 states. JAMA Pediatr 172(11):1038–1044. https://doi.org/10.1001/jamapediatrics.2018.2537

45. Evans GW, Li D, Whipple SS (2013) Cumulative risk and child development. Psychol Bull 139(6):1342–1396. https://doi.org/10.1037/a0031808

46. Steine IM, Winje D, Krystal JH, Bjorvatn B, Milde AM, Grønli J, Pallesen S (2017) Cumulative childhood maltreatment and its dose-response relation with adult symptomatology: Findings in a sample of adult survivors of sexual abuse. Child Abuse Neglect 65:99–111. https://doi.org/10.1016/j.chiabu.2017.01.008

47. Hartley CM, Grover KE, Pettit JW, Morgan ST, Schatte DJ (2013) Are reports of life event stress among suicidal youth subject to

cognitive bias? Suicide Life Threat Behav 43(5):503–510. https://doi.org/10.1111/sltb.12034

48. Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, Hergueta T, Baker R, Dunbar GC (1999) The Mini-International Neuropsychiatric Interview (MINI): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. J Clin Psychiatry 59:22–33

49. Agoston AM, Rudolph KD (2016) Interactive contributions of cumulative peer stress and executive function deficits to depression in early adolescence. J Early Adolesc 36(8):1070–1094. https://doi.org/10.1177/0272431615593176

50. Angold A, Costello EJ, Messer SC, Pickles A (1995) Development of a short questionnaire for use in epidemiological studies of depression in children and adolescents. Int J Methods Psychiatr Res 5(4):237–249

51. Sharp C, Goodyer IM, Croudace TJ (2006) The short mood and feelings questionnaire (SMFQ): a unidimensional item response theory and categorical data factor analysis of self-report ratings from a community sample of 7-through 11-year-old children. J Abnorm Child Psychol 34(3):365–377. https://doi.org/10.1007/s10802-006-9027-x

52. Kazdin AE, Peiti TA (1982) Self- report and interview measures of childhood and adolescent depression. J Child Psychol Psychiatry 23(4):437–457. https://doi.org/10.1111/j.1469-7610.1982.tb00089.x

53. Hodges K (1990) Depression and anxiety in children: a comparison of self-report questionnaires to clinical interview. Psychol Assess: J Consult Clin Psychol 2(4):376–381. https://doi.org/10.1037/1040-3590.2.4.376

54. Substance Abuse and Mental Health Services Administration. (2020) *Key substance use and mental health indicators in the United States: Results from the 2019 National Survey on Drug Use and Health* (HHS Publication No. PEP20–07–01–001, NSDUH Series H-55). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/

55. Slavich GM, Giletta M, Helms SW, Hastings PD, Rudolph KD, Nock MK, Prinstein MJ (2020) Interpersonal life stress, inflammation, and depression in adolescence: testing social signal transduction theory of depression. Depress Anxiety 37(2):179–193. https://doi.org/10.1002/da.22987

56. Aiken LS, West SG (1991) Multiple regression: testing and interpreting interactions. Sage, Thousand Oaks

57. Felton JW, Banducci AN, Shadur JM, Stadnik R, MacPherson L, Lejuez CW (2017) The developmental trajectory of perceived stress mediates the relations between distress tolerance and internalizing symptoms among youth. Dev Psychopathol 29(4):1391–1401. https://doi.org/10.1017/S0954579417000335

58. Hammen C (1988) Self-cognitions, stressful events, and the prediction of depression in children of depressed mothers. J Abnorm Child Psychol 16(3):347–360. https://doi.org/10.1007/BF00913805

59. Bohon C, Stice E, Burton E, Fudell M, Nolen-Hoeksema S (2008) A prospective test of cognitive vulnerability models of depression with adolescent girls. Behav Ther 39(1):79–90. https://doi.org/10.1016/j.beth.2007.05.003

60. Flouri E, Panourgia C (2011) Adverse life events and emotional and behavioral problems in adolescence: The role of non-verbal cognitive ability and negative cognitive errors. J Abnorm Child Psychol 39(5):695–709. https://doi.org/10.1007/s10802-011-9514-6

61. LoPilato AM, Addington J, Bearden CE, Cadenhead KS, Cannon TD, Cornblatt BA, Woods SW (2019) Stress perception following childhood adversity: unique associations with adversity type and sex. Dev Psychopathol. https://doi.org/10.1017/S0954579419000130

62. Olff M, Langeland W, Gersons BP (2005) Effects of appraisal and coping on the neuroendocrine response to extreme stress. Neurosci Biobehav Rev 29(3):457–467. https://doi.org/10.1016/j.neubiorev.2004.12.006

63. Piechaczek CE, Greimel E, Feldmann L, Pehl V, Allgaier AK, Frey M, Schulte-Koerne G (2019) Interactions between FKBP5 variation and environmental stressors in adolescent major depression. Psychoneuroendocrinology 106:28–37. https://doi.org/10.1016/j.psyneuen.2019.03.025

64. Hankin BL, Stone L, Wright PA (2010) Corumination, interpersonal stress generation, and internalizing symptoms: accumulating effects and transactional influences in a multiwave study of adolescents. Dev Psychopathol 22(1):217–235. https://doi.org/10.1017/S0954579409990368

65. Platt M, Freyd J (2011) Trauma and negative underlying assumptions in feelings of shame: an exploratory study. Psychol Trauma Theory Res Pract Policy 4(4):370–379. https://doi.org/10.1037/a0024253

66. Miers AC, Blöte AW, Heyne DA, Westenberg PM (2014) Developmental pathways of social avoidance across adolescence: the role of social anxiety and negative cognition. J Anxiety Disord 28(8):787–794. https://doi.org/10.1016/j.janxdis.2014.09.008

67. Van der Kolk B (2016) Commentary: the devastating effects of ignoring child maltreatment in psychiatry–a commentary on Teicher and Samson 2016. J Child Psychol Psychiatr 57(3):267–270. https://doi.org/10.1111/jcpp.12540

68. Ge X, Lorenz FO, Conger RD, Elder GH, Simons RL (1994) Trajectories of stressful life events and depressive symptoms during adolescence. Dev Psychol 30(4):467–483. https://doi.org/10.1016/S0149-7634(00)00014-2

69. Boden MT, John OP, Goldin PR, Werner K, Heimberg RG, Gross JJ (2012) The role of maladaptive beliefs in cognitive-behavioral therapy: evidence from social anxiety disorder. Behav Res Ther 50(5):287–291. https://doi.org/10.1016/j.brat.2012.02.007

70. Kang Y, Gruber J, Gray JR (2013) Mindfulness and de-automatization. Emot Rev 5(2):192–201. https://doi.org/10.1177/1754073912451629