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High Emotion Differentiation Buffers Against Internalizing Symptoms Following Exposure to Stressful Life Events in Adolescence: An Intensive Longitudinal Study

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Abstract

Exposure to stressful life events is strongly associated with internalizing psychopathology, and identifying factors that reduce vulnerability to stress-related internalizing problems is critical for development of early interventions. Drawing on research from affective science, we tested whether high emotion differentiation—the ability to specifically identify one's feelings—buffers adolescents from developing internalizing symptoms when exposed to stress. Thirty adolescents completed a laboratory measure of emotion differentiation before an intensive yearlong longitudinal study in which exposure to stress and internalizing problems were assessed at both the moment level (n = 4,921 experience-sampling assessments) and month level (n = 355 monthly assessments). High negative and positive emotion differentiation attenuated moment-level coupling between perceived stress and feelings of depression, and high negative emotion differentiation eliminated month-level associations between stressful life events and anxiety symptoms. These results suggest that high emotion differentiation buffers adolescents against anxiety and depression in the face of stress, perhaps by facilitating adaptive emotion regulation.

Keywords

adolescence, stress, emotion differentiation, internalizing psychopathology, open data, open materials

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Adolescence is a period of heightened risk for the development of internalizing psychopathology, including depression and anxiety (Hankin et al., 1998; Kessler et al., 2005; Somerville & McLaughlin, 2018). Exposure to stressful life events is a potent risk factor for internalizing problems, particularly during adolescence (Grant et al., 2006; Larson & Ham, 1993; McLaughlin & Hatzenbuehler, 2009; Michl et al., 2013). Given this tight coupling between stress and internalizing psychopathology, identifying factors that buffer against the emergence of internalizing problems following stressful experiences may inform the development of early interventions aimed at preventing stress-related psychopathology. Here, we used an intensive yearlong longitudinal study of adolescents to test whether the ability to specifically identify what one is feeling—a skill called *emotion differentiation* or *emotional granularity* (Barrett et al., 2001; Kashdan et al., 2015)—might be one such factor that buffers adolescents from developing internalizing problems following stressful experiences.

Stress is commonly defined as the cascade of psychological and physiological changes that occur when individuals perceive that the demands of their environment exceed their resources to cope (Lazarus & Folkman, 1984). Thus, stress emerges through a transaction between individuals and their environment, allowing

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multiple methods to measure stress (Monroe, 2008). Measuring environmental sources of stress involves assessment of events that require significant adaptation, ranging from daily hassles (e.g., missing the bus) to instances of threat, loss, or upheaval in one's life (e.g., death of a loved one). Alternatively, stress can be measured by focusing on *perceptions* of environmental events as stressful (i.e., appraisals of events as exceeding one's resources to cope; e.g., Cohen et al., 1983). A wealth of evidence using both of these measurement approaches shows that individuals who experience greater exposure to stressful life events and/or higher levels of perceived stress are at elevated risk for developing internalizing psychopathology (Brown & Harris, 1989; Cohen et al., 1983, 1995, 2016; Hammen et al., 2000; Monroe et al., 1999).

Most studies that establish associations between stress and psychopathology take a between-subjects approach and show that individuals who experience greater stress are at higher risk for developing psychopathology. More recent work has also revealed strong coupling between stress and psychopathology at the within-persons level. For example, a recent study from our group demonstrated that within-persons increases in stressful events (i.e., experiencing greater stressful life events than is typical for an individual) predicted subsequent within-persons increases in symptoms of depression and anxiety during adolescence (Jenness et al., 2019). Taking an idiographic, within-persons focus on processes that contribute to psychopathology is a necessary step in the field's movement toward precision medicine and personalized care (Fisher, 2015; Wright & Woods, 2020). Thus, additional studies that use intensive sampling to examine within-persons processes are crucial to understand the etiological pathways connecting stress to psychopathology.

Even though stressful events often precede the onset of internalizing problems at both the between-persons and within-persons levels, stressors do not invariably lead to the emergence of psychopathology. Stressors frequently arise in people's lives, but these events alone do not always instigate symptoms. Instead, psychological and environmental factors can moderate the association of stress with psychopathology. These moderating factors are theoretically understood through the lens of diathesis-stress models, which posit that psychopathology emerges through an interaction between an individual's underlying vulnerabilities—called *diatheses*—and environmental stressors (Alloy et al., 1999; Bernstein et al., 2019; Hammen et al., 2000; Hankin & Abramson, 2001; Hilsman & Garber, 1995; Hooley & Gotlib, 2000; Monroe & Simons, 1991; Nook, Dodell-Feder, et al., 2018; Shapero et al., 2017). Conversely, protective factors are conceptualized as variables that reduce vulnerability to psychopathology following exposure to stressors (Rutter, 1985). For example, social support buffers against the development of internalizing problems following stressful experiences (Cohen, 2004; Cohen & Wills, 1985). Heightened neural sensitivity to reward also buffers against the emergence of depression following exposure to stressors (Dennison et al., 2016; Nikolova et al., 2012).

Thus, the field has identified both interpersonal and neurobiological factors that reduce vulnerability to stress. Here we extend the search for resilience factors by focusing on processes that facilitate adaptive emotion regulation (i.e., the set of strategies people use to change how they feel; Gross, 1998, 2015). Factors that improve emotion regulation are key candidates for buffering the association of stress with psychopathology because (a) stressful experiences reliably induce negative affect (Bolger et al., 1989; Mroczek & Almeida, 2004) and (b) dysregulation of negative emotion is thought to be a central component of internalizing psychopathology (Aldao et al., 2010; Gross & Jazaieri, 2014). In fact, difficulties with emotion regulation have been shown to mediate the association between stress exposure and the development of internalizing symptoms in adolescents (McLaughlin & Hatzenbuehler, 2009), suggesting that skills that boost regulation may mitigate the links between stress and psychopathology.

Emerging work in the field of affective science indicates that emotion differentiation (i.e., the ability to specifically identify what one is feeling) may be one such factor that can facilitate effective emotion regulation and protect against psychopathology. For example, people with high emotion differentiation can easily distinguish when they are feeling disappointed from when they are feeling annoyed or angry, whereas people with low emotion differentiation struggle to make such fine-grained distinctions and simply consider both of these states as feeling bad. Prior work has consistently linked high emotion differentiation to better mental health and emotion regulation. Low emotion differentiation has been documented in several mental disorders including depression, social anxiety, eating disorders, and borderline personality disorder (Demiralp et al., 2012; Kashdan & Farmer, 2014; Selby et al., 2014; Suvak et al., 2011). Likewise, high emotion differentiation is associated with greater self-reported use of adaptive emotion-regulation strategies (Barrett et al., 2001), more successful emotion regulation (Kalokerinos et al., 2019), and the absence of self-destructive emotion-regulation strategies such as nonsuicidal self-injury or alcohol consumption (Anand et al., 2017; Kashdan et al., 2010; Zaki et al., 2013). This body of work supports a model in which high emotion differentiation is associated with better mental health outcomes by

enhancing emotion regulation. Thus, high emotion differentiation may be a factor that buffers individuals from developing internalizing problems following stress.

Indeed, this model has been supported by recent studies. First, Starr et al. (2017) conducted two ecological momentary assessment studies showing that high emotion differentiation buffers both undergraduate students and veterans from experiencing depression symptoms in response to negative life events. Second, Starr, Hershenberg, et al. (2020) showed that emotion differentiation attenuated the concurrent association between daily hassles and depressed mood over the course of 1 week as well as the prospective relationship between stressful life events and depression symptoms in adolescents. These studies provided evidence supporting the model described above: High emotion differentiation may play a moderating role in buffering individuals from the impact of stress.

The current study provides yet another test of this model. Our methods replicate and extend those of Starr, Hershenberg, et al. (2020) even though the two sets of studies were designed and implemented without mutual knowledge. Both studies investigated whether high emotion differentiation moderated the association between stress and symptoms in adolescents using parallel experience sampling and interview methods. Replication is an important scientific pursuit in its own right (Zwaan et al., 2018), but the current study also provides several key points of extension from prior work.

First, in the current study, we adopted an intensive yearlong approach and focused on within-persons relationships between stress and psychopathology rather than using a large between-persons sample and focusing on a shorter observation period. Second, we used a laboratory measure of emotion differentiation rather than extracting a measure of emotion differentiation from daily emotion ratings. This allows measures of emotion differentiation and daily affect to be totally separated. Third, we examined internalizing problems (i.e., both anxiety and depression) more broadly rather than focusing on depression alone. Finally, we included measures of both positive and negative emotion differentiation. Although the lion's share of research has focused on negative emotion differentiation, several studies have found that positive emotion differentiation has adaptive correlates (e.g., higher endorsement of healthy coping strategies and lower odds of binge eating problems; Dixon-Gordon et al., 2014; Mikhail et al., 2020; Tugade et al., 2004). That said, evidence is mixed. Only six of 16 recent studies that included measures of positive emotion differentiation showed adaptive associations (Liu et al., 2020). Consequently, we included a measure of positive emotion differentiation to test whether it could also help individuals adaptively respond to stressors. Although stress is often thought of as occurring in negative situations, it can also emerge in the context of positive events (e.g., being selected over one's friends as the starting member of a sports team can induce feelings of pride but also cause interpersonal stress; Shimizu & Pelham, 2004). Thus, in the current study, we aimed to both strengthen and extend the field's evidence that emotion differentiation protects adolescents from stress-related psychopathology.

From a developmental perspective, there are several reasons for focusing on adolescents when investigating whether emotion differentiation buffers individuals from the impact of stress. Adolescence is a developmental period characterized by elevated exposure to stressors, heightened emotional reactivity to stress, and elevated risk of the onset of internalizing psychopathology (Kessler et al., 2005; Larson et al., 2002; Larson & Ham, 1993). Moreover, although conceptual understanding of emotions continues to develop through the adolescent years (Nook et al., 2017, 2020), emotion differentiation actually declines from childhood into adolescence, making adolescence a normatively low period of emotion differentiation (Nook, Sasse, et al., 2018; Starr, Shaw, et al., 2020). As such, adolescence is a period characterized by low emotion differentiation, high exposure to stressors, and increased risk for internalizing psychopathology. Although prior research has not examined whether low emotion differentiation explains elevated risk for psychopathology in this age range, evidence that emotion differentiation protects against stress-related psychopathology would suggest that high emotion differentiation may be especially important for buffering against maladaptive responses to elevated stressors during this developmental period.

Here, we used an intensive yearlong longitudinal study of adolescent girls to test whether high emotion differentiation buffers adolescents from the deleterious influence of stress. Specifically, we used a combination of experience-sampling methods—in which participants reported on momentary subjective experiences of perceived stress and depressed and anxious affect several times daily—and gold-standard monthly interviews designed to provide objective measures of stressful life events, paired with monthly symptom assessments, to test whether emotion differentiation moderates the within-persons associations of stress exposure and internalizing problems. This design provides opportunities to examine factors that moderate the associations of stress with internalizing psychopathology at multiple timescales and levels of analysis. Determining whether emotion differentiation moderates the impact of stress on adolescents' risk for internalizing problems is a crucial step in targeted interventions for preventing the onset of psychopathology in youths.

Method

Participants

This study was designed to examine within-persons associations between stress and psychopathology. Thirty female adolescents ages 15 to 17 years participated in a yearlong longitudinal study that included 12 in-lab assessments, one conducted each month (n = 355 monthly assessments), and a total of 12 weeks of ecological momentary assessments (EMAs) spread across four waves of 3-week periods in which participants reported on stress and affect three times daily (n = 4,921 momentary assessments). We focused on adolescent girls because this is a group well documented to be at elevated risk for anxiety and depression and for whom the coupling between stressors and internalizing psychopathology is pronounced (Hankin & Abramson, 2001; Prinstein & Aikins, 2004).

Participants were recruited in Seattle, Washington, via fliers and word of mouth between January 2015 and June 2017 for a large neuroimaging and EMA study from which the current data are drawn. Inclusion criteria included being an English-speaking female ages 15 to 17 years who was committed to completing all study assessments. Exclusion criteria included non-English speaking, IQ less than 80, active substance dependence, psychosis, presence of pervasive developmental disorders (e.g., autism), MRI scan ineligibility (e.g., metal implants, metal braces, claustrophobia, pregnancy), psychiatric medication use, active safety concerns, and inability to attend the 12 study visits. Mood and anxiety disorders were assessed using the Kiddie Schedule for Affective Disorders and Schizophrenia (K-SADS) at the beginning and end of the year (Kaufman et al., 1997). More than half (60%) of the sample had experienced a lifetime mood or anxiety disorder when they enrolled in the study, and 40% met criteria for an internalizing disorder during the year of the study. All procedures were approved by the Institutional Review Board at the University of Washington. Participants provided written assent, and legal guardians provided written informed consent.

Procedures

Overview. The study design included parallel measures of stress and internalizing symptoms at both experience-sampling and month levels. These are referred to as *moment-level* and *month-level* observations throughout the article. Moment-level assessments focused on participants' perceptions of stress, depression, and anxiety and were collected via smartphone (through the MetricWire app; www.metricwire.com). Month-level assessments focused on (a) interview-based measures of stressful life events that were coded by interviewers to quantify the severity and impact of each event as objectively as possible and (b) self-reported clinical symptoms of depression and anxiety. These were collected at each of the 12 monthly visits. Emotion differentiation was measured in the laboratory using a behavioral task at the initial baseline session.

To give an overview of the study's timing and procedures (for an illustrative figure, see also the Supplemental Material available online), the study commenced with participants completing a laboratory session in which they completed the emotion differentiation task and their first month-level assessments (i.e., measures of stressful life events, depression symptoms, and anxiety symptoms). Participants were then enrolled in the study for a full year, and they returned to the lab to complete assessments each month. Interspersed between these monthly visits, participants completed four waves of moment-level measures. Each wave involved 3 weeks of moment-level measures, and waves were spread throughout the year. Further details of these procedures are provided below.

Moment-level-assessment procedures. Moment-level assessments of perceived stress and affect were collected three times a day for 3 weeks at four separate times across the yearlong study (i.e., a total of 12 weeks of moment-level assessments spread across four waves). Participants were counterbalanced to receive the first wave either in the first or second month of the study, and subsequent waves occurred during a random month within each quarter of the rest of the yearlong study (i.e., approximately every 3 months). By adopting a multiwave approach to experience sampling, we aimed to provide broad coverage of participants' momentary experiences without overburdening them. During experience-sampling periods, participants received three prompts each day spread across the morning, afternoon, and evening (i.e., at 7 a.m., 12 p.m., and 5 p.m.) directing them to complete a short survey measuring how they felt "right now." Participants were instructed to complete surveys in accordance with their school's policy on cellphone use, and participants were able to delay surveys for up to 2 hr if they were unable to complete them immediately.

Participants responded to a total of 4,921 prompts, and 4,865 of these included responses to measures of perceived stress, depressed affect, and anxious affect (i.e., 98.9% usable for all analyses, although observations were excluded from an analysis only if they did not include data needed for that analysis). Compliance with study procedures was encouraged by financially rewarding participants for completing moment-level assessments (for details, see the Supplemental Material). Unfortunately, a number of issues in the MetricWire (Versions 3.1.0–3.5.1) tool made it impossible to compute the exact proportion of moment-level assessments that participants completed. Specifically, the software did not consistently

record when prompts were sent to participants. In addition, errors in the MetricWire tool led to some prompts not being sent to respondents, making it impossible to know whether a prompt was ignored by the respondent or not actually sent. Although these issues have been resolved in newer versions of the tool, they had not yet been addressed in the version that was available at the time we started the study. Thus, it is not possible to compute the response rate for moment-level assessments, but the upper level of the number of surveys that could have been sent to participants is 7,560 surveys.

Month-level-assessment procedures. Month-level measures of stressful life events and internalizing symptoms were administered at each of the 12 monthly assessments (i.e., 12 observations per participant). This intensive longitudinal design resulted in a total of 360 possible month-level observations of stressful life events and symptoms over the study period; participants attended 355 out of 360 assessments (98.6% completion rate). Similar to moment-level assessments, participants were encouraged to complete monthly visits by providing increasing financial compensation for each monthly visit (for details, see the Supplemental Material).

Assessments

Emotion differentiation task. At the baseline laboratory session, participants completed a standard laboratory-based emotion differentiation task (Erbas et al., 2014; Nook, Sasse, et al., 2018). Participants viewed 20 negative and 20 positive images from the International Affective Picture System (Lang et al., 2008) and rated how strongly each induced a set of emotions on a 10-point scale (1 = *not at all*, 10 = *extremely*). For negative images, they rated how strongly they felt five negative emotions (i.e., angry, ashamed, disgusted, sad, and scared), and for positive images, they rated how strongly they felt five positive emotions (i.e., calm, excited, happy, inspired, and interested). Images were selected to induce a range of negative or positive emotions. Images were presented for 5 s, and rating was self-paced. Images and emotions were presented in random order for each participant.

Following prior work, we computed negative emotion differentiation scores by calculating the intraclass correlation (ICC) between negative emotion ratings across the 20 images (Erbas et al., 2014; Kalokerinos et al., 2019; Nook, Sasse, et al., 2018; Pond et al., 2012; Tugade et al., 2004). Specifically, we followed the methods shared by Kalokerinos et al. (2019) and computed emotion differentiation scores by Fisher r to z, transforming the ICC of consistency in average ratings across emotions—that is, ICC(3,k). Higher ICCs indicate greater similarity in how participants used each emotion scale (i.e., lower differentiation across emotions), and lower ICCs indicate less similarity across emotions. For interpretability, Fisher-transformed ICCs were reverse-scored by subtracting them from 1 so that higher scores represented greater emotion differentiation. A similar process was used to compute positive emotion differentiation scores from participants' endorsement of positive emotions in response to positive images.

Moment-level assessments.

Perceived stress. When prompted by the MetricWire app, participants responded to questions assessing perceived stress and affect in the current moment. In each prompt, stress was defined for participants through the text: "Stress is a situation where a person feels upset because of something that happened unexpectedly or when they are unable to control important things in their life." Participants then responded to the question "Do you feel this kind of stress right now?" on a 7-point scale (1 = *not at all*, 7 = *very stressed*). We refer to these ratings as *perceived stress scores*.

Depressed and anxious affect. At each MetricWire prompt, participants also rated their current feelings of depression and anxiety by responding to the questions "How depressed do you feel right now?" and "How anxious do you feel right now?" on 7-point scales (1 = *not at all*, 7 = *very depressed/anxious*). To distinguish these ratings from symptom inventories collected at the month level, we refer to these ratings as *depressed affect* and *anxious affect* ratings, respectively.

Month-level assessments.

Stressful life events. Exposure to stressful life events was assessed at each monthly visit using the UCLA Life Stress Interview (Hammen et al., 2000) adapted for children and adolescents. This semistructured interview was administered by a trained experimenter and assesses the impact of life events as objectively as possible in terms of both chronic stressors (e.g., interpersonal conflict with peers or family) and acute stressful life events (e.g., failing a test, breakup of a romantic relationship). The interview has been extensively validated and is widely considered to be the "gold-standard" approach for assessing stressful life events and chronic stress.

Structured prompts query several domains of the participant's life (i.e., peers, parents, household/extended family, neighborhood, school, academics, health, finance, and discrimination) for stressful life events. Each stressful event is then probed to determine timing, duration, impact, and coping resources. Trained experimenters objectively coded the impact of each event on an individual of the participant's age and sex using a nine-point scale (1.0 = *no negative impact*, 5.0 = *extremely severe negative impact*; half-points included).

Following prior work, we produced a stress impact score by taking the sum of the impact scores of all reported events (excluding those coded as 1). This score provides a weighted average of both the number and severity of stressors that occurred (Hammen et al., 2000). The interview was administered at baseline and at each of the monthly visits to measure stressful experiences occurring in the prior month. Stress measures were not obtained for four (i.e., 1.11%) observations.

Depression and anxiety symptoms. Symptoms of depression were collected using the Personal Health Questionnaire–9 (PHQ-9), a well-validated and widely used measure of depression (Kroenke et al., 2001). At each session, participants reported on their depressive symptoms over the preceding 2 weeks. Item scores ranged from 0 to 2; higher scores indicated higher depressive symptom severity. Responses demonstrated strong internal consistency across all time points in the current study ($\alpha = .84$). Symptoms of generalized anxiety disorder were measured with the Generalized Anxiety Disorder–7 (GAD-7; Spitzer et al., 2006). Like the PHQ-9, participants reported on anxiety symptoms occurring in the preceding 2 weeks. Item scores ranged from 0 to 3; higher scores indicated greater symptom severity. Reliability of the GAD-7 was high in the current study ($\alpha = .87$). We refer to sums of monthly symptom inventories as measures of *depression symptoms* and *anxiety symptoms*, respectively.

Beyond the four missing stress measures, anxiety and depression symptom scores were not obtained for one additional observation (i.e., 1.39% total month-level observations). Within the remaining observations, participants did not respond to two GAD-7 items (i.e., < 1% of 2,485 total items) and to 14 PHQ-9 items (i.e., < 1% of 3,195 total items). These missing items were imputed when calculating depression and anxiety scores for each observation by assigning the mean value for the total scale at that assessment for these items.

Analyses and hypotheses

Overall analytic approach. At a broad level, mixed-effects models—which allow longitudinal data to be nested within participants—were used to test whether emotion differentiation scores moderated the associations between stress and depression or anxiety. Parallel analyses were performed across both moment-level and month-level data to test whether these patterns emerged across both timescales and for both perceived stress and objective coding of stressful events.

To evaluate how within-persons fluctuations in stress were associated with internalizing symptoms, we transformed stress measures using both within-persons centering (i.e., centering stress scores around participant-specific means) and between-persons centering (i.e., computing each participant's mean stress level for the entire study period relative to the overall mean for the entire sample). This approach orthogonalizes variation in a given predictor into within- and between-persons variability (Bolger & Laurenceau, 2013; Enders & Tofighi, 2007), ultimately allowing us to test whether emotion differentiation moderates the association between within-persons fluctuations in stress and internalizing problems while controlling for between-persons differences in average levels of stress exposure.

Bivariate associations. Before testing the primary moderation analyses described above, we conducted analyses that allowed us to observe the strength of simple bivariate associations between all variables. One way to measure bivariate associations between variables is to average all data into single participant-level means and compute simple correlations. However, for this study, we sought to exploit the high temporal granularity of our data and examine how strongly variables covaried when they were sampled repeatedly within participants. Thus, we used the *statsBy* function in the *psych* package (Revelle, 2016) for the R software environment (Version 3.6.2; R Core Team, 2019) to compute correlations between measures at both the within-persons and between-persons levels. These correlations were conducted at the most temporally granular level possible for each measure. For example, the correlation between depressed affect (a moment-level variable) and symptoms of depression (a month-level variable) was computed by merging month-level symptom data into a data set that captured moment-level fluctuations in affect. However, the correlation between symptoms of depression (a month-level variable) and negative emotion differentiation (a person-level variable) was computed by merging person-level data into a data set that captured month-level variations in symptoms. Finally, to measure how strongly negative and positive emotion differentiation covaried (two person-level variables), a regression at the person level was conducted. Because negative and positive emotion differentiation did not vary within an individual, no within-persons correlation coefficients could be computed for these measures.

Moment-level analyses. Primary analyses involved mixed-effects models testing whether emotion differentiation assessed at the beginning of the study moderated the associations between moment-level assessments of perceived stress and affect. Given that this study included both negative and positive emotion differentiation and both depression and anxiety, four separate analyses were conducted (i.e., Negative Differentiation × Perceived Stress interaction in predicting depressed affect, Negative Differentiation × Perceived Stress interaction in predicting anxious affect, Positive Differentiation × Perceived Stress

interaction in predicting depressed affect, and Positive Differentiation × Perceived Stress interaction in predicting anxious affect). All analyses modeled affect as the outcome variable and included within-persons-centered perceived stress scores, emotion differentiation scores, the interaction between these two variables, and between-persons-centered perceived stress scores as fixed effects. Observations were nested within subject (i.e., the intercept was allowed to vary across participants as a random effect). Days since the baseline laboratory session was included in models as the measure of time. Finally, we included two control variables to ensure they did not confound results: school compared with summer (0 = not during school year, 1 = during school year) and the participant's average endorsement of negative emotions (in analyses involving negative emotion differentiation) or positive emotions (in analyses involving positive emotion differentiation) across all trials in the emotion differentiation task. Significance of results did not differ depending on inclusion of control variables. Continuous predictors other than perceived stress scores were grand-mean centered.

Decisions to include random slopes in analyses is debated in the literature. Some statisticians favor simple models that include only necessary random effects (Bates et al., 2015; Matuschek et al., 2017) and others favor complex "maximized" models in which all random effects and slopes are included (Barr et al., 2013). Here, our models were designed a priori to prioritize simplicity (i.e., with no random slopes), and including random slopes led to convergence issues in some of our models. Nonetheless, for thoroughness, we conducted supplemental analyses to verify that the strength of key results was similar when random slopes were included (although the significance of one result changes; see the Supplemental Material).

We hypothesized a significant interaction between within-persons perceived stress scores and emotion differentiation in predicting depressed and anxious affect such that the association between perceived stress and feelings of depression and anxiety would be lower among participants with high emotion differentiation. When this interaction was significant, we conducted simple-slopes analyses to clarify how variation in emotion differentiation influenced the relationship between perceived stress and affect.

Month-level analyses. Month-level analyses used a parallel structure to the analyses described above. We analyzed depression and anxiety symptoms using mixed-effects models that included within-persons-centered objective stress scores, emotion differentiation scores, the interaction between these two variables, and between-persons-centered objective stress scores as fixed effects. Again, observations were nested within subject (i.e., the intercept was allowed to vary across participants as a random effect), and four separate models were used to examine how negative and positive emotion differentiation related to both depression and anxiety symptoms. Month was included in the model as the measure of time. Month-level control variables included school compared with summer (0 = summer month, 1 = school month) and the participant's average endorsement of negative emotions (for analyses involving negative emotion differentiation) or positive emotions (for analyses involving positive emotion differentiation) across all trials in the emotion differentiation task. We controlled for average endorsement of emotion in the emotion differentiation task given that prior work has shown that average endorsement weakly correlates with emotion differentiation (Erbas et al., 2014; Nook, Sasse, et al., 2018), but it is not the primary measure of interest to the current study. Including control variables did not affect the significance of primary results, and a single change in significance is noted in a table footnote. Continuous predictors other than stress affect scores were grand-mean centered.

Again, the key hypothesized result was a significant interaction between within-persons stressful impact scores and negative emotion differentiation such that the association of stressful life events with symptoms of depression and anxiety would be lower among participants with high emotion differentiation. Simple-slopes analyses were used to clarify this interaction when significant.

Secondary analyses: differentiation of depressed and anxious affect. As a secondary analysis, we tested whether people with higher emotion differentiation also tended to differentiate depression from anxiety in their moment-level affect ratings. We consequently conducted two additional mixed-effects models that paralleled the moment-level analyses described above. Specifically, we modeled depressed affect as the outcome variable and included anxious affect, negative emotion differentiation (or positive emotion differentiation, in the second analysis), the interaction between anxious affect and differentiation, and the same control variables listed above as fixed effects. We hypothesized a significant interaction between differentiation and anxious affect in predicting depressed affect because this would suggest that people who are better at differentiating their emotions also tend to conceptualize depression and anxiety as more dissimilar affective states. We conducted simple-slopes analyses to unpack this interaction when significant.

Supplemental analyses: lagged impact of stress on affect and vice versa. Although stress can be measured either in terms of objective ratings of how taxing or significant an event is or by how severely individuals perceive the event as taxing their resources (Cohen et al., 2016; Hammen et al., 2000), concerns have been raised

that measures of perceived stress conflate exposure to stressful events with an individual's emotional reactions to events (Harkness & Monroe, 2016). If perceived stress ratings transcended "emotional" reactions and indeed measured a component of how demanding or taxing a situation was, we would expect perceived stress ratings to more strongly predict later affect ratings rather than the reverse. In a set of supplemental analyses, we explored how strongly moment-level perceived stress ratings predicted subsequent ratings of depressed/anxious affect compared with how strongly ratings of depressed/anxious affect predicted subsequent perceived stress ratings. Although we overall found bidirectional relationships between stress and affect (as would be predicted by the stress-generation hypothesis; Adrian & Hammen, 1993; Davila et al., 1995), we indeed found that perceived stress ratings had a numerically stronger relationship with subsequent affect ratings than the reverse (see the Supplemental Material), supporting the notion that moment-level perceived stress scores measure the stressfulness of events beyond participants' emotional reactions to them.

Software. Mixed-effects models were conducted in the R software environment using the *lme4* (Version 1.1-21; Bates et al., 2015) and *lmerTest* packages (Version 3.1-1; Kuznetsova et al., 2017). Standardized regression coefficients (βs) were extracted using the *reghelper* package (Version 0.3.5; Hughes, 2020), which standardizes by *z* scoring regression variables in the full sample. Simple-slopes functions were implemented using the *interactions* package (Version 1.1.1; Long, 2019). Mixed-effects models used restricted maximum likelihood estimation. We confirmed that adding an autocorrelated residual structure to both moment-level and month-level models was not necessary using tools from the *nlme* package (Version 3.1-143; Pinheiro et al., 2019). Specifically, autocorrelations at lag 1 were weak for all month-level (< .18) and moment-level (< .37) analyses, and so they were deemed unnecessary for parsimonious model fitting. Standard residual checks for normality were performed and produced satisfactory results.

Data and analytic code availability. Data and analytic code are available at https://osf.io/eavy4.

Results

Bivariate associations

Table 1 presents within-persons and between-persons correlations between dependent variables. At the within-persons level, significant positive associations emerged between all measures, suggesting that stress, affect, and internalizing symptoms overall tend to fluctuate in tandem. Note that within-persons fluctuations in moment-level measures were correlated significantly with within-persons fluctuations in their parallel month-level measures (e.g., fluctuations in moment-level depressed affect correlated with fluctuations in month-level depression symptoms). Similar results emerged at the between-persons level, and significant relationships emerged between moment-level and month-level variables thought to assess overlapping constructs. All between-subjects correlations were significant except (a) that the between-persons correlation between stress impact scores and anxious affect failed to reach significance ($r = .34$, $p = .069$) and (b) that even though relations between dependent variables and negative and positive emotion differentiation were in the negative direction, none reached significance.

Moment-level results

Emotion differentiation, perceived stress, and depressed affect. As hypothesized, within-persons fluctuations in perceived stress were associated with depressed affect such that at moments when adolescents experienced greater perceived stress than typical, they also reported higher levels of depressed affect (Table 2). However, negative emotion differentiation moderated this association, as evident by a significant interaction between negative emotion differentiation and within-persons perceived stress (Table 2). Simple-slopes analyses showed that within-persons fluctuations in perceived stress were more strongly associated with depressed affect in participants with low negative emotion differentiation scores (i.e., 1 *SD* below mean, $b = 0.38$, $p < .001$) compared with participants with high differentiation scores (i.e., 1 *SD* above mean, $b = 0.30$, $p < .001$; see Fig. 1a). Note that negative emotion differentiation scores for 17% of participants fell less than 1 *SD* below the mean and that 17% fell more than 1 *SD* above the sample mean.

Positive emotion differentiation also significantly moderated the relationship between within-persons fluctuations in perceived stress and depressed affect (Table 2). Simple-slopes analyses showed that within-persons fluctuations in perceived stress were more strongly associated with depressed affect in participants with low positive emotion differentiation scores (i.e., 1 *SD* below mean, $b = 0.43$, $p < .001$) compared with participants with high differentiation scores (i.e., 1 *SD* above mean, $b = 0.24$, $p < .001$). Note that positive emotion differentiation scores for 20% of participants fell less than 1 *SD* below the mean and scores for 13% fell more than 1 *SD* above the sample mean.

Emotion differentiation, perceived stress, and anxious affect. Within-persons fluctuations in perceived stress were significantly related to anxious affect (Table 2).

Table 1. Within-Persons and Between-Persons Bivariate Correlations Between Primary Measures

	1	2	3	4	5	6	7
1. Perceived stress	—	.08***	.40***	.50***	.11***	.12***	—
2. Stress impact scores	.44*	—	.08***	.03*	.12*	.17**	—
3. Depressed affect	.68***	.51**	—	.39***	.26***	.16***	—
4. Anxious affect	.75***	.34†	.57**	—	.09***	.06***	—
5. Depression symptoms	.64***	.54**	.77***	.67***	—	.60***	—
6. Anxiety symptoms	.64***	.44*	.59**	.66***	.85***	—	—
7. Negative emotion differentiation	−.13	−.11	−.33†	−.06	−.27	−.23	—
8. Positive emotion differentiation	−.26	−.26	−.24	−.14	−.26	−.36†	.05

Note: Within-persons bivariate correlations are shown above the diagonal, and between-persons bivariate correlations are shown below the diagonal. Decomposition of correlations into within-persons and between-persons components was computed using the statsBy function in the *psych* package (Revelle, 2016). Within-persons correlations with emotion differentiation could not be computed because it was measured only at the person level.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

When participants experienced greater perceived stress than was typical for them, they also reported increased anxious affect. However, no significant interaction between perceived stress and negative emotion differentiation emerged, suggesting that negative emotion differentiation did not moderate this relationship (Table 2). Likewise, positive emotion differentiation also did not moderate the relationship between within-persons fluctuations in perceived stress and anxious affect (Table 2).

Month-level results

Emotion differentiation, stressful life events, and symptoms of depression. Contrary to hypotheses, there was not a significant relationship between within-persons fluctuations in stress impact scores and symptoms of depression assessed at the month level (Table 3). In addition, the interaction between within-persons fluctuations in stress impact scores and negative emotion differentiation was not significant (Table 3).

Emotion differentiation, stressful life events, and symptoms of anxiety. As hypothesized, within-persons fluctuations in stress impact scores were associated with anxiety symptoms such that on months when adolescents experienced greater stressful life events than typical, they also reported more anxiety symptoms (Table 3). However, negative emotion differentiation moderated this association (Table 3). Simple-slopes analyses showed that within-persons fluctuations in stressful life events were positively associated with anxiety symptoms in participants with low negative emotion differentiation scores (i.e., 1 *SD* below mean, $b = 0.26$, $p < .001$) but not in participants with high differentiation scores (i.e., 1 *SD* above mean, $b = 0.04$, $p = .564$; see Fig. 1b). Positive emotion differentiation did not moderate the association between within-persons fluctuations in stress impact scores and either depression or anxiety symptoms (Table 3).

Secondary analyses: emotion differentiation and dissociation of depressed and anxious affect

A mixed-effects model tested whether moment-level ratings of depressed and anxious affect were less correlated in participants with higher negative emotion differentiation. Indeed, although anxious affect was a strong predictor of depressed affect, $\beta = 0.38$, $SE = 0.01$, $t = 27.65$, $p < .001$, negative emotion differentiation significantly moderated this association, $\beta = -0.07$, $SE = 0.01$, $t = -4.96$, $p < .001$. Simple-slopes analyses revealed that anxious and depressed affect were more strongly related in participants with low negative emotion differentiation scores (i.e., 1 *SD* below mean, $b = 0.39$, $p < .001$) compared with participants with high differentiation scores (i.e., 1 *SD* above mean, $b = 0.27$, $p < .001$).

Positive emotion differentiation also moderated the relationship between moment-level ratings of depressed and anxious affect, $\beta = -0.05$, $SE = 0.01$, $t = -3.48$, $p < .001$. Again, ratings of anxious and depressed affect were more strongly related in participants with low positive emotion differentiation scores (i.e., 1 *SD* below mean, $b = 0.37$, $p < .001$) compared with participants with high differentiation scores (i.e., 1 *SD* above mean, $b = 0.29$, $p < .001$).

Discussion

In the current study, we used an intensive yearlong longitudinal design to test whether adolescents who are better able to differentiate their emotions were less likely to develop internalizing problems in the face of stressful experiences. Both momentary experience-sampling methods and monthly interviews support the notion that high emotion differentiation may help protect against the emergence of stress-related internalizing problems. High negative and positive emotion differentiation

Table 2. Results of Moment-Level Mixed-Effects Models

Variable	β	*SE*	*t*	*p*
Negative Emotion Differentiation × Perceived Stress → Depressed affect				
Perceived stress (within persons)	0.30	0.01	28.55	< .001***
Perceived stress (between persons)	0.35	0.09	3.76	.001**
Negative emotion differentiation	−0.19	0.10	−1.88	.071
Negative Emotion Differentiation × Perceived Stress (within persons)	−0.03	0.01	−3.40	.001**
Day	0.01	0.01	1.12	.264
In school	0.05	0.01	4.58	< .001***
Average negative emotion rating in differentiation task	−0.06	0.10	−0.59	.562
Negative Emotion Differentiation × Perceived Stress → Anxious affect				
Perceived stress (within persons)	0.36	0.01	38.16	< .001***
Perceived stress (between persons)	0.49	0.10	5.03	< .001***
Negative emotion differentiation	0.04	0.10	0.40	.696
Negative Emotion Differentiation × Perceived Stress (within persons)	−0.01	0.01	−0.58	.563
Day	−0.01	0.01	−0.60	.550
In school	0.04	0.01	3.87	< .001***
Average negative emotion rating in differentiation task	0.15	0.11	1.42	.169
Positive Emotion Differentiation × Perceived Stress → Depressed affect				
Perceived stress (within persons)	0.29	0.01	27.82	< .001***
Perceived stress (between persons)	0.35	0.10	3.44	.002**
Positive emotion differentiation	−0.03	0.10	−0.35	.732
Positive Emotion Differentiation × Perceived Stress (within persons)	−0.08	0.01	−7.95	< .001***
Day	0.02	0.01	1.54	.123
In school	0.05	0.01	4.66	< .001***
Average positive emotion rating in differentiation task	−0.13	0.10	−1.33	.194
Positive Emotion Differentiation × Perceived Stress → Anxious affect				
Perceived stress (within persons)	0.36	0.01	37.86	< .001***
Perceived stress (between persons)	0.50	0.11	4.77	< .001***
Positive emotion differentiation	0.07	0.10	0.67	.509
Positive Emotion Differentiation × Perceived Stress (within persons)	−0.01	0.01	−1.42	.157
Day	−0.01	0.01	−0.53	.599
In school	0.04	0.01	3.89	< .001***
Average positive emotion rating in differentiation task	0.02	0.10	0.24	.811

**$p < .01$. ***$p < .001$.

attenuated moment-level coupling between perceived stress and depressed affect, and high negative emotion differentiation eliminated the association between stressful life events and anxiety symptoms at the month level. In addition, the association between depressed and anxious affect was lower in participants with high positive and negative emotion differentiation, showing that a laboratory measure of emotion differentiation generalized to moment-level measures of real-world affect. Overall, these findings advance knowledge in both clinical psychology and affective science regarding (a) protective factors that may buffer against the negative mental health consequences of stress and (b) the pathways through which high emotion differentiation may reduce risk for internalizing problems.

Although stressful life events are potent risk factors for the development of internalizing problems in both adolescents and adults (Grant et al., 2006; Hammen, 2005; LeMoult et al., 2020; McLaughlin & Hatzenbuehler, 2009), many people who experience stressors do not go on to develop psychopathology. Prior work on factors that confer vulnerability or protection to stress-related psychopathology have primarily focused on cognitive, neurobiological, and social factors (Alloy et al., 1999; Cheng et al., 2014; Cohen, 2004; Dennison et al., 2016; Hooley et al., 2009; Hooley & Gotlib, 2000; Nikolova et al., 2012; Russo et al., 2012; Swartz et al., 2015). However, recent studies have revealed that aspects of emotion understanding may shape stress responding and the development of psychopathology (Armstrong et al., 2011; Kranzler et al., 2016; Nook & Somerville, 2020; Southam-Gerow & Kendall, 2002; Weissman et al., 2020). Here, we extend this body of knowledge by showing that emotion differentiation in

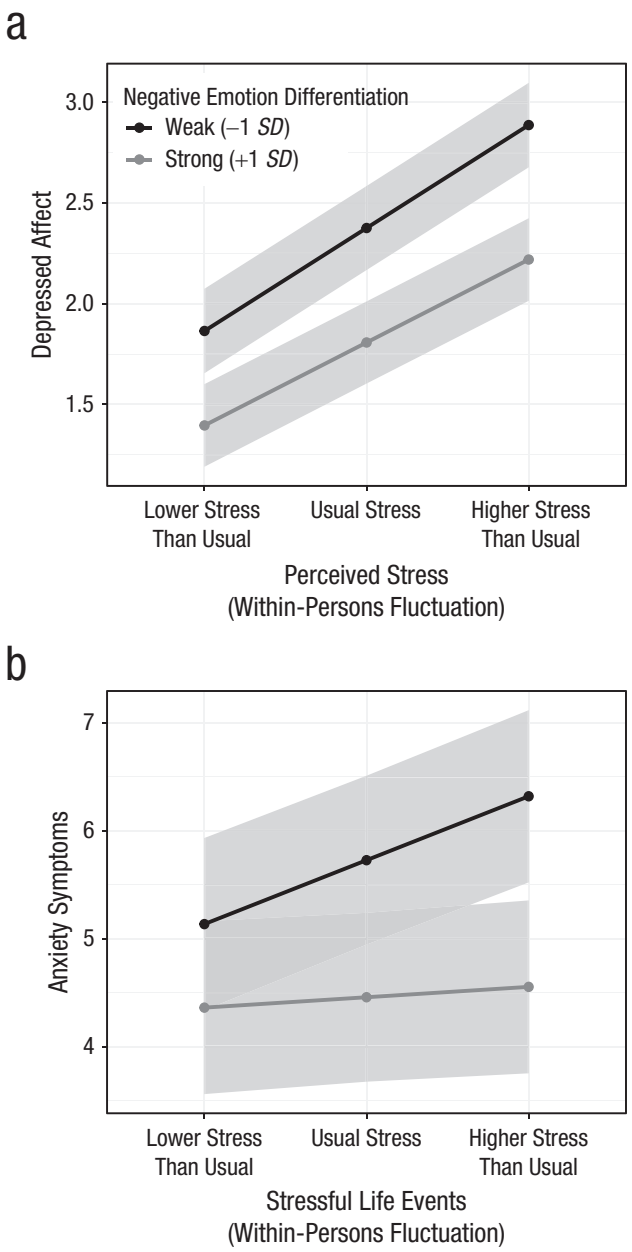

Fig. 1. Simple-slopes plots showing that negative emotion differentiation moderates the relationship between within-persons fluctuations in stress and internalizing problems at both moment and month levels. Solid lines show model-expected symptom severity as a function of stress moderated by emotion differentiation. (a) Participants with weak emotion differentiation (1 *SD* below mean, black line) showed increased depressed affect in moments with higher than average stressful experiences, but this relationship was attenuated for participants with strong positive and negative emotion differentiation (1 *SD* above mean, gray line). (b) Parallel results at the month level show that participants with weak emotion differentiation reported increased anxiety symptoms on months with higher than average stressful experiences, but this relationship was eliminated for participants with strong negative emotion differentiation. Gray shaded regions represent standard error of predicted means.

particular moderates the link between stress and internalizing problems in adolescence.

We found that high emotion differentiation attenuates associations between experiences of stress and internalizing problems at both the moment and month levels. These findings are consistent with another recent study in which emotion differentiation and stress-related psychopathology were examined. Specifically, Starr and colleagues (2017) showed that negative emotion differentiation attenuated the association between daily negative life events and depressive symptoms in both young adults and veterans, and in Starr, Hershenberg, et al. (2020), they found that emotion differentiation also attenuated associations between both daily hassles and depressed mood at the daily level and between stressful life events and symptoms of depression over a 1.5-year period in adolescents. In the current study, we conceptually replicated these findings and provide several key methodological extensions. First, compared with 7 days of experience sampling and a single follow-up session 1.5 years later (Starr, Hershenberg, et al., 2020), we replicated the stress-buffering role of emotion differentiation at the momentary level using much more intensive sampling of stress and affect over a longer period of time (i.e., 4 months of sampling spread over a year), providing greater confidence in results given the thousands of within-persons observations collected in the current study. Second, we extend the between-persons finding that high emotion differentiation reduces the association of stressful life events and depression to the within-persons level using an intensive longitudinal design. This consistency across methods and levels of analysis is a strength of the current study because the perceived stress measure focused on distress in response to uncontrollable events, whereas the interview-based stress measure focused on the objective impact of stressful life events.

Third, we used a task-based measure of emotion differentiation rather than an experience-sampling method as in prior work, which allows our measure of emotion differentiation to be entirely separated from outcome measures. In fact, the evidence that our lab-based emotion differentiation measure moderated relationships between EMA ratings of anxious and depressed affect provides support for the notion that lab-based and EMA-based measures of emotion differentiation assess the same underlying construct (see also Erbas et al., 2014). Finally, in the current study, we examined how emotion differentiation related to broader internalizing problems as opposed to focusing on symptoms of depression alone. Whereas many studies have examined emotion differentiation specifically in relation to

Table 3. Results of Month-Level Mixed-Effects Models

Variable	β	*SE*	*t*	*p*
Negative Emotion Differentiation × Stressful Life Events → Depression symptoms				
Stressful life events (within persons)	0.05	0.03	1.68	.094†
Stressful life events (between persons)	0.35	0.13	2.73	.011*
Negative emotion differentiation	−0.25	0.13	−1.90	.069
Negative Emotion Differentiation × Stressful Life Events (within persons)	−0.01	0.03	−0.49	.622
Month	−0.12	.03	−3.65	< .001***
In school	0.10	0.03	3.10	.002**
Average negative emotion rating in differentiation task	−0.25	0.13	−1.58	.126
Negative Emotion Differentiation × Stressful Life Events → Anxiety symptoms				
Stressful life events (within persons)	0.09	0.03	2.79	.006**
Stressful life events (between persons)	0.31	0.14	2.15	.041*
Negative emotion differentiation	−0.17	0.15	−1.10	.283
Negative Emotion Differentiation × Stressful Life Events (within persons)	−0.06	.03	−2.33	.021*
Month	−0.03	0.03	−1.03	.302
In school	0.12	0.03	3.82	< .001***
Average negative emotion rating in differentiation task	−0.06	0.16	−0.38	.705
Positive Emotion Differentiation × Stressful Life Events → Depression symptoms				
Stressful life events (within persons)	0.05	0.03	1.61	.109
Stressful life events (between persons)	0.29	0.13	2.13	.043*
Negative emotion differentiation	−0.16	0.13	−1.24	.227
Negative Emotion Differentiation × Stressful Life Events (within persons)	−0.02	0.03	−0.77	.442
Month	−0.12	0.03	−3.54	< .001***
In school	0.10	0.03	3.08	.002**
Average negative emotion rating in differentiation task	−0.28	0.13	−2.13	.043*
Positive Emotion Differentiation × Stressful Life Events → Anxiety symptoms				
Stressful life events (within persons)	0.10	0.03	2.91	.004**
Stressful life events (between persons)	0.21	0.15	1.45	.159
Negative emotion differentiation	−0.24	0.14	−1.76	.090
Negative Emotion Differentiation × Stressful Life Events (within persons)	−0.01	0.03	−0.39	.693
Month	−0.04	0.03	−1.07	.287
In school	0.12	0.03	3.69	< .001***
Average negative emotion rating in differentiation task	−0.19	0.14	−1.31	.201

†Significant when covariates are excluded. *$p < .05$. **$p < .01$. ***$p < .001$.

depression (Demiralp et al., 2012; Erbas et al., 2014, 2019; Kalokerinos et al., 2019; Liu et al., 2020; Mankus et al., 2016; Starr et al., 2017; Starr, Hershenberg, et al., 2020; Willroth et al., 2020), only a single study has examined emotion differentiation in generalized anxiety disorder (Decker et al., 2008). That study found that mean levels of emotion differentiation did not differ between individuals who did or did not have generalized anxiety disorder. Likewise, we find no main effect of emotion differentiation on generalized anxiety symptoms in our sample. However, the interaction between stress and emotion differentiation predicting anxiety suggests that the association of emotion differentiation with symptoms of anxiety may emerge only at certain levels of stress exposure (for a similar result in depression, see Starr, Hershenberg, et al., 2020).

In addition to extending the search for factors that may protect against stress-related psychopathology, our findings also enrich theoretical understanding of why emotion differentiation is associated with mental health. Empirical study of emotion differentiation emerged from the constructionist theory of emotion, which posits that emotion concepts—how an individual internally represents the meaning of emotion words—play a key role in constructing individual emotional experiences (Barrett, 2006, 2017). From this view, high emotion differentiation emerges when individuals have highly granular emotion concepts, allowing people to construct a specific understanding of what they are feeling in terms of (a) the underlying causes and characteristics that give rise to each emotional experience and (b) how to implement regulatory strategies that will best ameliorate a

given emotional experience in any specific situation (Kashdan et al., 2015; Nook et al., 2020). Consequently, analyzing and responding to one's emotional experiences using such "granular" emotion concepts and words is thought to boost adaptive responding to negative emotions (Kalokerinos et al., 2019; Kashdan et al., 2015), which are commonly induced by stressful experiences (Bolger et al., 1989; Mroczek & Almeida, 2004). This, in turn, protects individuals from developing maladaptive regulatory habits (e.g., worrying, avoidance, and rumination) that can contribute to internalizing problems (Aldao et al., 2010; Kircanski et al., 2015).

By contrast, having a weak conceptualization of one's emotional experience (i.e., understanding any experience of negative affect as "bad") is thought to lead to ineffective and/or unhealthy regulation in response to aversive experiences. For example, people with low emotion differentiation may repetitively use maladaptive strategies such as worry and rumination because their challenges in conceptualizing their affective experience prevents them from learning that these regulatory strategies actually *maintain* the negative affect they are trying to regulate or because they struggle to identify the causes of their emotions. By contrast, an individual with high emotion differentiation may notice that these strategies actually *produce* negative affect, leading them to learn to apply more adaptive regulatory responses such as cognitive reappraisal, problem solving, or acceptance. These theoretical notions are supported by our finding that both positive and negative emotion differentiation attenuates relations between stress exposure and internalizing problems when individuals experience elevated levels of stress. Furthermore, in line with this notion, recent studies have shown that high emotion differentiation reduces the extent to which rumination predicts increased depressive symptoms over a 6-month period (Liu et al., 2020) and that low emotional clarity (i.e., self-reported levels of how clearly individuals understand what emotion they were feeling) is associated with increased worrying at both within-persons and between-persons levels (Eckland & Berenbaum, 2021). Thus, results from this study join a growing body of evidence suggesting that a specific understanding of one's emotions facilitates adaptive emotion regulation and mental health.

Emotion regulation has long been thought to play an important role in the development and maintenance of psychopathology (Aldao et al., 2010; Cludius et al., 2020; Gross & Jazaieri, 2014; John & Gross, 2004). In fact, prior work shows that difficulties with emotion regulation mediates the relationship between stressful life events and internalizing symptoms in adolescence (McLaughlin et al., 2009; McLaughlin & Hatzenbuehler, 2009). Given that high emotion differentiation is associated with greater use of adaptive emotion-regulation strategies and better emotion-regulation efficacy (Kalokerinos et al., 2019; Kashdan et al., 2015), the current study's findings suggest that being able to identify one's emotions may disrupt this pathway. This disruption (i.e., more adaptive regulation in response to stress) provides a potential explanation for why emotion differentiation is associated with better mental health. However, future studies are needed to test whether differences in use or effectiveness of emotion-regulation strategies mediate the stress-buffering influence of high emotion differentiation on internalizing problems. A second possible explanation for the role of emotion differentiation in buffering stress-affect relationships is that it helps people to accurately identify the causes of their current affect and thereby separate their distress about stressful situations from internalized experiences of depression and anxiety. Greater facility in identifying the environmental determinants of one's affect may accelerate recovery from negative emotions following stressful situations and decrease engagement in maladaptive responses, such as rumination, in which one thinks incessantly about the causes and consequences of distress (Nolen-Hoeksema et al., 2008). Both of these are interesting pathways, and more research is needed to gain a clearer understanding of the psychological mechanisms that explain why individuals with high emotion differentiation report fewer symptomatic disruptions in the face of stress.

Regardless of the mechanism underlying these associations, our findings highlight novel targets for interventions—specifically, boosting emotion differentiation—to prevent or reduce risk for stress-related psychopathology. Such interventions may be particularly important during adolescence, a period of heightened risk for psychopathology broadly and stress-related psychopathology specifically (Grant et al., 2006; Hankin et al., 1998; Kessler et al., 2005; Larson & Ham, 1993; McLaughlin et al., 2009; McLaughlin & Hatzenbuehler, 2009; Michl et al., 2013; Somerville & McLaughlin, 2018), increased exposure to stressors (Larson & Ham, 1993), and low emotion differentiation (Nook, Sasse, et al., 2018). For instance, mindfulness meditation has been shown to both increase emotion differentiation and reduce symptoms of internalizing disorders (Sibinga et al., 2016; Van der Gucht et al., 2019). These and other interventions that focus on refining emotion concept understanding could help guide efforts to reduce the burden of stress-related internalizing psychopathology.

Note that several hypothesized relationships did not emerge. No significant main effects were observed between emotion differentiation and internalizing

problems at moment level or month level. Although this contrasts with prior work (Demiralp et al., 2012; Erbas et al., 2014), our study was optimized to detect *within-persons* associations between stress and psychopathology rather than *between-persons* associations between trait-level variables and outcomes, as has been the focus in prior work on emotion differentiation and psychopathology. Nonetheless, the relationship between negative and positive differentiation was extremely low ($r = .05$), a somewhat surprising result, when an analysis of 13 studies that reported this relationship revealed a weighted mean of $r = .31$ (Liu et al., 2020). It is possible that the use of a laboratory task, rather than experience sampling, explains this low correlation, but future research is needed to explain this very small effect. In addition, emotion differentiation did not moderate associations between perceived stress and anxious affect at the moment level or associations between stressful life events and depression symptoms at the month level. Although these inconsistent results could suggest specificity in these relationships, we would caution against drawing this interpretation. Perceived stress and anxious affect were strongly associated with one another even at the within-persons level ($r = .50$, 95% confidence interval [CI] = [.48, .52]), suggesting that they were considered by many participants as extremely similar, compared with the significantly weaker coupling between perceived stress and depressed affect ($r = .40$, 95% CI = [.38, .43]). Thus, at the month level, there was a significant concurrent association between stress impact scores and anxiety symptoms, but stress impact scores did not have a significant main effect on depression symptoms at all.

One potential way to synthesize these results is that the buffering impact of emotion differentiation is likely to emerge (both statistically and conceptually) only when stress-internalizing relationships are at a "moderate" strength. If the relationship is too strong (e.g., the relationship between moment-level perceived stress and anxious affect), individual differences in emotion differentiation will have only a small impact on decoupling the relationship, and if the relationship is too weak (i.e., the relationship between month-level stress impact scores and depression symptoms), there is overall no relationship for emotion differentiation to "buffer." In the latter case, even though a crossover interaction can occur when main effects are null or weak (i.e., the relationship is negative for some individuals and positive for others), this seems unlikely in the current case given that stress is unlikely to have an ameliorative impact on mental health for any individuals. Thus, it seems conceptually unlikely for differentiation to moderate or "buffer against" stress–psychopathology relationships when no main effect exists. Although these are speculative interpretations of our findings, we suggest future research both (a) investigate the possibility of a *sensitive range* in which emotion differentiation can moderate stress-internalizing relationships and (b) seek to replicate whether results are similar or different across analytic timescales and measures of depression and anxiety.

Future research should address key limitations of the current study. First, although this study was optimized for within-persons effects, future research should enhance power to detect and replicate between-persons relationships. Thus, the current study should be seen as a replication and extension of prior work in a focused longitudinal sample that is constrained with between-persons power. In addition, the number of individuals in a study is related to within-persons power (Bolger & Laurenceau, 2013), suggesting that even within-persons relationships (or the between-within interaction of emotion differentiation on stress) that did not emerge in this sample may do so in future studies that test this model in larger samples. Second, although the month-level measures included gold-standard interviews and symptom measures, moment-level measures were merely single-item ratings. Even though single-item ratings provide face-valid measures of underlying constructs and are commonly used in EMA research (Goetz et al., 2010; Kuppens et al., 2010; Shiffman et al., 2002), they are weak measures from both a statistical and conceptual perspective. Future research should include more robust moment-level measures of perceived stress and negative affect.

Relatedly, although the use of both perceived and objective measures of stress is a strength of the current study, it is unclear the extent to which perceived stress measures capture exposure to stressful events compared with an individual's emotional distress about events (Harkness & Monroe, 2016). In the current study, this raises the concern that moment-level analyses may merely measure how strongly individuals differentiate "feelings of stress" from "feelings of depression or anxiety." Supplemental analyses suggest that perceived stress scores are numerically more predictive of later depressed/anxious affect than the reverse, supporting the idea that perceived stress measures capture actual stress appraisals and not just a different form of negative affect. Nonetheless, this limitation should be kept in mind when interpreting the current study, and future research should seek to replicate this finding using more objective or biological moment-level measures of stress.

Third, recent research has revealed that emotion differentiation is not static across individuals but actually rises and falls as a function of stress (Erbas et al., 2018). This suggests the possibility of an even more interesting process model, whereby stress not only could activate

negative emotions that foment internalizing problems but also could actually *compound* risk for psychopathology by reducing emotion differentiation, thereby further increasing susceptibility to psychopathology. Collecting state-level measures of emotion differentiation longitudinally would greatly enrich the model outlined above by (a) allowing for cyclical interactions between stress and differentiation to be tested and (b) motivating researchers to investigate the deeper cognitive mechanisms that produce emotion differentiation and how/why these are influenced by stress. Fourth, the model outlined above could also benefit from a deeper integration with research on the biological bases of stress (Burghy et al., 2012; Cohen et al., 2016; Romeo & McEwen, 2006). Future work should investigate how exactly emotion differentiation buffers stress at the neural, endocrine, and psychophysiological levels.

In all, the current study knits together clinical and affective science by highlighting emotion differentiation as a key factor that moderates the association of stress with internalizing problems. In an intensive longitudinal design, we found that high emotion differentiation buffered adolescents from developing internalizing problems in response to within-persons elevations in both perceived stress and exposure to environmental stressors. Thus, emotion differentiation may play a key role in conferring resilience against developing stress-related psychopathology during adolescence. Further research that develops and refines a clear model of this process at psychological and biological levels could advance efforts to prevent the emergence of internalizing psychopathology, particularly in the context of stress. The current findings suggest that interventions that improve emotion differentiation may be an important clinical tool for preventing the development of internalizing problems during adolescence.

Transparency

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Author Contributions

K. A. McLaughlin designed the study and oversaw data collection. E. C. Nook and K. A. McLaughlin jointly designed, executed, and interpreted analyses with assistance from J. C. Flournoy, A. M. Rodman, and P. Mair. E. C. Nook drafted the manuscript, and K. A. McLaughlin, J. C. Flournoy, A. M. Rodman, and P. Mair provided critical revisions. All of the authors approved the final manuscript for submission.

Declaration of Conflicting Interests

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

Open Practices

All data and materials have been made publicly available via OSF and can be accessed at https://osf.io/eavy4. This article has received badges for Open Data and Open Materials. More information about the Open Practices badges can be found at https://www.psychologicalscience.org/publications/badges.

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Supplemental Material

Additional supporting information can be found at http://journals.sagepub.com/doi/suppl/10.1177/2167702620979786

References

Adrian, C., & Hammen, C. (1993). Stress exposure and stress generation in children of depressed mothers. *Journal of Consulting and Clinical Psychology*, *61*(2), 354–359. https://doi.org/10.1037/0022-006X.61.2.354

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

Alloy, L. B., Abramson, L. Y., & Francis, E. L. (1999). Do negative cognitive styles confer vulnerability to depression? *Current Directions in Psychological Science*, *8*(4), 128–132. https://doi.org/10.1111/1467-8721.00030

Anand, D., Chen, Y., Lindquist, K. A., & Daughters, S. B. (2017). Emotion differentiation predicts likelihood of initial lapse following substance use treatment. *Drug and Alcohol Dependence*, *180*, 439–444. https://doi.org/10.1016/j.drugalcdep.2017.09.007

Armstrong, A. R., Galligan, R. F., & Critchley, C. R. (2011). Emotional intelligence and psychological resilience to negative life events. *Personality and Individual Differences*, *51*(3), 331–336. https://doi.org/10.1016/j.paid.2011.03.025

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language*, *68*(3), 255–278. https://doi.org/10.1016/j.jml.2012.11.001

Barrett, L. F. (2006). Solving the emotion paradox: Categorization and the experience of emotion. *Personality and Social Psychology Review*, *10*(1), 20–46. https://doi.org/10.1207/s15327957pspr1001_2

Barrett, L. F. (2017). The theory of constructed emotion: An active inference account of interoception and categorization. *Social Cognitive and Affective Neuroscience*, *12*(1), 1–23. https://doi.org/10.1093/scan/nsw154

Barrett, L. F., Gross, J. J., Christensen, T. C., & Benvenuto, M. (2001). Knowing what you're feeling and knowing what to do about it: Mapping the relation between emotion differentiation and emotion regulation. *Cognition & Emotion*, *15*(6), 713–724. https://doi.org/10.1080/02699930143000239

Bates, D., Kliegl, R., Vasishth, S., & Baayen, H. (2015). Parsimonious mixed models. *ArXiv*. https://arxiv.org/abs/1506.04967

Bates, D., Mächler, M., Bolker, B. M., & Walker, S. C. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Bernstein, E. E., Kleiman, E. M., van Bork, R., Moriarity, D. P., Mac Giollabhui, N., McNally, R. J., Abramson, L. Y., & Alloy, L. B. (2019). Unique and predictive relationships between components of cognitive vulnerability and symptoms of depression. *Depression and Anxiety*, *36*(10), 950–959. https://doi.org/10.1002/da.22935

Bolger, N., DeLongis, A., Kessler, R. C., & Schilling, E. A. (1989). Effects of daily stress on negative mood. *Journal of Personality and Social Psychology*, *57*(5), 808–818. https://doi.org/10.1037/0022-3514.57.5.808

Bolger, N., & Laurenceau, J.-P. (2013). *Intensive longitudinal methods: An introduction to diary and experience sampling research*. Guilford.

Brown, G. W., & Harris, T. O. (1989). *Life events and illness*. Guilford Press.

Burghy, C. A., Stodola, D. E., Ruttle, P. L., Molloy, E. K., Armstrong, J. M., Oler, J. A., Fox, M. E., Hayes, A. S., Kalin, N. H., Essex, M. J., Davidson, R. J., & Birn, R. M. (2012). Developmental pathways to amygdala-prefrontal function and internalizing symptoms in adolescence. *Nature Neuroscience*, *15*(12), 1736–1741. https://doi.org/10.1038/nn.3257

Cheng, C., Lau, H. B., & Chan, M. S. (2014). Coping flexibility and psychological adjustment to stressful life changes: A meta-analytic review. *Psychological Bulletin*, *140*(6), 1582–1607. https://doi.org/10.1037/a0037913

Cludius, B., Mennin, D., & Ehring, T. (2020). Emotion regulation as a transdiagnostic process. *Emotion*, *20*(1), 37–42.

Cohen, S. (2004). Social relationships and health. *The American Psychologist*, *59*(8), 676–684. https://doi.org/10.1037/0003-066X.59.8.676

Cohen, S., Gianaros, P. J., & Manuck, S. B. (2016). A stage model of stress and disease. *Perspectives on Psychological Science*, *11*(4), 456–463. https://doi.org/10.1177/1745691616646305

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*(4), 385–396.

Cohen, S., Kessler, R. C., & Underwood Gordon, L. (1995). *Measuring stress: A guide for health and social scientists*. Oxford University Press.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis: A theoretical analysis. *Psychological Bulletin*, *98*(2), 310–357.

Davila, J., Hammen, C., Burge, D., Paley, B., & Daley, S. E. (1995). Poor interpersonal problem solving as a mechanism of stress generation in depression among adolescent women. *Journal of Abnormal Psychology*, *104*(4), 592–600.

Decker, M. L., Turk, C. L., Hess, B., & Murray, C. E. (2008). Emotion regulation among individuals classified with and without generalized anxiety disorder. *Journal of Anxiety Disorders*, *22*(3), 485–494. https://doi.org/10.1016/j.janxdis.2007.04.002

Demiralp, E., Thompson, R. J., Mata, J., Jaeggi, S. M., Buschkuehl, M., Barrett, L. F., Ellsworth, P. C., Demiralp, M., Hernandez-Garcia, L., Deldin, P. J., Gotlib, I. H., & Jonides, J. (2012). Feeling blue or turquoise? Emotional differentiation in major depressive disorder. *Psychological Science*, *23*(11), 1410–1416. https://doi.org/10.1177/0956797612444903

Dennison, M. J., Sheridan, M. A., Busso, D. S., Jenness, J. L., Peverill, M., Rosen, M. L., & McLaughlin, K. A. (2016). Neurobehavioral markers of resilience to depression amongst adolescents exposed to child abuse. *Journal of Abnormal Psychology*, *125*(8), 1201–1212. https://doi.org/10.1037/abn0000215

Dixon-Gordon, K. L., Chapman, A. L., Weiss, N. H., & Rosenthal, M. Z. (2014). A preliminary examination of the role of emotion differentiation in the relationship between borderline personality and urges for maladaptive behaviors. *Journal of Psychopathology and Behavioral Assessment*, *36*(4), 616–625. https://doi.org/10.1007/s10862-014-9423-4

Eckland, N. S., & Berenbaum, H. (2021). Emotional awareness in daily life: Exploring its potential role in repetitive thinking and healthy coping. *Behavior Therapy*, *52*(2), 338–349. https://doi.org/10.1016/j.beth.2020.04.010

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

Erbas, Y., Ceulemans, E., Blanke, E. S., Sels, L., Fischer, A., & Kuppens, P. (2019). Emotion differentiation dissected: Between-category, within-category, and integral emotion differentiation, and their relation to well-being. *Cognition and Emotion*, *33*(2), 258–271. https://doi.org/10.1080/02699931.2018.1465894

Erbas, Y., Ceulemans, E., Kalokerinos, E. K., Houben, M., Koval, P., Pe, M. L., & Kuppens, P. (2018). Why I don't always know what I'm feeling: The role of stress in within-person fluctuations in emotion differentiation. *Journal of Personality and Social Psychology*, *115*(2), 179–191. https://doi.org/10.1037/pspa0000126

Erbas, Y., Ceulemans, E., Lee Pe, M., Koval, P., & Kuppens, P. (2014). Negative emotion differentiation: Its personality and well-being correlates and a comparison of different assessment methods. *Cognition & Emotion*, *28*(7), 1196–1213. https://doi.org/10.1080/02699931.2013.875890

Fisher, A. J. (2015). Toward a dynamic model of psychological assessment: Implications for personalized care. *Journal of Consulting and Clinical Psychology*, *83*(4), 825–836. https://doi.org/10.1037/ccp0000026

Goetz, T., Frenzel, A. C., Stoeger, H., & Hall, N. C. (2010). Antecedents of everyday positive emotions: An experience sampling analysis. *Motivation and Emotion*, *34*(1), 49–62. https://doi.org/10.1007/s11031-009-9152-2

Grant, K. E., Compas, B. E., Thurm, A. E., McMahon, S. D., Gipson, P. Y., Campbell, A. J., Krochock, K., & Westerholm, R. I. (2006). Stressors and child and adolescent psychopathology: Evidence of moderating and mediating effects. *Clinical Psychology Review*, *26*(3), 257–283. https://doi.org/10.1016/j.cpr.2005.06.011

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, *2*(5), 271–299.

Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, *26*(1), 1–26. https://doi.org/10.1080/1047840X.2014.940781

Gross, J. J., & Jazaieri, H. (2014). Emotion, emotion regulation, and psychopathology: An affective science perspective. *Clinical Psychological Science*, *2*(4), 387–401. https://doi.org/10.1177/2167702614536164

Hammen, C. (2005). Stress and depression. *Annual Review of Clinical Psychology*, *1*(1), 293–319. https://doi.org/10.1146/annurev.clinpsy.1.102803.143938

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. (2001). Development of gender differences in depression. *Psychological Bulletin*, *127*(6), 773–796.

Hankin, B. L., Abramson, L. Y., Moffitt, T. E., Silva, P. A., McGee, R., & Angell, K. E. (1998). Development of depression from preadolescence to young 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

Harkness, K. L., & Monroe, S. M. (2016). The assessment and measurement of adult life stress: Basic premises, operational principles, and design requirements. *Journal of Abnormal Psychology*, *125*(5), 727–745. https://doi.org/10.1037/abn0000178

Hilsman, R., & Garber, J. (1995). A test of the cognitive diathesis-stress model of depression in children: Academic stressors, attributional style, perceived competence, and control. *Journal of Personality and Social Psychology*, *69*(2), 370–380. https://doi.org/10.1037/0022-3514.69.2.370

Hooley, J. M., & Gotlib, I. H. (2000). A diathesis-stress conceptualization of expressed emotion and clinical outcome. *Applied and Preventive Psychology*, *9*(3), 135–151. https://doi.org/10.1016/S0962-1849(05)80001-0

Hooley, J. M., Gruber, S. A., Parker, H. A., Guillaumot, J., Rogowska, J., & Yurgelun-Todd, D. A. (2009). Cortico-limbic response to personally challenging emotional stimuli after complete recovery from depression. *Psychiatry Research: Neuroimaging*, *172*(1), 83–91. https://doi.org/10.1016/j.pscychresns.2009.02.001

Hughes, J. (2020). *reghelper: Helper functions for regression analysis* (Version 0.3.5) [Computer software]. Comprehensive R Archive Network. https://cran.r-project.org/package=reghelper

Jenness, J. L., Peverill, M., King, K. M., Hankin, B. L., & McLaughlin, K. A. (2019). Dynamic associations between stressful life events and adolescent internalizing psychopathology in a multiwave longitudinal study. *Journal of Abnormal Psychology*, *128*(6), 596–609. https://doi.org/10.1037/abn0000450

John, O. P., & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality*, *72*(6), 1301–1333. https://doi.org/10.1111/j.1467-6494.2004.00298.x

Kalokerinos, E. K., Erbas, Y., Ceulemans, E., & Kuppens, P. (2019). Differentiate to regulate: Low negative emotion differentiation is associated with ineffective emotion regulation use, but not strategy selection. *Psychological Science*, *30*(6), 863–879.

Kashdan, T. B., Barrett, L. F., & McKnight, P. E. (2015). Unpacking emotion differentiation: Transforming unpleasant experience by perceiving distinctions in negativity. *Current Directions in Psychological Science*, *24*(1), 10–16. https://doi.org/10.1177/0963721414550708

Kashdan, T. B., & Farmer, A. S. (2014). Differentiating emotions across contexts: Comparing adults with and without social anxiety disorder using random, social interaction, and daily experience sampling. *Emotion*, *14*(3), 629–638. https://doi.org/10.1037/a0035796

Kashdan, T. B., Ferssizidis, P., Collins, R. L., & Muraven, M. (2010). Emotion differentiation as resilience against excessive alcohol use: An ecological momentary assessment in underage social drinkers. *Psychological Science*, *21*(9), 1341–1347. https://doi.org/10.1177/0956797610379863

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 and Adolescent Psychiatry*, *36*(7), 980–988. https://doi.org/10.1097/00004583-199707000-00021

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), 593–602. https://doi.org/10.1001/archpsyc.62.6.593

Kircanski, K., Thompson, R. J., Sorenson, J. E., Sherdell, L., & Gotlib, I. H. (2015). Rumination and worry in daily life: Examining the naturalistic validity of theoretical constructs. *Clinical Psychological Science*, *3*(6), 926–939. https://doi.org/10.1177/2167702614566603

Kranzler, A., Young, J. F., Hankin, B. L., Abela, J. R. Z., Elias, M. J., & Selby, E. A. (2016). Emotional awareness: A transdiagnostic predictor of depression and anxiety for

children and adolescents. *Journal of Clinical Child and Adolescent Psychology*, *45*(3), 262–269. https://doi.org/10.1080/15374416.2014.987379

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

Kuppens, P., Oravecz, Z., & Tuerlinckx, F. (2010). Feelings change: Accounting for individual differences in the temporal dynamics of affect. *Journal of Personality and Social Psychology*, *99*(6), 1042–1060. https://doi.org/10.1037/a0020962

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software*, *82*(13). https://doi.org/10.18637/jss.v082.i13

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2008). *International Affective Picture System (IAPS): Affective ratings of pictures and instruction manual. Technical Report A-8*. University of Florida.

Larson, R. W., & 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

Larson, R. W., Moneta, G., Richards, M. H., & Wilson, S. (2002). Continuity, stability, and change in daily emotional experience across adolescence. *Child Development*, *73*(4), 1151–1165. https://doi.org/10.1111/1467-8624.00464

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. Springer.

LeMoult, J., Humphreys, K. L., Tracy, A., Hoffmeister, J.-A., Ip, E., & Gotlib, I. H. (2020). Meta-analysis: Exposure to early life stress and risk for depression in childhood and adolescence. *Journal of the American Academy of Child & Adolescent Psychiatry*, *59*(7), 842–855. https://doi.org/10.1016/j.jaac.2019.10.011

Liu, D. Y., Gilbert, K. E., & Thompson, R. J. (2020). Emotion differentiation moderates the effects of rumination on depression: A longitudinal study. *Emotion*, *20*(7), 1234–1243. https://doi.org/10.1037/emo0000627

Long, J. A. (2019). *interactions: Comprehensive, user-friendly toolkit for probing interactions* (Version 1.1.1) [Computer software]. Comprehensive R Archive Network. https://cran.r-project.org/package=interactions

Mankus, A. M., Boden, M. T., & Thompson, R. J. (2016). Sources of variation in emotional awareness: Age, gender, and socioeconomic status. *Personality and Individual Differences*, *89*, 28–33. https://doi.org/10.1016/j.paid.2015.09.043

Matuschek, H., Kliegl, R., Vasishth, S., Baayen, H., & Bates, D. (2017). Balancing Type I error and power in linear mixed models. *Journal of Memory and Language*, *94*, 305–315. https://doi.org/10.1016/j.jml.2017.01.001

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

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

Mikhail, M. E., Keel, P. K., Burt, S. A., Neale, M., Boker, S., & Klump, K. L. (2020). Low emotion differentiation: An affective correlate of binge eating? *International Journal of Eating Disorders*, *53*(3), 412–421. https://doi.org/10.1002/eat.23207

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., 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. https://doi.org/10.1037/0021-843X.108.4.606

Monroe, S. M., & Simons, A. D. (1991). Diathesis-stress theories in the context of life stress research: Implications for the depressive disorders. *Psychological Bulletin*, *110*(3), 406–425. https://doi.org/10.1037//0033-2909.110.3.406

Mroczek, D. K., & Almeida, D. M. (2004). The effect of daily stress, personality, and age on daily negative affect. *Journal of Personality*, *72*(2), 355–378. https://doi.org/10.1111/j.0022-3506.2004.00265.x

Nikolova, Y. S., Bogdan, R., Brigidi, B. D., & Hariri, A. R. (2012). Ventral striatum reactivity to reward and recent life stress interact to predict positive affect. *Biological Psychiatry*, *72*(2), 157–163. https://doi.org/10.1016/j.biopsych.2012.03.014

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., Dodell-Feder, D., Germine, L. T., Hooley, J. M., DeLisi, L. E., & Hooker, C. I. (2018). Weak dorsolateral prefrontal response to social criticism predicts worsened mood and symptoms following social conflict in people at familial risk for schizophrenia. *NeuroImage: Clinical*, *18*, 40–50. https://doi.org/10.1016/j.nicl.2018.01.004

Nook, E. C., Sasse, S. F., Lambert, H. K., McLaughlin, K. A., & Somerville, L. H. (2017). Increasing verbal knowledge mediates development of multidimensional emotion representations. *Nature Human Behaviour*, *1*(12), 881–889. https://doi.org/10.1038/s41562-017-0238-7

Nook, E. C., Sasse, S. F., Lambert, H. K., McLaughlin, K. A., & Somerville, L. H. (2018). The nonlinear development of emotion differentiation: Granular emotional experience is low in adolescence. *Psychological Science*, *29*(8), 1346–1357. https://doi.org/10.1177/0956797618773357

Nook, E. C., & Somerville, L. H. (2020). Emotion concept development from childhood to adulthood. In M. Neta & I. J. Haas (Eds.), *Emotion in the Mind and Body,*

Proceedings of the 66th Nebraska Symposium on Motivation (pp. 11–42). Springer.

Nook, E. C., Stavish, C. M., Sasse, S. F., Lambert, H. K., Mair, P., McLaughlin, K. A., & Somerville, L. H. (2020). Charting the development of emotion comprehension and abstraction from childhood to adulthood using observer-rated and linguistic measures. *Emotion*, *20*(5), 773–792. https://doi.org/10.1037/emo0000609

Pinheiro, J., Bates, D., DebRoy, S., Sarkar, D., & *R Core Team*. (2019). *nlme: Linear and nonlinear mixed effects models* (Version 3.1-143) [Computer software]. Comprehensive R Archive Network. https://cran.r-project.org/package=nlme

Pond, R. S., Kashdan, T. B., DeWall, C. N., Savostyanova, A., Lambert, N. M., & Fincham, F. D. (2012). Emotion differentiation moderates aggressive tendencies in angry people: A daily diary analysis. *Emotion*, *12*(2), 326–337. https://doi.org/10.1037/a0025762

Prinstein, M. J., & Aikins, J. W. (2004). Cognitive moderators of the longitudinal association between peer rejection and adolescent depressive symptoms. *Journal of Abnormal Child Psychology*, *32*(2), 147–158.

R Core Team. (2019). *R: A language and environment for statistical computing* (Version 3.6.2) [Computer software]. R Foundation for Statistical Computing.

Revelle, W. (2016). *psych: Procedures for personality and psychological research*. Northwestern University.

Romeo, R. D., & McEwen, B. S. (2006). Stress and the adolescent brain. *Annals of the New York Academy of Sciences*, *1094*, 202–214. https://doi.org/10.1196/annals.1376.022

Russo, S. J., Murrough, J. W., Han, M.-H., Charney, D. S., & Nestler, E. J. (2012). Neurobiology of resilience. *Nature Neuroscience*, *15*(11), 1475–1484. https://doi.org/10.1038/nn.3234

Rutter, M. (1985). Resilience in the face of adversity. *British Journal of Psychiatry*, *147*(6), 598–611. https://doi.org/10.1192/bjp.147.6.598

Selby, E. A., Wonderlich, S. A., Crosby, R. D., Engel, S. G., Panza, E., Mitchell, J. E., Crow, S. J., Peterson, C. B., & Le Grange, D. (2014). Nothing tastes as good as thin feels: Low positive emotion differentiation and weight-loss activities in anorexia nervosa. *Clinical Psychological Science*, *2*(4), 514–531. https://doi.org/10.1177/2167702613512794

Shapero, B. G., McClung, G., Bangasser, D. A., Abramson, L. Y., & Alloy, L. B. (2017). Interaction of biological stress recovery and cognitive vulnerability for depression in adolescence. *Journal of Youth and Adolescence*, *46*(1), 91–103. https://doi.org/10.1007/s10964-016-0451-0

Shiffman, S., Gwaltney, C. J., Balabanis, M. H., Liu, K. S., Paty, J. A., Kassel, J. D., Hickcox, M., & Gnys, M. (2002). Immediate antecedents of cigarette smoking: An analysis from ecological momentary assessment. *Journal of Abnormal Psychology*, *111*(4), 531–545. https://doi.org/10.1037/0021-843X.111.4.531

Shimizu, M., & Pelham, B. W. (2004). The unconscious cost of good fortune: Implicit and explicit self-esteem, positive life events, and health. *Health Psychology*, *23*(1), 101–105. https://doi.org/10.1037/0278-6133.23.1.101

Sibinga, E. M. S., Webb, L., Ghazarian, S. R., & Ellen, J. M. (2016). School-based mindfulness instruction: An RCT. *Pediatrics*, *137*(1), Article e20152532. https://doi.org/10.1542/peds.2015-2532

Somerville, L. H., & McLaughlin, K. A. (2018). What develops during emotional development? Normative trajectories and sources of psychopathology risk in adolescence. In A. S. Fox, R. C. Lapate, A. J. Shackman, & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (2nd ed., pp. 382–385). Oxford University Press.

Southam-Gerow, M. A., & Kendall, P. C. (2002). Emotion regulation and understanding: Implications for child psychopathology and therapy. *Clinical Psychology Review*, *22*(2), 189–222. https://doi.org/10.1016/S0272-7358(01)00087-3

Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder. *Archives of Internal Medicine*, *166*(10), 1092–1097. https://doi.org/10.1001/archinte.166.10.1092

Starr, L. R., Hershenberg, R., Li, Y. I., & Shaw, Z. A. (2017). When feelings lack precision: Low positive and negative emotion differentiation and depressive symptoms in daily life. *Clinical Psychological Science*, *5*(4), 613–631. https://doi.org/10.1177/2167702617694657

Starr, L. R., Hershenberg, R., Shaw, Z. A., Li, Y. I., & Santee, A. C. (2020). The perils of murky emotions: Emotion differentiation moderates the prospective relationship between naturalistic stress exposure and adolescent depression. *Emotion*, *20*(6), 927–938. https://doi.org/10.1037/emo0000630

Starr, L. R., Shaw, Z. A., Li, Y. I., Santee, A. C., & Hershenberg, R. (2020). Negative emotion differentiation through a developmental lens: Associations with parental factors and age in adolescence. *Personality and Individual Differences*, *152*, Article 109597. https://doi.org/10.1016/j.paid.2019.109597

Suvak, M. K., Litz, B. T., Sloan, D. M., Zanarini, M. C., Barrett, L. F., & Hofmann, S. G. (2011). Emotional granularity and borderline personality disorder. *Journal of Abnormal Psychology*, *120*(2), 414–426. https://doi.org/10.1037/a0021808

Swartz, J. R., Knodt, A. R., Radtke, S. R., & Hariri, A. R. (2015). A neural biomarker of psychological vulnerability to future life stress. *Neuron*, *85*(3), 505–511. https://doi.org/10.1016/j.neuron.2014.12.055

Tugade, M. M., Fredrickson, B. L., & Barrett, L. F. (2004). Psychological resilience and positive emotional granularity: Examining the benefits of positive emotions on coping and health. *Journal of Personality*, *72*(6), 1161–1190. https://doi.org/10.1111/j.1467-6494.2004.00294.x

Van der Gucht, K., Dejonckheere, E., Erbas, Y., Takano, K., Vandemoortele, M., Maex, E., Raes, F., & Kuppens, P. (2019). An experience sampling study examining the potential impact of a mindfulness-based intervention on emotion differentiation. *Emotion*, *19*(1), 123–131. https://doi.org/10.1037/emo0000406

Weissman, D. G., Nook, E. C., Dews, A. A., Miller, A. B., Lambert, H. K., Sasse, S., Somerville, L. H., & McLaughlin, K. A. (2020). Low emotional awareness as a transdiagnostic mechanism underlying psychopathology in adolescence. *Clinical Psychological Science*, *8*(6), 971–988.

Willroth, E. C., Flett, J. A. M., & Mauss, I. B. (2020). Depressive symptoms and deficits in stress-reactive negative, positive, and within-emotion-category differentiation: A daily diary

study. *Journal of Personality*, *88*(2), 174–184. https://doi.org/10.1111/jopy.12475

Wright, A. G. C., & Woods, W. C. (2020). Personalized models of psychopathology. *Annual Review of Clinical Psychology*, *16*(1), 49–74. https://doi.org/10.1146/annurev-clinpsy-102419-125032

Zaki, L. F., Coifman, K. G., Rafaeli, E., Berenson, K. R., & Downey, G. (2013). Emotion differentiation as a protective factor against nonsuicidal self-injury in borderline personality disorder. *Behavior Therapy*, *44*(3), 529–540. https://doi.org/10.1016/j.beth.2013.04.008

Zwaan, R. A., Etz, A., Lucas, R. E., & Donnellan, M. B. (2018). Making replication mainstream. *Behavioral and Brain Sciences*, *41*, Article e120. https://doi.org/10.1017/S0140525X17001972