Published in final edited form as:

Pers Individ Dif. 2020 January 1; 152: . doi:10.1016/j.paid.2019.109597.

Negative Emotion Differentiation through a Developmental Lens: Associations with Parental Factors and Age in Adolescence

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Abstract

Negative emotion differentiation (NED) is the ability to precisely discern negatively-valenced emotional states. Low NED has been linked to numerous negative outcomes. However, little is known about the conditions under which individual differences in NED emerge, particularly during adolescence, a potentially important developmental stage. We examined associations between NED (assessed using intraclass correlations between negative emotion [NE] ratings collected via intensive longitudinal methods), parental variables, and age. Adolescents ($N=233$, $M_{age}=15.90$, 53% female) and their parents completed interview measures of depression and self-report questionnaires; adolescents then completed a seven-day ecological momentary assessment. Lower NED was associated with greater parental depression, greater authoritarian parenting style, and lower parental attachment security. Age was negatively and linearly associated with NED. Results held controlling for mean NE and adolescent depression, although authoritarian parenting was non-significant controlling for other developmental variables. Findings suggest healthy parent-child relationships may relate to adolescents' ability to perceive NEs with nuance.

Keywords

Negative Emotion Differentiation; Granularity; Adolescence; Development; Parenting

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Declarations of interest: none.

1. Introduction

Negative emotion differentiation (NED), or emotion granularity, is the trait-like ability to make fine-grained distinctions between discrete negative emotional states (Barrett, Gross, Christensen, & Benvenuto, 2001; Kashdan, Barrett, & McKnight, 2015). People with high NED describe their emotional experiences with nuance (e.g., “I was more embarrassed than disappointed”). Those low on NED describe a monolithic view of emotion (“I felt bad”).

Low NED has important consequences. Negative emotions (NEs) conveys critical information about arousal, valence, sources of distress, social context, and attentional demands. People who do not draw distinctions between NE states may be less prepared to use this information to regulate their emotions (Barrett et al., 2001; Kalokerinos, Erbas, Ceulemans, & Kuppens, 2019; Kashdan et al., 2015). Moreover, the act of affect labeling has inherent regulatory properties (Lieberman et al., 2007) from which those with low NED are less likely to benefit. Accordingly, low NED is linked to deficits in implementing effective emotion regulation (ER) strategies, greater distress after using maladaptive coping strategies, and numerous psychopathological problems including depression (e.g., Barrett et al., 2001; Demiralp et al., 2012; Kashdan et al., 2015; Starr, Hershenberg, Li, & Shaw, 2017; Tugade, Fredrickson, & Barrett, 2004).

Given its importance to transdiagnostic outcomes, we know surprisingly little about developmental factors which impact the emergence of NED. Scarce research has examined NED in child or adolescent samples, and the limited existing studies suggest NED relates to emotional well-being in youth (e.g., Lennarz, Lichtwarck-Aschoff, Timmerman, & Granic, 2018; Starr, Hershenberg, Shaw, Li, & Santee, in press). However, it is unclear how specific environmental contexts and aspects of socioemotional development relate to variation in youth NED. The current study examines how developmentally relevant factors relate to NED in an adolescent sample. Adolescence may be an important developmental stage to explore NED due to surges in NEs (Bailen, Green, & Thompson, 2019) and rapid development of emotion-related neural regions (Ahmed, Bittencourt-Hewitt, & Sebastian, 2015). Normative development of ER is believed to unfold as a function of numerous factors, including age-related cognitive developmental changes and variations in environmental experiences (e.g., neural maturation, family factors) that are especially salient during this developmental period (Cole, Michel, & Teti, 1994). In parallel, we investigated multifactorial contributors to the development of NED, including age and multi-informant reports of parental variables.

1.1. Age

Emotion intensity, clarity, language complexity, and regulatory abilities normatively change with age, even over relatively narrow developmental windows within adolescence (Bailen et al., 2019; Larson, Moneta, Richards, & Wilson, 2002; Maciejewski, van Lier, Branje, Meeus, & Koot, 2015; O’Kearney & Dadds, 2004). Changes in emotion-related neural connectivity also occur during adolescence, with an increase in top-down activation in regions involved in cognitive control and mental representations (Gee et al., 2013; Silvers et al., 2017). Thus, similar age-related changes may occur in NED. Emotion differentiation is hypothesized to rely on verbal ability, including the capacity to pair emotional vocabulary with behavioral, somatic, and cognitive experiences (Barrett, 2006; Kashdan et al., 2015). As

lexical learning accumulates with age, emotion-related vocabulary becomes more nuanced (e.g., O’Kearney & Dadds, 2004), increasing young people’s ability to identify and make distinctions between NEs, and develop multifaceted emotional representations (Herba, Landau, Russell, Ecker, & Phillips, 2006; Nook, Sasse, Lambert, McLaughlin, & Somerville, 2017). Further, while emotion language comprehension appears to plateau in early adolescence (Baron-Cohen, Golan, Wheelwright, & Granader, 2010), abstraction for emotion related concepts continues to develop into adulthood (Nook et al., in press). Thus, NED may increase with age during adolescence. However, a recent longitudinal study (Haas et al., 2018) suggested self-reported emotional clarity *declines* over the course of adolescence. Moreover, a recent investigation with a wider age range (5-25 years) suggests NED may follow a non-linear developmental trajectory, *decreasing* across childhood toward nadir in adolescence and then increasing into early adulthood (Nook, Sasse, Lambert, McLaughlin, & Somerville, 2018). These researchers suggest that younger children experience more simplified, “one-at-a-time” emotions (*single emotional experience* [SEE]). Thus, high NED in childhood may reflect oversimplified emotional experience, while NED in adulthood reflects the capacity to differentiate among co-occurring emotions. Adolescence may represent a period of low differentiation because emotional experiences become increasingly complex, but emotion concepts remain unrefined. Given these intriguing findings, it is important to explore how NED changes *within* adolescence, and whether age-related differences in SEE contribute.

1.2. Parental Factors

1.2.1. Parental attachment.—Attachment theory focuses on relational patterns between children and caregivers that impact the development of identity, early working models of self and others, and emotional functioning. According to Bowlby (e.g., 1980), attachment experiences with early caregivers provide internal working models that serve as the basis for experience and expression of distressing emotions throughout the lifespan. When caregivers are sensitive to children’s distress, children internalize that difficult emotions can be expressed and regulated and learn to utilize NEs as a step toward seeking support or enacting other regulatory strategies (see Cooper, Shaver, & Collins, 1998). Openness towards NEs may allow children to better perceive their variations. Supporting this model, infant attachment security predicts emotion recognition and effective implementation of ER strategies later in childhood (Steele, Steele, & Croft, 2008), and securely attached adolescents show higher emotional awareness and more adaptive ER (Laible, 2007; Zimmermann, 1999). As such, adolescents with more secure parental attachment (i.e., characterized by lower alienation and higher communication and trust) may show higher NED.

1.2.2. Authoritarian parenting style.—Parenting styles are characterized by variations in responsiveness and demandingness (Baumrind, 1968). Authoritarian parents are higher in hostility, coercion, and psychological control, and authoritarian parenting practices are related to adolescents’ limited access to and maladaptive use of ER strategies (Morris, Silk, Steinberg, Myers, & Robinson, 2007). Disciplinary practices related to authoritarian parenting (e.g., harsh discipline, punitive reactions to children’s NE displays; McKinney, Milone, & Renk, 2011) may socialize avoidance and suppression rather than understanding

and labeling of NEs, leading to lower NED. Supporting this notion, research links authoritarian parenting and related practices to lower emotional intelligence, emotional understanding, and ER in children and adolescents (e.g., Brody & Ge, 2001; Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997; Moilanen, Rasmussen, & Padilla-Walker, 2015). Taken together, NED may be lower among adolescents with parents who use an authoritarian style.

1.2.3. Parental depression.—Finally, having a depressed parent may inhibit NED development. Parental depression strongly predicts offspring ER problems and heightened emotional distress throughout the lifespan (Cummings & Davies, 1994). Beginning in infancy, depressed parents' child-directed speech focuses less on labeling and responding to children's affective experiences and more on the parent's experiences, and parents interpret their infant's facial expressions less accurately (see Davila, Stroud, & Starr, 2014; Murray, Kempton, Woolgar, & Hooper, 1993). This may place children on a trajectory that prevents them from learning to effectively categorize emotions. In support, children of depressed parents show impairments in identifying negative facial expressions by late childhood and early adolescence (Joormann, Gilbert, & Gotlib, 2010). Depressed parents may also be more likely to display poor NED themselves (Demiralp et al., 2012) and may model labelling of emotional states using undifferentiated terms and expose their children to less nuanced emotional vocabulary. As such, we predicted youth with depressed parents would exhibit lower NED.

1.3. Present Study

We examined associations between NED and these developmentally-relevant variables in a sample of adolescents. We predicted lower parent-adolescent attachment, higher authoritarian parenting style, and higher parental depression would be associated with lower NED. As these parental variables are typically correlated with each other, we also conducted models controlling for shared variance to identify unique predictors of NED. We also examined associations with age on an exploratory basis, given conflicting guidance from available theory and research. Finally, given established gender differences in variables relevant to NED (e.g., emotion regulation; Nolen-Hoeksema, 2012), we explored gender differences in NED. Our hypotheses focused on NED rather than *positive* emotion differentiation (PED) because NED is more clearly linked to negative outcomes (Demiralp et al., 2012; Starr et al., 2017); however, to determine whether developmental factors relate to NED specifically versus emotion granularity more broadly, we also explored associations with PED.

2. Method

2.1. Participants and Procedures

Adolescents aged 14-17 ($M_{\text{age}}=15.90$ years, $SD=1.09$; 53% female, 46% male, 1% non-binary gender) were recruited from the community of a mid-sized metropolitan area and participated with one primary caregiver. A variety of recruitment methods were employed (e.g., advertisements, commercial mailing lists). Families were required to be fluent in English and excluded if adolescents had prior bipolar or psychotic disorder diagnoses, major

physical or neurological disorders, or prior sibling participation. The full sample included 241 adolescent-parent dyads. For most families (90.9%), the participating parent was a female caregiver. For more sample and recruitment details, see Starr et al., 2017. Eight adolescents completed insufficient daily surveys to compute NED (these participants did not differ from the remaining sample on age, gender, or major study variables), leaving a final sample of 233. Power analyses suggested adequate power ($>80\%$) to detect a small-to-medium effect sizes ($r = .20$) comparable to those found in previous studies examining parenting variables and emotion outcomes in adolescence (e.g., Alegre & Benson, 2010).

At a baseline session, families provided consent/assent, completed interviews and questionnaires, and received instructions on daily survey completion. Adolescents subsequently completed brief surveys using personal devices four times per day for seven days. Because of school schedules, it was not feasible to randomize survey prompts; instead, adolescents completed surveys during pre-designated times at approximately 4–6-hour intervals, including right after awakening, at lunchtime, after school, and at bedtime. A prorated compensation system and raffle entries encouraged compliance. Staff monitored survey compliance and troubleshooted as necessary. Participants completed a mean of 24.05/28 valid surveys (86% compliance). All study procedures were approved by the University of Rochester Research Subjects Review Board.

2.2. Measures

2.2.1. Parent Measures.

2.2.1.1. Authoritarian Parenting Style.: The authoritarian scale of the 12-item, parent-report Parenting Styles and Dimensions Questionnaire (PSDQ; Robinson, Mandleco, Olsen, & Hart, 2001) measures how frequently a parent exhibits certain behaviors including physical coercion, verbal hostility, and non-reasoning/punitive strategies towards their child. The PSDQ has demonstrated good psychometric properties (Robinson et al., 2001). Here, Cronbach's $\alpha = .83$.

2.2.1.2. Parental Depression.: Parent's depression (major depression/dysthymia) was assessed using the Structured Clinical Interview for the DSM-IV (Spitzer, Williams, Gibbon, & First, 1995), a semi-structured diagnostic interview with strong validity and reliability. To capture both diagnoses and subsyndromal symptoms, interviewers rated the disorder on a 5-point scale: 0=no symptoms, 1=mild symptoms, 2=moderate, subthreshold symptoms, 3=DSM-IV criteria met, 4=DSM-IV criteria met with high severity; 7.5% met current diagnostic criteria. Second raters coded a subset of audiotapes, with excellent interrater reliability ($ICC = .97$).

2.2.2. Child Measures.

2.2.2.1. Parental Attachment.: The Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987), a 28-item youth-report questionnaire with established psychometric properties, assesses affective and cognitive dimensions of youths' relationships with the participating parent, including communication, trust, and alienation (Cronbach's $\alpha = .94$). Total scores were used in analyses (higher scores=more secure attachment).

2.2.2.2. Child Depression: (covariate) was assessed using the Schedule for Affective Disorders and Schizophrenia for School-Aged Children—Present and Lifetime (KSADS-PL; Kaufman et al., 1997), and coded on the same scale as parental depression (100% interrater reliability).

2.2.2.2. Emotion Variables.: The Profile of Mood States-15 (POMS-15; Cranford et al., 2006), which includes 12 items assessing momentary NEs (e.g., anxious, sad, annoyed, angry, worn-out) rated on a 5-point Likert-type scale, were administered at each diary prompt. Five positive emotion (PE) items (happy, proud, cheerful, lively, joyful) were drawn from the Positive and Negative Affect Scale for Children (Ebesutani et al., 2012).

NED was calculated using established, validated methods (Tugade et al., 2004): the average intraclass correlation for NE items across repeated measures was computed separately for each participant, and then subtracted from one to aid interpretability (higher *NED*=more differentiation). Negative ICCs are considered statistically problematic (Giraudeau, 1996) and were re-coded as zero (*NED*=1); excluding participants with negative ICCs did not change results. For supplemental analyses, positive emotion differentiation (*PED*) was calculated using the same methods.

Mean NE was computed by averaging NE ratings across all prompts. Cronbach's alpha (calculated at each prompts, then averaged)=.86.

SEE was calculated with daily survey data following the methods of Nook et al. (2018). At each prompt, we identified the highest score among the 12 NE items and calculated the mean distance between the 11 remaining items to the highest NE, and then averaged these values across all prompts. Higher values indicate an emotional experience more dominated by a single NE.

3. Results

3.1. Bivariate Correlations.

Table 1 displays descriptive data and bivariate correlations among study variables. As shown, *NED* showed significant positive correlations with parental attachment and significant negative correlations with age, authoritarian parenting style, and parental depression (all $ps < .05$). Figure 1 displays corresponding scatterplots. Gender was not associated with *NED*, $t(228) = .85$, $p = .398$.¹ To ensure no outliers accounted for associations, we conducted Cook's distance tests (all *Ds* in acceptable range [.24]), and winsorized *NED* values at a conservative $M \pm 2 SD$ (significance unchanged).

3.2. Tests of Robustness.

As in previous studies, *NED* was inversely correlated with mean NE, an association that could be inflated by restricted range (i.e., reporting consistently high NE ratings allows less room for differentiation). As a test of robustness, we calculated partial correlations controlling for mean NE. All significant correlations remained (all $ps < .05$). In addition, as

¹Adolescents endorsing non-binary gender were excluded from this analysis.

reported elsewhere Starr et al., 2017, NED was negatively correlated with depression. Partial correlations between NED and developmental variables remained significant when controlling for depression (all $ps < .05$).

3.3. Further Tests of Age and NED.

As noted above, age was negatively correlated with NED ($p < .001$), such that older adolescents differentiated emotions less than younger adolescents (Fig. 1a). Although not a primary hypothesis, we also tested a U-shaped nonlinear function, as supported by Nook et al. (2018) in a sample with a wider age range (5-25). First, we entered linear and quadratic terms for age (centered) in a stepwise regression model; in the final step, the linear term was significant ($\beta = -.24$, $p < .001$) but the quadratic term was not ($\beta = -0.03$, $p = .679$). Second, because tests of quadratic functions can misdiagnose U-shaped curves (Simonsohn, 2018), we employed Simonsohn's (2018) "Two Lines" test, which fits regression lines above and below an algorithmically-derived break-point. In this test, average slopes below and above the cut-point must be significant and with opposite signs to support a U-shape curve; in our data, both average slopes were negative (change point [x_c]=17.09; average slope $< x_c = -.02$, $p = .014$; average slope $> x_c = -.09$, $p = .173$). We conclude that the association between NED and age is best described by a linear function within our sample's age range.

To better understand the negative association between NED and age, we next explored the role of SEE. Based on the model proposed by Nook et al. (2018), we expected that SEE would a) positively correlate with NED, b) negatively correlate with age, and c) account for the negative correlation between age and NED. Although SEE and NED were, surprisingly, *negatively* correlated (Table 1), when controlling for SEE's positive correlation with mean NE, SEE was positively associated with NED ($r = .21$, $p = .001$). However, SEE was unrelated to age (Table 1), even when controlling for mean NE ($p = .03$, $p = .680$); when age, SEE, and mean NE were simultaneously entered into a regression model predicting NED, age remained significant ($\beta = -.21$, $p < .001$). In sum, we found no evidence that SEE accounts for the negative correlation between age and NED within adolescence.

To better understand the multi-factorial associations between variables, we conducted exploratory moderation analyses testing whether age moderates the association between parental variables and NED. Age significantly moderated the association between parental depression and NED, $b = .02$, $SE = .01$, $p = .027$, with parental depression more strongly predicting NED at older ages (Johnson-Neyman region of significance > 15.80). All other interactions were non-significant.

3.4. Tests of Specificity.

Finally, we simultaneously entered all significant developmental variables into a linear regression with NED entered as the dependent variable. As displayed in Table 2, age, parental attachment, and parental depression remained significant predictors of NED, but authoritarian parenting style was no longer associated with NED after controlling for shared variance with other developmental variables. A final model included mean NE as a covariate; results were unchanged, except parental depression became marginally significant ($p = .072$).

3.5. Tests of PED.

Although a priori hypotheses focused on NED, as supplemental exploratory analyses, we examined associations between PED and developmental variables. Bivariate correlations suggested a significant association between PED and higher parental attachment and lower parental depression (Table 1). However, controlling for NED (correlated with PED, $r=.31$), only parental depression was associated with PED ($pr=-.14$, $p=.030$; all other $ps>.05$). In contrast, associations between developmental variables and NED remained when controlling for PED.

4. Discussion

Increasing research suggests NED has important implications for well-being, but little is known about how and why individual differences in this skill develop. The present study is the first to explore associations between family-of-origin variables and NED. Results showed that, among adolescents, low NED is correlated with higher parental depression, less secure parental attachment, and authoritarian parenting style (although the latter association was better accounted for by other variables). Importantly, these associations were not better explained by shared correlations with emotional intensity or child depression, eliminating potential confounds and reducing the likelihood that NED's link with parental functioning is secondary to its association with general well-being.

In addition, we found *lower* NED in older adolescents. This is somewhat counterintuitive, as NED is presumed to rely on verbal abilities that improve with age. Further, our results could not be explained by Nook and colleagues' (2018) model arguing SEE accounts for age-related reductions in NED between childhood and adolescence. This raises the possibility that different mechanisms drive developmental trajectories of NED across adolescence versus across earlier periods of development. For example, limbic subcortical areas involved in affective reactivity are fully developed by adolescence and exhibit increased activation in response to emotional stimuli relative to adults (Casey, Jones, & Hare, 2008). In contrast, prefrontal cortical regions involved in higher-order cognitive control and changes necessary for enhanced efficiency of cognitive processing are not fully mature until adulthood (Casey et al., 2008). This dyssynchronous development across emotion processing-related neurobehavioral systems may contribute to lower NED in later adolescence, making differentiation of intense emotions difficult in the presence of still developing cognitive control functions. This hypothesis warrants further research.

Results suggest that healthy parent functioning and parent-child relationships may lead to positive outcomes in part by providing context for children to learn to differentiate emotions. Although research should delineate specific mechanisms, secure attachment with caregivers may allow adolescents to develop comfort with confronting NEs, allowing them to perceive greater emotional nuance. Conversely, high levels of family negative expressiveness among those with poor parent-child relationships may heighten children's emotional arousal while limiting cognitive energy required to distinguish between NEs (Morris et al., 2007). Finally, parental depression may influence youth emotion differentiation via multiple mechanisms. Depressed parents may provide less guidance in response to their children's emotional cues and, as depression is associated with lower NED, depressed parents may directly model

undifferentiated labelling of emotional states. Taken together, this study is the first to integrate the role of parenting variables with the development of emotion differentiation, underscoring the role of family interventions for improving healthy adolescent emotion functioning.

Future research should continue to examine factors associated with healthy development of NED and conditions which disrupt trajectories. For example, maltreatment is associated with deficits in emotional understanding (Camras, Sachs-Alter, & Ribordy, 2014) and may undermine development of NED. Factors relevant to language development may promote NED by allowing access to a large emotional vocabulary. Finally, in addition to distal associations between developmental variables and trait-level NED, research should examine the extent to which NED is subject to momentary fluctuations within individuals, and the short-term influences and consequences of these momentary fluctuations (Erbas et al., 2018).

4.1. Study Limitations

Important limitations should be noted. There was no significant time lag between assessment of developmental variables and NED. Longitudinal studies should identify factors predicting trajectories of NED over childhood. In particular, effects of age on NED should be examined by following within-person trajectories over a sustained developmental period; our age results should be considered preliminary. Prospective research on NED (examining both causes and consequences) is relatively limited and an important next direction. Further, although our measures were validated and multi-informant, questionnaire measures of parenting and attachment have limitations and should be supplemented in future work by additional assessment methods (e.g., observational coding, attachment interviews). Further, although not a primary study focus, our index of PED may be limited by the narrow scope of PE adjectives. Limitations are balanced by study strengths, including integration of adolescent-administered EMA, parent-reported data, and diagnostic interviews. Our study presents intriguing associations between developmental variables and emotional differentiation that suggests the skill may grow, at least in part, vis-à-vis the parent-child relationship. Future studies can build on the present work to cultivate a refined understanding of the developmental origins of NED.

Acknowledgements.

The authors thank Fanny Mlawer and Meghan Huang for their assistance with study management. The University of Rochester provided study funding. Author Y.I.L. was supported by funding from the National Institute of Mental Health (F131 MH117875–01A1) during manuscript preparation.

References

- Ahmed SP, Bittencourt-Hewitt A, & Sebastian CL (2015). Neurocognitive bases of emotion regulation development in adolescence. *Developmental cognitive neuroscience*, 15, 11–25. [PubMed: 26340451]
- Alegre A, & Benson MJ (2010). Parental Behaviors and Adolescent Adjustment: Mediation via Adolescent Trait Emotional Intelligence. *Individual Differences Research*, 8(2), 83–96.

- Armsden GC, & Greenberg MT (1987). The inventory of parent and peer attachment: Individual differences and their relationship to psychological well-being in adolescence. *Journal of Youth and Adolescence*, 16(5), 427–454. [PubMed: 24277469]
- Bailen NH, Green LM, & Thompson RJ (2019). Understanding Emotion in Adolescents: A Review of Emotional Frequency, Intensity, Instability, and Clarity. *Emotion Review*, 11(1), 63–73.
- Baron-Cohen S, Golan O, Wheelwright S, & Granader Y (2010). Emotion word comprehension from 4 to 16 years old: a developmental survey. *Frontiers in evolutionary neuroscience*, 2, 109. [PubMed: 21151378]
- Barrett LF (2006). Solving the Emotion Paradox: Categorization and the Experience of Emotion. *Personality and Social Psychology Review*, 10(1), 20–46. [PubMed: 16430327]
- Barrett LF, Gross J, Christensen TC, & 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.
- Baumrind D (1968). Authoritarian vs. authoritative parental control. *Adolescence*, 3(11), 255.
- Bowlby J (1980). *Attachment and loss*. New York, NY, US: Basic Books.
- Brody GH, & Ge X (2001). Linking parenting processes and self-regulation to psychological functioning and alcohol use during early adolescence. *Journal of Family Psychology*, 15(1), 82. [PubMed: 11322087]
- Camras LA, Sachs-Alter E, & Ribordy SC (2014). Emotion Understanding in Maltreated Children: Recognition of Facial Expressions and Integration With Other Emotion Cues In Lewis M & Sullivan MW (Eds.), *Emotional Development in Atypical Children* (pp. 203–226). New York: Psychology Press.
- Casey BJ, Jones RM, & Hare TA (2008). The Adolescent Brain. *Annals of the New York Academy of Sciences*, 1124(1), 111–126. [PubMed: 18400927]
- Cole PM, Michel MK, & Teti LOD (1994). The development of emotion regulation and dysregulation: A clinical perspective. *Monographs of the society for research in child development*, 59(2-3), 73–102. [PubMed: 7984169]
- Cooper ML, Shaver PR, & Collins NL (1998). Attachment styles, emotion regulation, and adjustment in adolescence. *Journal of personality and social psychology*, 74(5), 1380. [PubMed: 9599450]
- Cranford JA, Shrout PE, Iida M, Rafaeli E, Yip T, & Bolger N. (2006). A procedure for evaluating sensitivity to within-person change: Can mood measures in diary studies detect change reliably? *Personality and Social Psychology Bulletin*, 32(7), 917–929. [PubMed: 16738025]
- Cummings EM, & Davies PT. (1994). Maternal depression and child development. *Journal of Child Psychology and Psychiatry*, 35(1), 73–112. [PubMed: 8163630]
- Davila J, Stroud CB, & Starr LR (2014). Depression in couples and families In Gotlib IH & Hammen CL (Eds.), *Handbook of Depression* (3rd ed., pp. 410–428). New York: Guilford.
- Demiralp E, Thompson RJ, Mata J, Jaeggi SM, Buschkuhl M, Barrett LF, ... Jonides J. (2012). Feeling Blue or Turquoise? Emotional Differentiation in Major Depressive Disorder. *Psychological Science*, 25(11), 1410–1416.
- Denham SA, Mitchell-Copeland J, Strandberg K, Auerbach S, & Blair K (1997). Parental Contributions to Preschoolers' Emotional Competence: Direct and Indirect Effects. *Motivation and Emotion*, 27(1), 65–86.
- Ebesutani C, Regan J, Smith A, Reise S, Higa-McMillan C, & Chorpita BF (2012). The 10-Item Positive and Negative Affect Schedule for Children, Child and Parent Shortened Versions: Application of Item Response Theory for More Efficient Assessment. *Journal of Psychopathology and Behavioral Assessment*, 34(2), 191–203.
- Erbas Y, Ceulemans E, Kalokerinos EK, Houben M, Koval P, Pe ML, & 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. [PubMed: 30024239]
- Gee DG, Humphreys KL, Flannery J, Goff B, Telzer EH, Shapiro M, ... Tottenham N. (2013). A developmental shift from positive to negative connectivity in human amygdala–prefrontal circuitry. *Journal of Neuroscience*, 33(10), 4584–4593. [PubMed: 23467374]

- Giraudeau B (1996). Negative values of the intraclass correlation coefficient are not theoretically possible. *Journal of clinical epidemiology*, 49(10), 1205. [PubMed: 8827004]
- Haas LM, McArthur BA, Burke TA, Olino TM, Abramson LY, & Alloy LB (2018). Emotional clarity development and psychosocial outcomes during adolescence. *Emotion*.
- Herba CM, Landau S, Russell T, Ecker C, & Phillips ML (2006). The development of emotion-processing in children: effects of age, emotion, and intensity. *Journal of Child Psychology and Psychiatry*, 47(11), 1098–1106. [PubMed: 17076748]
- Joormann J, Gilbert K, & Gotlib IH (2010). Emotion identification in girls at high risk for depression. *J Child Psychol Psychiatry*, 51(5), 575–582. [PubMed: 19788553]
- Kalokerinos EK, Erbas Y, Ceulemans E, & Kuppens P (2019). Differentiate to Regulate: Low Negative Emotion Differentiation Is Associated With Ineffective Use but Not Selection of Emotion-Regulation Strategies. *Psychological Science*, 0956797619838763.
- Kashdan TB, Barrett LF, & McKnight PE (2015). Unpacking Emotion Differentiation: Transforming Unpleasant Experience by Perceiving Distinctions in Negativity. *Current Directions in Psychological Science*, 24(1), 10–16.
- Kaufman J, Birmaher B, Brent D, Rao UMA, Flynn C, Moreci P, ... Ryan N. (1997). Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL): Initial Reliability and Validity Data. *Journal of the American Academy of Child & Adolescent Psychiatry*, 36(7), 980–988. [PubMed: 9204677]
- Laible D (2007). Attachment with parents and peers in late adolescence: Links with emotional competence and social behavior. *Personality and Individual Differences*, 43(5), 1185–1197.
- Larson RW, Moneta G, Richards MH, & Wilson S (2002). Continuity, stability, and change in daily emotional experience across adolescence. *Child Development*, 73(4), 1151–1165. [PubMed: 12146740]
- Lennarz HK, Lichtwarck-Aschoff A, Timmerman ME, & Granic I (2018). Emotion differentiation and its relation with emotional well-being in adolescents. *Cognition and Emotion*, 32(3), 651–657. [PubMed: 28602148]
- Lieberman MD, Eisenberger NI, Corckett MJ, Tom SM, Pfeifer JH, & Way BM (2007). Putting feelings into words: affect labeling disrupts amygdala activity in response to affective stimuli. *Psychological Science*, 18(5), 421–428. [PubMed: 17576282]
- Maciejewski DF, van Lier PA, Branje SJ, Meeus WH, & Koot HM (2015). A 5- year longitudinal study on mood variability across adolescence using daily diaries. *Child Development*, 86(6), 1908–1921. [PubMed: 26464350]
- McKinney C, Milone MC, & Renk K (2011). Parenting and late adolescent emotional adjustment: Mediating effects of discipline and gender. *Child Psychiatry & Human Development*, 42(4), 463–481. [PubMed: 21479509]
- Moilanen KL, Rasmussen KE, & Padilla-Walker LM (2015). Bidirectional Associations Between Self-Regulation and Parenting Styles in Early Adolescence. *Journal of Research on Adolescence*, 25(2), 246–262.
- Morris AS, Silk JS, Steinberg L, Myers SS, & Robinson LR (2007). The Role of the Family Context in the Development of Emotion Regulation. *Social Development*, 16, 361–388. [PubMed: 19756175]
- Murray L, Kempton C, Woolgar M, & Hooper R (1993). Depressed mothers' speech to their infants and its relation to infant gender and cognitive development. *Journal of Child Psychology and Psychiatry*, 34(1), 1083–1101. [PubMed: 8245134]
- Nolen-Hoeksema S (2012). Emotion regulation and psychopathology: the role of gender. *Annu Rev Clin Psychol*, 8, 161–187. [PubMed: 22035243]
- Nook EC, Sasse SF, Lambert HK, McLaughlin KA, & Somerville LH (2017). Increasing verbal knowledge mediates development of multidimensional emotion representations. *Nature human behaviour*, 1, 881–889.
- Nook EC, Sasse SF, Lambert HK, McLaughlin KA, & Somerville LH (2018). The Nonlinear Development of Emotion Differentiation: Granular Emotional Experience Is Low in Adolescence. *Psychological Science*, 29(8), 1346–1357. [PubMed: 29878880]

- Nook EC, Stavish CM, Sasse SF, Lambert HK, Mair P, McLaughlin KA, & Somerville LH (in press). Charting the development of emotion comprehension and abstraction from childhood to adulthood using observer-rated and linguistic measures. *Emotion*.
- O’Kearney R, & Dadds M (2004). Developmental and gender differences in the language for emotions across the adolescent years. *Cognition and Emotion*, 18(7), 913–938.
- Robinson CC, Mandleco B, Olsen SF, & Hart CH (2001). The parenting styles and dimensions questionnaire (PSDQ). *Handbook of Family Measurement Techniques*, 3, 319–321.
- Silvers JA, Insel C, Powers A, Franz P, Helion C, Martin R, ... Ochsner KN. (2017). The transition from childhood to adolescence is marked by a general decrease in amygdala reactivity and an affect-specific ventral-to-dorsal shift in medial prefrontal recruitment. *Developmental cognitive neuroscience*, 25, 128–137. [PubMed: 27445112]
- Simonsohn U (2018). Two lines: a valid alternative to the invalid testing of u-shaped relationships with quadratic regressions. *Advances in Methods and Practices in Psychological Science*, 1(4), 538–555.
- Spitzer RL, Williams JBW, Gibbon M, & First M (1995). *Structured Clinical Interview for DSM-IV(SCID-IV)*. Washington, D.C.: American Psychiatric Association.
- Starr LR, Hershenberg R, Li YI, & Shaw ZA (2017). When Feelings Lack Precision: Low Positive and Negative Emotion Differentiation and Depressive Symptoms in Daily Life. *Clinical Psychological Science*, 5(4), 613–631.
- Starr LR, Hershenberg R, Shaw ZA, Li YI, & Santee AC (in press). The Perils of Murky Emotions: Emotion Differentiation Moderates the Prospective Relationship between Naturalistic Stress Exposure and Adolescent Depression. *Emotion*.
- Steele H, Steele M, & Croft C (2008). Early attachment predicts emotion recognition at 6 and 11 years old. *Attachment & Human Development*, 10(4), 379–393. [PubMed: 19016048]
- Tugade MM, Fredrickson BL, & Barrett LF (2004). Psychological Resilience and Positive Emotional Granularity: Examining the Benefits of Positive Emotions on Coping and Health. *Journal of personality*, 72(6), 1161–1190. [PubMed: 15509280]
- Zimmermann P (1999). Structure and functions of internal working models of attachment and their role for emotion regulation. *Attachment & Human Development*, 1(3), 291–306. [PubMed: 11708228]

Figure 1. Scatterplots with fitted regression lines for associations between NED and a) age, b) parental attachment, c) authoritarian parenting style, and d) parental depression rating..

Table 1

Bivariate correlations among study variables.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Negative Emotion Differentiation	--								
2. Positive Emotion Differentiation	.31***	--							
3. Age	-.24**	-.11	--						
4. Parental Attachment	.26***	.13*	-.02	--					
5. Authoritarian Parenting Style	-.16*	-.04	.10	-.27***	--				
6. Parental Depression	-.19**	-.19**	.06	-.12	.12	--			
7. Mean NE	-.46***	-.21**	.07	-.23***	.08	.09	--		
8. Single Emotional Experience	-.19**	-.17*	.04	-.15*	.03	.09	.70***	--	
9. Child Depression	-.30**	-.10	.04	-.36***	.14*	.12	.31***	.15*	---
<i>M</i>	.88	.65	15.90	98.40	1.51	.35	1.52	1.70	.29
<i>SD</i>	.10	.19	1.09	17.92	.41	.90	.44	.78	.79

*
 $p < .05$,**
 $p < .01$,***
 $p < .001$

Table 2

Results for Linear Regression Model of Developmental Variables Predicting Negative Emotion Differentiation

	β	<i>b</i>	<i>SE</i>	<i>p</i>	95% CI for <i>b</i>
Intercept		1.10	.09	<.001	.911, 1.281
Age	-.21	-.02	.01	.001	-.029, -.007
Parental Attachment	.22	.00	.00	.001	.000, .002
Authoritarian Parenting Style	-.08	-.02	.02	.219	-.046, .011
Parental Depression	-.13	-.01	.01	.040	-.027, -.001