

Does Children's Negative Emotion Differentiation Relate to Emotion Regulation and Psychopathology?

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ABSTRACT

Negative emotion differentiation (NED) refers to experiencing negative emotions as being different from each other (e.g., sadness vs. fear). Prior literature has linked emotion regulation (ER) to internalizing psychopathology. The current study investigates how NED among pre-adolescent youth may moderate this relationship. Participants include 106 youth ranging from ages 7 to 11 (55.6% male, Mage = 9.3 years). NED scores were computed as the variance in self-reports of negative emotions across multiple time points. ER processes were measured using autobiographical emotion interviews and resting respiratory sinus arrhythmia (RSA) during a baseline task. Children's anxiety and depression symptoms were evaluated using validated measures. NED is expected to (1) relate to depressive symptoms, (2) moderate the effectiveness and selection of both adaptive and maladaptive ER strategies, and (3) moderate the relationship between RSA and psychopathology. Initial correlational and independent t-test analyses revealed that NED was not directly associated with psychopathology. Instead, NED was positively related to separation anxiety for youth who did not use support-seeking strategies. NED was also higher for children who did not use cognitive reframing strategies compared to children who did. Additional analyses revealed that resting RSA had a protective effect against some facets of psychopathology based on specific regulation strategies used. These findings have implications for interventions (e.g., mindfulness) that can improve mental health outcomes for youth.

KEYWORDS: Emotion differentiation, emotion regulation, child psychopathology, respiratory sinus arrhythmia (RSA)

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Dr. Davis is an Associate Professor in the departments of Psychology and Media & Cultural Studies at UCR. Her research focuses on understanding how emotion regulation relates to adaptive outcomes (e.g., learning) and maladaptive outcomes (e.g., anxiety) in childhood. Her goal is to identify regulatory strategies that children can use to effectively alleviate negative emotion and to identify individual differences in children's biology and social experiences that determine if they can regulate emotion effectively. She oversees the Emotion Regulation Lab which seeks to provide an empirical basis for interventions aimed at improving children's emotion regulation abilities and mitigating risk for maladaptive outcomes.



Gerardo Michel

Gerardo Michel is a fourth year Psychology major with a Philosophy minor. Over the past year, he has been working with Dr. Elizabeth L. Davis investigating what emotional processes may affect emotion regulation, and consequently, symptoms of depression and anxiety. He is involved in Dr. Davis' Emotion Regulation Lab, Dr. Tuppett Yates' Adversity & Adaptation Lab, and Psi Chi (the International Honor Society in Psychology). Gerardo plans to pursue a Ph.D. in Clinical Psychology to continue this research, conduct psychotherapy, and help address the youth mental health crisis.

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INTRODUCTION

Background

The United States is experiencing a youth mental health crisis. According to the National Alliance on Mental Illness (2022), one in six youth aged 6 to 17 years in the United States experience a mental health condition each year. There are several ways in which this crisis can be targeted. One of these paths is through the process of emotion regulation which refers to how we respond to and modify our emotional processes to achieve a certain goal (Thompson, 1994).

Previous research has found that emotional regulation is related to internalizing psychopathology while maladaptive strategy selection (e.g., avoidance and suppression) is more related to symptoms (Cavicchioli et al., 2022; Compas et al., 2017; Vanderlind et al., 2022; Werner et al., 2011) compared to more adaptive strategy use (e.g., cognitive reframing and support seeking).

There are many factors that could contribute to the relationship between emotion regulation and psychopathology. One possible factor is emotion differentiation, which broadly refers to how an individual experiences emotion as being different from each other (for example, distinguishing between sadness and fear; Barrett et al., 2001). Negative emotion differentiation (NED), which refers to emotion differentiation exclusively among different negative emotions, has been found to be related to internalizing psychopathology (Demiralp et al., 2012; Erbas et al., 2014; Kashdan & Farmer, 2014; Matt et al., 2016; Starr et al., 2017). NED has also been found to relate to emotion regulation, specifically when it comes to strategy use (Barrett et al., 2001; Brown et al., 2021) and strategy effectiveness (Kalokerinos et al., 2019). It is possible that emotion regulation, NED, and internalizing psychopathology (e.g., depression and anxiety) all relate to each other, which presents possible routes for clinical research. NED could serve to moderate the relationship between emotion regulation and psychopathology. Higher NED may be related

to increased use of adaptive strategies, and thus, result in less symptoms of psychopathology.

Emotion regulation has been associated with psychopathology. One meta-analysis found that maladaptive strategy use such as avoidance and suppression were related to higher levels of psychopathology in children (Compas et al., 2017). Another meta-analysis built upon this work by assessing longitudinal studies and found evidence that the use of emotion regulation (e.g., using maladaptive strategies) could be a risk factor in the development of psychopathology (Cavicchioli et al., 2022). Additionally, one study found that the use of maladaptive strategies such as avoidance, and decreased use of adaptive strategies such as cognitive reframing was related to symptoms of social anxiety disorder (Werner et al., 2011). Vanderlind et al. (2022) found that emotion regulation was related to depression in that symptoms of depression contributed to the use of regulation strategies that did not promote positive emotion. However, the relationship between emotion regulation and psychopathology is not entirely clear. One study found that participants who reported greater use of worry and rumination, as well as the use of all types of emotion regulation strategies, had more symptoms of psychopathology than participants who used adaptive strategies but did not use all emotion regulation strategies (Dixon-Gordon et al., 2014). Although there is extensive research on how emotion regulation relates to psychopathology, more research is needed for investigating different types of moderators that may affect this relationship.

Emotion regulation is thought to relate to NED. However, the relationship is unclear. An earlier study found an association between higher NED and better emotion regulation in addressing negative emotions (Barrett et al., 2001). However, other studies have found different results. For example, in the face of stress, Brown et al. (2021) found that higher NED was related to less disengagement

strategy use (e.g., substance use) but not more constructive strategy use (e.g., instrumental). Another study found that less NED was not related to strategy selection, but was related to a decrease in the effectiveness of both adaptive and maladaptive strategy use for reducing negative emotions (Kalokerinos et al., 2019).

NED is also thought to relate to psychopathology. Specifically, NED has been found to be related to symptoms of depression (Demiralp et al., 2012; Erbas et al., 2014; Starr et al., 2017). There also seems to be some evidence to suggest that individuals experiencing social anxiety disorder (SAD) differentiate between negative emotions less frequently than those who do not have these symptoms (Kashdan & Farmer, 2014). Another study found that individuals with higher levels of trait anxiety struggled more with NED than did individuals with lower levels of trait anxiety (Matt et al., 2016). However, research on how NED relates to different anxiety disorders is limited.

In the literature, the relationships between all three of these topics (i.e., emotion regulation, NED, and psychopathology) have been explored. One study of adolescents found that higher emotion differentiation could serve as a protective factor against symptoms of depression and anxiety by means of more adaptive emotion regulation (Nook et al., 2021). Another study found that individuals with lower NED who were also considered highly socially anxious used less cognitive reappraisal than individuals who had a lower amount of social anxiety (O'Toole et al., 2014). However, there are currently no publications on the relationship among all three of these topics in children younger than age 14 (Nook, 2021). This highlights a gap in the literature that needs to be addressed. As early adolescents can experience symptoms of psychopathology (Pfeifer & Allen, 2021; Graber, 2013), it is important to investigate the developmental roots of these symptoms. If NED is found to be a moderator in the relationship between emotion regulation and psychopathology, this insight can provide a

foundation for a prevention approach for children at risk of psychopathology such as techniques that aim to improve children's awareness of their emotions. These strategies could then contribute to more adaptive emotion regulation, and thus, could contribute to less intensity and frequency for symptoms of psychopathology.

Psychophysiological processes related to emotion differentiation, emotion regulation, and psychopathology are important to investigate, as they can provide another perspective to explore NED. Respiratory sinus arrhythmia (RSA) refers to how the heart rate relates to breathing, and it is thought to be a biological marker of the parasympathetic nervous system as well as an index for measuring an individual's emotion regulatory capacity (Bernston et al., 1997; Porges, 2007). RSA has been found to relate to emotion regulation; higher RSA is possibly associated with better emotion regulatory capacity, though results are somewhat mixed (Bandon et al., 2008; Fox et al., 2018; Gentzler et al., 2009). However, the relationship between RSA and NED has not been sufficiently explored in the literature. Some studies have found a possible positive correlation between emotion granularity, a concept that is synonymous with emotion differentiation, and RSA (Hoemann et al., 2020; Hoemann et al., 2021). However, both of these samples consisted of adult participants. The relationship between respiratory sinus arrhythmia and emotion differentiation in children has not been explored.

Resting RSA has been found to be negatively related to psychopathology (Zhang et al., 2017; Yaptangco 2015), though results are somewhat mixed (Beauchaine 2019). Another study found similar results, where participants who did not regularly engage in cognitive reframing had a negative correlation between RSA and worry and rumination (Plate et al., 2020). This presents another route of research that should be explored further.

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Current Study

The current study seeks to replicate the findings from previous studies with a child sample. The aim of this project is to investigate whether NED in children is related to (1) the selection of adaptive (e.g., instrumental and support-seeking) emotion regulation strategies, (2) maladaptive (e.g., avoidance and suppression) emotion regulation strategies, (3) the effectiveness of the selected strategies in reducing unwanted emotions, (4) respiratory sinus arrhythmia, and (5) symptoms of depression and anxiety. NED will be investigated as a moderator among the selection of adaptive and maladaptive regulation strategies and internalizing psychopathology (i.e., symptoms of depression and anxiety). NED will also be investigated as a moderator in the relationship between the effectiveness of regulation strategy use and psychopathology.

METHODS

Participants

The sample for this study consisted of 106 pre-adolescent participants (59 males, M age = 9.3). Their ages ranged from 7 to 11 years old. Half of the sample had a family income of \$40,000 or less. Participants' racial backgrounds were reported as Caucasian (17.9%), African-American (13.2%), Hispanic (31.1%), Asian-American (0.9%), other (0.9%), and mixed (35.8%). Participating children and one parent visited the Emotion Regulation Lab located on the main campus of University of California, Riverside. Participants only came to the lab for a single session. Parents provided consent and children provided assent before study procedures began. Families received a small honorarium for completing the study.

Measures

Negative Emotion Differentiation (NED)

NED was computed from emotion self-reports obtained from participants. The reports asked participants how strongly they felt a specific emotion. The emotions included

happiness, anger, sadness, and fear. The intensities of these emotions ranged from one to four. These self-reports were administered to children five times throughout their visit. For the purposes of this study, only negative emotions were included in analyses which were anger, sadness, and fear. To obtain a score for NED, an average variance (Mikhail et al., 2020) was computed by taking the variance of these three negative emotions at each time point. These values were then averaged across time points to produce composite scores.

Emotion regulation

One of the measures used for assessing emotion regulation is an autobiographical emotion interview, which asked the participants to recall specific events that elicited fear, anger, and sadness (Davis et al., 2010). In these interviews, children were asked what emotion regulation strategies they used to cope with these negative emotions. For the current study, five emotion regulation strategies were assessed. Two of the strategies that were included were categorized as adaptive based on prior research done with US populations. These included cognitive reframing (e.g., a child thinking about the situation in a more constructive way) and social support seeking (e.g., a child asking a parent for help). The other three strategies that were included are considered to be maladaptive in prior literature with samples from the United States. These included avoidance and withdrawal (e.g., a child avoiding or leaving a situation), thought suppression (e.g., a child trying to inhibit how much they are experiencing specific thoughts), and expressive suppression (e.g., a child not physically expressing their emotions). For the purposes of this project, all responses to the three maladaptive strategies were composited into one maladaptive score.

To measure emotion regulatory capacity, the present student used biopsychological data regarding respiratory sinus arrhythmia (RSA). For this sample, RSA was measured noninvasively using an electrocardiogram (ECG) while children quietly performed neutral tasks such as reading a book or coloring (Quiñones-Camacho & Davis, 2017). This

took place for five minutes during the start of the visit. Children's RSA was quantified via 30-second epochs, and approximately ten epochs were recorded for each child during the initial baseline task. After collecting this data, resting RSA was computed by averaging epochs.

Child Psychopathology

The present study used two measures of psychopathology that were completed by the participants' parents regarding their children's symptoms. To measure symptoms of anxiety, the parent version of the Screen for Child Anxiety Related Emotional Disorders (SCARED) was administered (Birmaher et al., 1997). This measure consists of 41 items that ask parents to consider symptoms their child has experienced in the past three months. There are several scales included in this measure; panic disorder and somatic symptoms (e.g., "When my child feels frightened, it is hard for him/her to breathe"), generalized anxiety disorder (e.g., "My child worries about other people liking him/her"), separation anxiety disorder (e.g., "My child gets scared if he/she sleeps away from home"), social anxiety disorder (e.g., "My child doesn't like to be with people he/she doesn't know well), and school avoidance (e.g., "My child worries about going to school"). For each item, parents are asked to respond using a three-point scale: 0 (*not true or hardly true*), 1 (*somewhat true or sometimes true*), and 2 (*very true or often true*).

The second measure that was used in this project is the MacArthur Health Behavior Questionnaire (HBQ) which includes questions about physical health, mental health, and social and school functioning (Essex et al., 2002). The questionnaire included 170 items that asked parents to respond using a three-point scale: 0 (*never or not true*), 1 (*sometimes true*), and 2 (*often or very true*). This measure of internalizing behaviors is further divided into three subscales: depression (e.g., "Feels worthless or inferior), feeling overanxious (e.g., "Worries about things in the future"), and separation anxiety (e.g., "Worries about being separated from loved ones"). For each subscale, an average was computed by

taking the mean of the responses.

RESULTS

Relationship Between NED, Psychopathology, and Adaptive Regulation Strategy Use

Results revealed that there was no relationship between NED and psychopathology. There was also no significant relationship between NED and the SCARED questionnaire, which includes generalized anxiety disorder, separation anxiety, social anxiety, school avoidance, panic, and a total anxiety score, $r(99) = \leq 0.11$, $p \geq 0.25$. The internalizing subscale from the HBQ also did not find significant results, $r(98) = 0.03$, $p = 0.75$. Results indicated that for children who did not use support seeking, there was a positive relationship between NED and separation anxiety, $r(45) = 0.29$, $p = 0.04$. Unexpectedly, an independent samples t-test revealed children who did not use cognitive reframing ($M = 0.23$, $SD = 0.36$) had higher NED than children who did ($M = 0.10$, $SD = 0.11$), $t(78) = 2.46$, $p = 0.01$. These results are represented in

Figure 1.

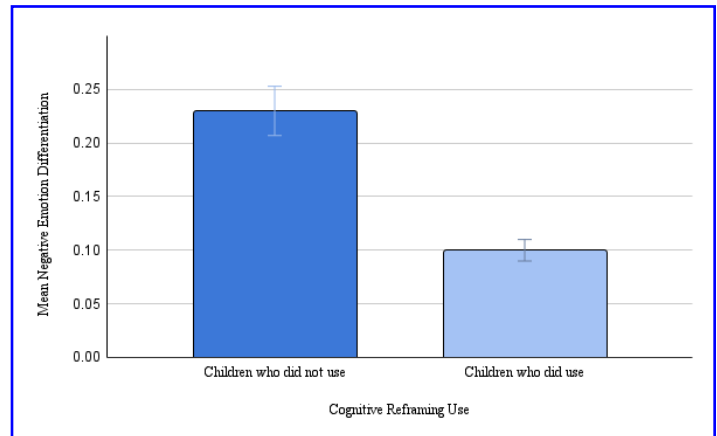


Figure 1 Participants' Mean Negative Emotion Differentiation and Cognitive Reframing Use

Differences in negative emotion differentiation between children who use cognitive reframing and children who do not ($N = 79$). The x-axis represents if children used cognitive reframing. The y-axis represents the childrens' mean negative

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emotion differentiation.

Respiratory Sinus Arrhythmia

An additional investigation was conducted regarding how respiratory sinus arrhythmia (RSA) was related to NED, ER, and psychopathology. Results in **Table 1** indicated that a higher resting RSA was related to fewer symptoms for some types of anxiety, but it depended on regulation strategy use.

CONCLUSION

The present study investigated if children’s negative emotion differentiation (NED) was related to emotion regulation and internalizing psychopathology (i.e., depression and

anxiety). Results from the study were mixed in terms of support for the hypotheses. First, NED and psychopathology were not correlated. Additionally, the analysis calculated an intraclass coefficient (ICC) to assess NED. As the data in the present study drew upon previously collected data for another research aim, the present study could only include a self-report scale of emotion with four items. Additionally, the analyses were conducted using the average variance of scores. Data for the second hypothesis found that NED was higher for children who did not use cognitive reframing. This is consistent with Kalokerinos et al., 2019, which found that emotion differentiation was related to decreased use of reappraisal. This result is possibly due to a risk of rumination.

Psychopathology Symptoms	General	Cognitive Reframing	
		Did Use	Did Not Use
Internalizing	$r(98) = -.18, p = .05^*$	$r(36) = -.40, p = .01^{**}$	$r(60) = -.09, p = .45$
Generalized Anxiety Disorder	$r(97) = -.22, p = .02^{**}$	$r(37) = -.32, p = .04^{**}$	$r(59) = -.13, p = .32$
Panic Disorder	$r(97) = -.34, p < .001^{***}$	$r(37) = -.41, p = .008^{**}$	$r(58) = -.26, p = .03^{**}$
School Avoidance	$r(98) = -.19, p = .05^*$	$r(38) = -.25, p = .11$	$r(59) = -.12, p = .34$
Social Anxiety	$r(98) = -.16, p = .09$	$r(38) = -.07, p = .63$	$r(58) = -.25, p = .04^{**}$
Separation Anxiety	$r(98) = -.16, p = .09$	$r(37) = -.37, p = .01^{***}$	$r(59) = .01, p = .88$
Total SCARED	$r(97) = -.27, p = .006^{**}$	$r(38) = -.34, p = .03^{**}$	$r(59) = -.20, p = .12$

Psychopathology Symptoms	Support Seeking		Maladaptive Strategies	
	Did Use	Did Not Use	Did Use	Did Not Use
Internalizing	$r(48) = -.26, p = .06^*$	$r(48) = -.22, p = .12$	$r(26) = -.27, p = .16$	$r(70) = -.23, p = .04^{**}$
Generalized Anxiety Disorder	$r(49) = -.29, p = .03^{**}$	$r(47) = -.11, p = .45$	$r(25) = -.12, p = .55$	$r(71) = -.27, p = .01^{**}$
Panic Disorder	$r(49) = -.52, p < .001^{***}$	$r(47) = -.13, p = .35$	$r(25) = -.29, p = .14$	$r(71) = -.38, p < .001^{***}$
School Avoidance	$r(49) = -.28, p = .04^{**}$	$r(47) = -.14, p = .31$	$r(25) = -.06, p = .75$	$r(71) = -.26, p = .02^{**}$
Social Anxiety	$r(50) = -.22, p = .11$	$r(47) = -.09, p = .54$	$r(25) = -.26, p = .18$	$r(72) = -.14, p = .20$
Separation Anxiety	$r(50) = -.19, p = .16$	$r(47) = -.12, p = .38$	$r(25) = -.14, p = .49$	$r(72) = -.18, p = .11$
Total SCARED	$r(49) = -.34, p = .01^{**}$	$r(47) = -.16, p = .26$	$r(25) = -.26, p = .19$	$r(71) = -.29, p = .01^{**}$

Table 1. Correlations Between RSA and Psychopathology Based on Regulation Strategy

Note: RSA = respiratory sinus arrhythmia

* Marginally significant

** $p \leq .05$

*** $p \leq .001$

For example, children may not find it effective to think about circumstances that had contributed to negative emotions, as this may lead to a cycle of repetitive negative thoughts about the event. If the child is experiencing different negative emotions, thinking about them can be even more overwhelming in the moment rather than being helpful. Data for the third hypothesis found NED was positively associated with separation anxiety for no support seeking. Experiencing more negative emotions may result in further discouragement of support seeking behaviors. Lastly, data for the additional hypothesis found that higher resting RSA is possibly a protective factor against some facets of psychopathology but depended on regulation strategy use. This implies that there are individual biological differences that may promote the effectiveness of some regulation strategy use. This approach could be used to inform children about which emotion regulation strategies may be more effective based on their psychopathology and resting RSA.

Limitations of the study include methodological boundaries. Prior studies used a daily diary method as a measure for NED, and the data was evaluated using an intraclass correlation (ICC). This differed from the measure and statistical procedure used for this study. Thus NED may not have been fully captured because the sample data had not been collected with the intention of measuring NED. Another limitation includes the assessments not being able to capture complex emotional states (Brown et al., 2021) such as feeling simultaneously anxious and excited. Another limitation includes that the measures were not able to capture cultural and ethnic differences. Lastly, these measures were not able to capture within-emotion differentiation (e.g., anger, frustration, and irritability).

Future directions can address these limitations as well as explore how NED, emotion regulation, and psychopathology may otherwise be related. This can inform clinical interventions that aim to increase NED to improve the frequency and effectiveness of adaptive emotion regulation

strategies. Doing so can help mitigate risks of developing (or experiencing more intensely) conditions associated with psychopathology.

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