

LUNSFORD, JAIMIE M., M.A. Emotion Differentiation, Depression, and Emotion Regulation: A Daily Diary Study. (2018)  
Directed by Dr. Kari M. Eddington. 66 pp.

Labelling negative emotion experiences in a discrete way (i.e., negative emotion differentiation, or NED) has been found to be associated with lower incidence of several forms of psychopathology, including major depressive disorder. However, little is known about the mechanisms underlying this relationship. The present study used a two-week daily sampling design with 173 undergraduate participants to examine the relationships between NED and several momentary processes, including rumination, overgeneralizing cognitions, emotion regulation, and source awareness (knowledge about the cause of an emotion). NED was found to be significantly associated with lower baseline depression and less daily rumination, as predicted. Higher NED was also found to diminish the relationship between daily negative emotion and overgeneralizing, such that experiencing a bad mood more strongly predicted broad negative thinking about life and the future for low differentiators. However, no association between NED and daily source awareness or emotion regulation strategy use was observed, failing to support the hypothesis that high differentiators are more likely to know the cause of their emotions, and to engage in more adaptive regulation strategies (i.e., reappraisal and acceptance). Implications and future directions are discussed.

EMOTION DIFFERENTIATION, DEPRESSION, AND EMOTION REGULATION:  
A DAILY DIARY STUDY

by

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A Thesis Submitted to  
the Faculty of The Graduate School at  
The University of North Carolina at Greensboro  
in Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts

Greensboro  
2018

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## ACKNOWLEDGMENTS

I would like to express my appreciation for the support and guidance of my advisor, Dr. Kari Eddington, my thesis committee members Drs. Rosemary Nelson-Gray and Paul Silvia, and additional mentors in the UNCG Psychology Department, Drs. Michael Kane and Douglas Levine. I am also grateful for the efforts of all the lab members in the Depression Treatment and Research Program that made this research possible. I would like to acknowledge the contributions of Dr. John Willse to my education in R Studio Software, and to researchers Drs. Erin Sheets, Yasemin Erbas, and Katherine Dixon-Gordon, for their helpful email consultations on statistical approaches to measuring negative emotion differentiation. Finally, none of this work would have been possible without the continual support and encouragement of my husband Chris Lunsford, and our daughter, Dianne.

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## CHAPTER I

### INTRODUCTION

To understand emotion differentiation, think back to the most emotionally difficult experience you've had in the past twenty-four hours. Perhaps it was a necessary, but uncomfortable conversation, or the moment you received some unpleasant news. Now, try to describe how you felt. For some, the words that come to mind will be specific and will each carry distinct pieces of information (e.g., you felt “anxious”, “frustrated”, or “disappointed”) while for others, the terms will be broad, and focused mostly on the negative valence of the experience (e.g., you felt “bad”, “upset”, or “terrible”). Emotion differentiation is the extent to which an individual labels emotional experiences with granularity or specificity, taking not only valence, but also arousal, sense of control, sense of responsibility, or other dimensions of affect into account. This is sometimes conceptualized as a skill, or the ability to *represent* one's experience in a differentiated way (e.g., Kashdan et al., 2015), and other times as a trait, or the tendency to *experience* one's emotions in a differentiated way (e.g., Erbas et al., 2015).

#### **Defining and Measuring Emotion Differentiation**

Emotion differentiation has been found to be distinct from emotion clarity or the self-reported sense that one generally knows how one is feeling (Boden et al., 2013). That is, expressing confidence about usually being able to know how one feels did not significantly predict the use of specific emotion words to describe distinct feeling states.

Emotion differentiation has been negatively correlated with alexithymia, or the self-reported inability to sort out or express one's feelings (Erbas et al., 2014), but only modestly (effect size of 0.20).

In contrast to these traits, however, emotion differentiation is typically measured behaviorally through experience sampling methods rather than eliciting dispositional self-reports. This is because emotion differentiation can itself be conceptualized as an aspect of self-awareness, so measuring it using questionnaires that require some degree of self-awareness may generate invalid results. Differentiation of negative emotions (negative emotion differentiation, or NED) is considered separately from differentiation of positive emotions (positive emotion differentiation, or PED). There are mixed findings about whether they are positively correlated with one another, with some studies showing an association (effect sizes between 0.31 and 0.5; Emery et al., 2014; Erbas et al., 2015; Selby et al., 2014) and others finding none (Demiralp et al., 2012; Dixon-Gordon et al., 2014).

In a typical study, participants are asked at intervals throughout the research period to rate the extent to which their current emotional experience is described by several positive and negative feeling words. This can be done over the course of completing several in-lab emotion-inducing tasks, such as reading vignettes (Boden et al., 2013; Cameron et al., 2013), writing about personal experiences (Fogarty et al., 2013), or watching film clips (Erbas et al., 2015), though this somewhat artificial method has only a modest correlation (between 0.23 and 0.26) with more naturalistic approaches (Erbas et al., 2015). It is more common to track participants' emotion reports in their ordinary

environments, either with daily diaries (Barrett et al., 2001; O’Toole et al., 2014), ecological momentary sampling using beepers (e.g., Boden et al., 2015; Erbas et al., 2016; Sheets et al., 2015; and many others), or both (Starr, 2017). Since multiple emotion words may be endorsed at each instance, an emotion differentiation index is then generated for each participant by calculating the intraclass correlation coefficient between emotion words across occasions (with negative emotion differentiation being calculated using only the negative emotion words, and positive emotion differentiation using only the positive emotion words). A low ICC indicates more differentiation, since it suggests that the individual is using different emotion terms in distinct ways to express various affective states. That is, a participant who selects different words for different experiences, based on many aspects of the situation, is exhibiting high differentiation and will have a lower correlation among negative emotion words across time points. A high ICC indicates less differentiation, as it suggests that the individual is using many of the emotion terms similarly to represent various negatively valenced experiences. That is, since it is unlikely that all the negative emotions always co-occur across situations for any person, a participant with a high ICC between negative emotion words is endorsing items based mainly on their valence (selecting “bad” feeling words to describe when they are feeling “bad”), disregarding other dimensions of the label. For ease of interpretation, therefore, ICCs are typically reverse scored prior to further analyses.

### **Correlates of Emotion Differentiation**

More differentiation among negative emotions (and to a lesser extent, positive emotions – see Selby et al., 2014 and Tugade et al., 2004) has been implicated in several

ways with greater psychological health. It has been shown to be associated with greater self-esteem (effect sizes between 0.19 and 0.35, Erbas et al., 2014), quality of life (effect size of 0.13, Boden et al., 2015), and mindfulness, or attention to the present moment (effect size of 0.22, Fogarty 2015, Hill & Updegraff 2012). Negative emotion differentiation (NED) has been found to be negatively associated with depressive symptoms in samples of undergraduates, with effect sizes ranging from 0.15 to 0.20 (Erbas et al., 2014), and in a sample of veterans, with an effect size of 0.29 (Starr et al., 2017). In another study examining a clinical population with a diagnosis of major depressive disorder, NED was found to be significantly lower than in healthy controls, with an effect size of 0.54 (Demiralp et al., 2012). Similar studies have found lower NED in other groups exhibiting various types of psychopathology compared to controls, including borderline personality disorder (Suvak et al., 2011, Zaki et al., 2013), social anxiety disorder (Kashdan & Farmer, 2014), and autism spectrum disorder (Erbas et al., 2013). Low NED has also been linked to substance use issues, including alcohol related problems (Emery et al., 2014) and heavy smoking (Sheets et al., 2015).

Furthermore, in three studies (described individually below), higher NED was shown to serve as a protective factor against maladaptive behavior even among high risk or high symptom individuals (Kashdan et al., 2010; Pond et al., 2012; Zaki et al., 2013). In participants with borderline personality disorder, more rumination predicted higher rates of non-suicidal self-injury (NSSI), but this association was moderated by NED, such that high differentiators did not experience increases of NSSI with rumination (Zaki et al., 2013). In another study, intense negative emotions predicted episodes of binge

drinking among underage drinkers, but high differentiators drank less after experiencing these intense negative emotions than did low differentiators (Kashdan et al., 2010). Finally, Pond and colleagues (2012) found that the association between intense experiences of anger and subsequent aggressive behavior was weaker for high differentiators, suggesting that they were better able to choose non-aggressive responses even when experiencing intense anger. In all three studies, emotion differentiation moderated the relationship between a difficult or triggering inner experience (i.e., rumination, intense negative affect, or anger), and the subsequent maladaptive behavior that was associated with the trigger in that group (i.e., NSSI, binge drinking, and aggression, respectively). All three studies examined traditionally externalizing types of problem behaviors, and internalizing behaviors associated with depression (i.e., avoidance, escape, withdrawal) have yet to be investigated in the context of emotion differentiation.

### **Other Hypothesized Correlates**

*Correlate 1: Increased source knowledge.* It has been suggested that producing a more specific label for a negative emotion provides access to source knowledge, or a theory about what has caused the currently experienced emotion (Cameron et al., 2013; Erbas et al., 2014, 2016). This contrasts with feeling generally “miserable” or “upset”, which does not carry any information about the source. This relationship could also be bidirectional, with initial awareness of source providing the ability to use more differentiated labels. Many emotion words contain a specific cognitive interpretation, or an answer to the question “what about?” in their definitions, as has been long observed

(Gordon, 1978). In fact, some models of emotion suggest that most common feeling labels cannot be used without at least some knowledge of the source (that is, I cannot feel “frustrated” about nothing; I must be able to report some recent nuisance or thwarting of my efforts, however vague).

Boden and colleagues (2015) directly tested the proposed link between NED and source awareness for the first time and did find a significant positive association between self-reported source knowledge and negative emotion differentiation (effect size 0.24). However, source knowledge was assessed using a retrospective, dispositional questionnaire which relied on subjects’ self-awareness and memory to report how easily they were generally able to identify the reason for their feelings.

*Correlate 2: Rumination.* It has also been proposed (Kashdan et al., 2010) that having more information about an emotion (including source knowledge) may reduce rumination to further try to “figure out” how one is feeling and why. Rumination is a repetitive pattern of thinking characterized by passively focusing on one’s own distress or potential causes of the distress (Nolen-Hoeksema et al., 2008). Rumination may be initiated for a variety of reasons, including attempted problem-solving or strategizing about an unattained goal, and may even be adaptive when focused progress to the exclusion of all distractions is required (Altamirano et al., 2010). However, it has been strongly linked to depression in many studies (see Nolen-Hoeksema, et al., 2008 for a review).

There may be more and less adaptive styles of rumination. Treynor and colleagues (2003) identified a “brooding” type of rumination characterized by thinking

passively and negatively about one's current or recent experience (e.g., mentally replaying a recent conversation and thinking of everything that went wrong; thinking gloomily about one's own perceived inability to cope as effectively as others). This style of rumination was associated with depression both currently (effect size 0.44) and one year later (effect size 0.37). In contrast, a second style called "reflective pondering" or "reflection" was also identified, which was characterized by an attempt to overcome problems or difficulties and was less strongly linked to depression currently (effect size 0.12) or one year later (0.08). Watkins and colleagues have also identified abstract and evaluative rumination (e.g., "What is wrong with me? Why do I always react this way?") as more harmful than concrete, experiential reflection (e.g., "What exactly am I feeling right now?") (Watkins, 2008).

Since there is some evidence that individuals who tend to engage in rumination often believe that it will help them understand and resolve difficult emotions (Watkins & Moulds, 2005) it is reasonable to investigate whether the additional knowledge about emotions that comes from specific labeling reduces rumination. Two studies have directly tested this. Zaki and colleagues (2013) examined NED and brooding rumination (but not the reflective pondering style) in a clinical sample diagnosed with Borderline Personality Disorder and did not find a significant association (Zaki et al., 2013). Starr and colleagues (2017) recently found a significant association between NED and rumination among undergraduates and veterans but did not examine brooding and pondering separately. In all the studies discussed so far, rumination has been measured using dispositional, retrospective questionnaires.

## **Hypothesized Mechanisms**

*Mechanism 1: More effective emotion regulation.* By far the most commonly cited mechanism for the benefits of differentiation is the theory that high differentiators are able to engage in more adaptive emotion regulation strategies because of the additional information available to them (including source knowledge) from a specific, rather than a diffuse, label of their emotion (Erbas et al., 2016; Kashdan et al., 2015; Sheets et al., 2015; Smidt & Suvak, 2015; and others). This seems to have first been suggested by Barrett and colleagues (2001). In their study, more frequent self-reported emotion regulation was indeed associated with greater emotion differentiation. However, as in the case of source knowledge discussed above, the measure of emotion regulation was retrospective; participants were asked to remember the strategies they had used over the past two weeks. This is a serious limitation, because research suggests that when asked retrospective questions about emotion experience, people employ a different kind of processing than they do when answering about the current moment, incorporating their own beliefs and expectations, self-schemas, and stereotypes (Robinson & Clore, 2002). Particularly in the case of individuals with psychopathology, reduced self-efficacy beliefs as well as memory and attentional biases may influence respondents to underestimate their use of effective coping strategies and overestimate their frequency of negative responses (Abbott & Rapee, 2004, Ingram 1989). This suggests that measuring the use of emotion regulation strategies retrospectively may provide more information about how participants think of themselves than about their actual everyday behavior.

Additionally, in this first study by Barrett and colleagues, only the overall rate of emotion regulation of all types (e.g., suppression, reappraisal, distraction) was examined, even though the various types have important differences. Suppression is thought to be generally maladaptive, while reappraisal is generally adaptive (Gross, 2007). Distraction may be a good short-term way to lift one's mood, but chronic distraction as a means of avoidance may be harmful (Nolen-Hoeksema et al., 2008). So, though this study is frequently cited as showing that higher differentiators engage in more *adaptive* regulation, the authors could only conclude that high differentiators reported more total regulation of all types.

A later investigation (Tugade et al., 2004) examined specific regulation strategies separately instead of using a global regulation index and found that higher *positive* emotion differentiation predicted less self-reported use of distraction and more behavioral disengagement (i.e., pausing before taking action) to regulate emotions. However, this study did not examine *negative* emotion differentiation, and it also relied only on retrospective, dispositional measures of emotion regulation (the participants were asked to rate how much they generally used certain strategies in response to stressful events).

Addressing these limitations, one study by O'Toole and colleagues (2014) examined the association between NED and various emotion regulation strategies using a daily diary design with a sample of undergraduates. Their findings were mixed regarding the proposed mechanism of NED contributing to adaptive regulation - they did find that individuals higher in NED were more likely to use reappraisal, as expected, but that NED did not inversely predict suppression. It is important to note that participants were asked

about their use of emotion regulation strategies in response to their most emotionally intense experience that day (which could have been several hours prior to completing the daily diary). While this is closer in time than retrospectively reporting on the past two weeks, other research has found that even participants asked about coping strategies used in stressful situations as recently as 48 hours ago did not give responses that corresponded well with what their own in-the-moment reports had been at the time (Stone et al., 1998). Therefore, it is not clear at exactly what point (between reporting on the current moment to reporting on 48 hours ago), memory failure or recall biases begin to alter results. More research using truly in-the-moment reports of emotion regulation strategy use is necessary to develop our understanding of the hypothesized connection between differentiation and regulation of emotions.

There are at least two ways that emotion differentiation could serve as a pathway to better emotion regulation. The first is that utilizing the emotion regulation strategies that have been found to be the most adaptive in the long-term may require some degree of specific emotion knowledge. A label for one's emotion may be a prerequisite for reappraisal (Subic-Wrana et al., 2014). At least some knowledge of what has caused the current emotion (i.e., source knowledge) may also be necessary, since reappraisal involves reevaluating or reinterpreting the meaning of a situation (without source knowledge, how would one know *what* situation to reappraise?). Source knowledge may also facilitate non-judgmental acceptance of emotion experience (Baer et al., 2006, Feldman et al., 2007). In contrast, attentional control may be the only prerequisite for

suppression (Boden & Thompson, 2015) or distraction, which have not been found to be as adaptive in the long-term (Gross & John, 2003).

Secondly, it should be noted that while each emotion regulation strategy discussed above has been conceptualized as generally either adaptive or maladaptive, some recent evidence suggests that this can also depend on context, and flexibility in choosing an appropriate strategy is important (Sheppes et al., 2014). For example, suppression might be adaptive in a context in which expression of anger would only produce unproductive conflict, but maladaptive in a situation in which masking one's sadness would reduce support from others, and in which non-judgmental acceptance might be advantageous. Emotion differentiation might support adaptive emotion regulation by providing more information on which to make that choice. Knowing only that you feel "bad" would be less helpful. In this case, the greater understanding provided by differentiation could serve to bolster a flexible repertoire of multiple emotion regulation strategies, and the ability to employ them appropriately.

*Mechanism 2: Reduced overgeneralizing.* Another way in which greater negative emotion differentiation may be helpful is that knowing the cause of a negative emotion may reduce overgeneralizing from that emotion to evaluations about an unrelated domain. Support for a negative association between differentiation and generalizing comes from two studies (Cameron et al., 2013) in which high differentiators were less influenced by incidental disgust (elicited by unpleasant video clips) when subsequently asked to make moral judgements about vignettes than were low differentiators. The first study was correlational, and the second study replicated the results using a manipulation

(participants were instructed to either focus on which specific emotions they were experiencing, or simply how bad or how good they were feeling).

Overgeneralizing in clinically significant ways has not been examined in the context of emotion differentiation. In Beck's cognitive model, overgeneralization is a type of distorted thinking believed to lead to depression symptoms (Beck, 1976), which has since been supported empirically (Carver, 1998). Similarly, in the learned helplessness model of depression, overgeneralizing from a single negative incident to broader negative internal, stable, and global evaluations regarding the self, the future, and the world is considered a key feature of depressogenic cognitions (Abramson, 1978). If more emotion differentiation is associated with reduced overgeneralizing cognitions of this kind in response to incidental negative emotions, this would be clinically salient.

*Mechanism 3: Reduced negative arousal.* It has been suggested (Zaki et al., 2013) that accessing more differentiated information about one's experience of negative affect (including source knowledge) may itself be an effective emotion regulation strategy. One series of studies has compared distanced, abstract processing of a difficult emotional experience with immersive, concrete "reliving" of the experience. Both approaches were found to elicit similar levels of negative affect when the focus was on "what" questions (e.g., what sensations participants were experiencing), but distancing was found to buffer against negative emotional arousal when the focus was on "why" questions (e.g., reasons for the participant's feelings) (Kross et al., 2005). This "distanced-why" perspective has also been shown to reduce immediate physiological arousal (Ayduk & Kross, 2008) as well as depressed affect for up to one week, more than either distracting from the

experience or reliving it from an immersed perspective (Kross & Ayduk, 2008). This has been found to hold true in individuals diagnosed with major depressive disorder, who might otherwise be at risk for greater rumination with any increased attention to negative emotion experiences (Kross et al., 2012).

Labeling negative emotions has also been found to reduce anxious arousal and increase habituation to anxiety-provoking stimuli in studies of phobic individuals (Niles et al., 2015; Tabibnia et al., 2008). For example, in one study (Kircanski et al., 2012), arachnophobic participants in the presence of a spider were instructed to say a personalized sentence they created, that either 1) used at least two negative emotion words to describe their affective response and the spider (e.g., “I feel anxious that the disgusting tarantula will jump on me”), 2) used neutral words to describe the spider in a way that would help them feel less negatively towards it (e.g., “The little spider is not dangerous to me”), or 3) was unrelated, and described a piece of furniture in their home and its location. Participants in the negative affective labelling group reported less fear and approached the spider more closely than the participants who either verbalized the opposite of their likely feelings or distracted themselves. These findings suggest that directly labeling the source of one’s negative arousal may serve an independent regulatory function of its own.

One reason for this may be that the verbal, cognitive processing required to apply an appropriate affective label to an experience consistently activates the lateral prefrontal cortex (PFC), an area which is believed to downregulate the amygdala, reducing emotional arousal (Lieberman et al., 2007). More research is necessary to understand

how this might apply to negative emotion labelling in everyday life, aside from exposure to specific fear cues.

It is also important to note that in emotion differentiation studies, there are mixed findings about whether greater NED is associated with less total negative affect intensity (as would be expected if differentiation functions in the same way as verbal labelling in the above research, to directly reduce negative arousal). Some researchers have found high NED to predict less negative emotion experience (Erbas et al., 2014; effect sizes between 0.27 and 0.61), while others have found no association (Demiralp et al., 2012; Fogarty et al., 2015).

### **Pilot Data on Emotion Differentiation, Rumination and Overgeneralizing**

In a recent daily diary study, our lab examined the evidence for reduced rumination (correlate 2) and overgeneralizing (mechanism 2) with higher NED. The present study involves a partial replication and extension of these methods, with attempts to improve potential measurement issues in the pilot, which is described in more detail below.

Participants were given measures of depression and rumination at intake and asked daily about their current mood and their expectations for tomorrow. We expected that NED would be negatively correlated with anhedonic depression, conceptually replicating previous research on NED and depression (Demiralp et al., 2012, Erbas et al., 2014). Secondly, if low differentiators tend to feel confused about their negative emotions and ruminate more to “sort out” how they are feeling (correlate 2), we would hypothesize that NED should be negatively associated with rumination. Further, if low

differentiators tend to overgeneralize readily from incidental negative emotions to broader judgements and evaluations (mechanism 2), we would expect any association between negative mood and negative expectations about tomorrow (generalizations to the future) to be moderated by NED such that the link is weaker for higher differentiators.

Our sample of UNCG undergraduate participants ( $n = 169$ ) were 75% female, and ethnically diverse, in keeping with the overall demographics of the university. Our data were generated as part of a larger study, which involved the collection of saliva samples for cortisol measures and several daily questionnaires regarding social interactions, stress, sleep and health, and goal directed behavior. Described here is the subset of measures used for investigating hypotheses about emotion differentiation.

Each participant visited the lab individually for an initial battery of baseline measures, which included a 26-item version of the Mood and Anxiety Symptom Questionnaire (Mini-MASQ, Casillas & Clark, 2000) and the Ruminative Response Scale (RRS, Nolen-Hoeksema & Morrow, 1991). Each participant then completed an online daily diary survey each evening for 14 days. In these surveys, current mood was assessed using ratings of 23 positive and negative emotion words from the expanded version of the Positive and Negative Affect Scale (PANAS-x, Watson & Clark, 1994). As in previous research, NED was calculated for each person from these emotion ratings using the intraclass correlation coefficient (ICC) between all negative emotions across days. ICCs were then reversed so that higher scores indicated more differentiation. Positive emotion differentiation (PED) was not examined. Participants were also asked each day to rate their expectations for tomorrow, namely, the extent to which they expected tomorrow to

be 1) unpleasant, 2) difficult, and 3) enjoyable with respect to a) their relationships and b) their work (a total of six items). Their total ratings for “difficult” and “unpleasant”, for both relationships and work, were summed to create a total negative expectations index (positive expectations were not examined).

NED scores in our sample were comparable to commonly reported ranges in the literature, with a mean (*SD*) of 0.28 (0.27), and a broad range spanning all possible scores, from a minimum of 0 to a maximum of 1. The mean (*SD*) rumination score was 48.11 (14.31), and the mean (*SD*) anhedonic depression score from the Mini-MASQ was 21.20 (6.23).

NED scores were negatively correlated with scores on the anhedonic depression subscale of the Mini-MASQ ( $r = -0.22, p = 0.01$ ), replicating earlier findings linking depressive symptoms with low differentiation. The negative correlation between NED and RRS scores was exactly at the cutoff for statistical significance ( $r = -0.19, p = 0.05$ ). When decomposed into brooding and pondering subscales, only a small significant effect for pondering was observed ( $r = -0.08, p = 0.04$ ). One limitation may have been that rumination was assessed at intake using a dispositional report of how participants believe they usually respond to negative experiences (the imperfections of which have been discussed), while NED was measured during the daily diary stage of the study, based on participants’ in-the-moment reports of mood.

The relationships between mood, NED, and expectations about tomorrow were examined using the “multilevel” package in R, with days nested within persons (mood and expectations as level 1 variables, and NED as a level 2 variable). There was an

overall positive association between current negative mood and negative expectations about tomorrow ( $b = 0.09, p < 0.001$ ), indicating that the more negative emotion a participant was currently experiencing, the more likely they were to report expectations that tomorrow would be unpleasant or difficult with respect to work or relationships. However, there was no significant moderation effect of NED on the association between negative mood and negative expectations ( $b = 0.03, p = 0.47$ ), failing to provide support for mechanism 2 (reduced overgeneralizing).

One reason for this may have been a confound in the operationalization of overgeneralizing (as the association between negative mood and negative expectations about tomorrow), since current mood could be caused by an event that does, in fact, directly relate to some anticipated event or interaction the next day. For example, a fight with a significant other today might result in both a negative current mood and the expectation that one's social interactions tomorrow will be difficult and unpleasant. Or, finding out today that you've been assigned to work a double shift tomorrow could cause both a negative current mood and the expectation that your work tomorrow will be difficult and unpleasant. This would not be an example of overgeneralizing, because the current emotions are not incidental to the next day's expectations, they are highly salient.

To assess this possibility, the present study instead operationalized overgeneralizing as the association between current negative mood and scores on the Depressive Attributions Questionnaire (DAQ). Respondents were asked to what extent they endorsed statements like, "I think my life will never get better", and "I can't see anything positive in my life". These items were able to more sensitively assess the kind

of overgeneralization that would be predicted to accompany low differentiation and lack of source knowledge, and potentially lead to depression. If current negative mood were caused by an interpersonal conflict, for instance, it would be an overgeneralization to conclude, “I can’t see anything positive in my life”, instead of “I am frustrated and disappointed [an example of differentiation] about how our conversation went earlier [an example of source knowledge], but there are positive things in my life related to work and my other relationships”. Additionally, the present study examined rumination using daily reports of both brooding and pondering in the moment.

### **Goals and Hypotheses**

The present study investigated the association between depressive symptoms and negative emotion differentiation and assessed the evidence for two proposed correlates of NED: 1) increased source knowledge, and 2) reduced rumination. We also explored evidence for two of the proposed mechanisms (which need not be mutually exclusive): 1) that NED increases access to more adaptive emotion regulation strategies, and 2) that NED reduces overgeneralization from incidental negative emotions to evaluations in unrelated domains. Depressive symptoms and baseline rumination were measured at intake, and a daily diary method was used to assess participants’ in-the-moment emotion experience, source knowledge, emotion regulation strategy choices, as well as ruminative and overgeneralizing thinking.

*Hypothesis 1.* Replicating previous research and the findings of the pilot study, we expected to see a negative association between NED and depression.

*Hypothesis 2.* If high differentiators do have access to more knowledge about the source of their feelings (correlate 1), we would expect to find a positive correlation between NED and daily reports of source knowledge.

*Hypothesis 3.* If NED decreases the need to ruminate over negative emotions to try to “sort them out” (correlate 2), we would expect to see a negative association between daily rumination and NED. We did not have a strong basis for predicting which subtypes of rumination would be more or less associated with NED.

*Hypothesis 4.* If mechanism 1 is correct, and NED increases access to adaptive emotion regulation strategies, we would expect to find that high differentiators engage in more daily reappraisal and acceptance (which require the use of meta-emotional information), and less daily suppression and distraction (which only involve attentional control), than low differentiators.

*Hypothesis 5.* In general, expected *a)* an overall positive association between current negative emotion ratings and current overgeneralizing cognitions (that is, we expected individuals to make more depressed overgeneralizations when experiencing a more negative mood, just as participants in the pilot study had more negative future expectations when experiencing a more negative mood). However, if NED reduces overgeneralization from incidental emotions to evaluations in unrelated domains, we would also expect *b)* for that relationship to be moderated by NED such that it is weaker for high differentiators.

## CHAPTER II

### METHOD

#### **Participants**

Two hundred fifteen undergraduate students aged 18 or older were recruited from the research pool at the University of North Carolina at Greensboro. Participants were granted course credit for participation. Of this initial pool, 38 (18%) were removed due to failure to complete the minimum number of surveys (10 of 14). Additionally, of 2,208 surveys submitted, 17 (<1%) contained skipped items on critical daily measures and were removed, leaving 2,191 complete surveys for analysis. This reduced four of the participants' total number of surveys below the minimum of 10, and they were therefore excluded from the study.

The final sample with complete data ( $N = 173$ ) was 74% female, with an average age of 19.2 ( $SD = 2.15$ ). The sample was racially diverse, with 36% of students identifying as Caucasian/White, 31% as African-American/Black, 11% as Asian, 9% as Hispanic/Latino, and 1% as American Indian. Additionally, 12% selected multiple races or "other".

#### **Materials**

*Demographics Questionnaire.* Participants completed a brief demographics survey at intake, which included items for age, gender, race/ethnicity, and GPA.

*Anhedonic Depression (AD) Subscale of the Brief Mood and Anxiety Symptom Questionnaire (Mini-MASQ, Casillas & Clark, 2000).* The AD subscale of the Mini-MASQ consists of eight items related to low mood and reduced enjoyment and pleasure, symptoms which distinguish depression from anxiety alone. At intake, respondents were asked to rate the extent to which they have felt the way each item describes over the past week, on a scale from 1 (not at all) to 5 (extremely), and the ratings are summed to yield a total score (see Appendix B for items). The subscale exhibited good internal validity in the present sample ( $\alpha = 0.88$ ).

*Modified Ruminative Response Scale (RRS, Treynor et al., 2003).* This modified version of the RRS was developed by Treynor and colleagues by removing items on the original that directly overlapped with DSM symptoms of major depressive disorder. The Brooding and Pondering subscales (of five items each) were then distinguished through principal components analysis, and were found to show convergent and divergent validity with related measures. This measure was administered at intake, and slightly reworded items were also administered each day to ask about how much the participant has been engaging in ruminative thinking today, rather than how much they usually do this (See appendix B). Scores from each subscale were then summed to yield a brooding score and a pondering score. Both subscales exhibited good internal validity in the current sample (with Cronbach's  $\alpha$  of 0.89 and 0.86 for daily brooding and pondering, respectively).

*Expanded Positive and Negative Affect Scale (PANAS-x; Watson & Clark, 1994).* Current mood was assessed daily using 41 items from the PANAS-x. All subscales belonging to the negative affect dimensions (sadness, fear, hostility, and guilt items) and

the positive affect dimensions (joviality, self-assurance, serenity, and attentiveness items) were included, but not subscales categorized as “other affect” (surprise, shyness, and fatigue items). (See Appendix B for the list of items). These ratings were also used to calculate the negative emotion differentiation index.

*Source knowledge.* Awareness of the source of the participants’ current emotions was assessed using a single item: “I think I know what caused me to feel the way I do right now.” (rated on a scale from 1 – strongly disagree, to 7 – strongly agree).

*Situational Version of the Brief COPE Inventory (Monzani et al., 2015).* Three of the four emotion regulation strategies of interest were assessed using their corresponding subscales from this measure: positive reframing (i.e., reappraisal), self-distraction (i.e., distraction), and acceptance. Each subscale contains two items. Respondents were asked to rate the extent to which they had just been engaging in the described behavior to cope with their current feelings, from a scale of 1 (I haven’t been doing this at all) to 4 (I’ve been doing this a lot) (e.g., “I’ve been turning to work or other activities to take my mind off things” - distraction). The subscale ratings were then summed such that each strategy yielded one total score per day. Because the scale was originally developed to assess recent responses to a stressful situation, and in the present study it was used to assess current responses to negative emotions, items were reworded slightly (see Appendix B for a full list).

*Emotion Regulation Questionnaire (ERQ; Gross & John, 2003).* The final emotion regulation strategy of interest (suppression) was assessed using items from the corresponding subscale of this 10-item measure. The two highest contributing items to

the suppression subscale were used, as identified by two independent studies of the psychometric properties for this instrument in a U.S (Melka et al., 2011) and a German population (Wiltink et al., 2011). As with the Brief COPE strategies, the sum of these ratings was used as the total suppression score. For the purposes of the present study, the wording was changed to assess the extent to which the respondent is currently employing the strategy of suppression (instead of to what extent they usually do so). Finally, for continuity, the same response scale was used as in the Brief COPE, from 1 (I haven't been doing this at all) to 4 (I've been doing this a lot); for example, "Right now, I'm controlling my emotions by not expressing them". (See Appendix B for a complete list of original and reworded items, and their factor loadings for their respective subscales).

*Depressive Attributions Questionnaire (DAQ; Kleim et al., 2011).* The DAQ consists of 16 statements expressing negative overgeneralizations across life domains (e.g., "I think my life will never get better", and "I can't see anything positive in my life"), and the respondent is asked to rate how much they agree with each item on a scale ranging from 0 (not at all) to 4 (very strongly). This measure has been found to possess convergent and divergent validity with related measures. The four items with the highest factor loadings were used for the daily surveys, and the wording was adapted to focus on current experience (see Appendix B). The total of all four ratings was summed to generate the participant's daily overgeneralizing score. Though the scale was developed with multiple subscales in mind, factor analysis showed a single factor model to be the best fit, so the present study did not differentiate between subscales. The four daily items had good internal reliability in the current sample ( $\alpha = 0.90$ ).

## **Procedures**

First, participants visited a lecture hall on campus where they completed the intake measures on desktop computers through Qualtrics. Undergraduate research assistants ran participants in groups no larger than 20, to allow for adequate spacing and privacy.

After the intake visit, participants received emailed links to the daily surveys every evening at 5:00 pm for 14 days. The links expired at midnight, ensuring that all surveys were completed at the end of the appropriate day. This was intended to increase response rates by ensuring that participants could plan their availability to complete the survey during the same interval each day (rather than receiving surveys at various times during the day when they might be in class or at work) and reduce any carry-over effects that might result from completing multiple surveys in one day. To discourage attrition, participants were only awarded one third of their class credit after participation at intake, and the remaining two thirds were earned by completing at least 12 of the 14 surveys.

Within the surveys, participants were first asked about their current mood, rating items from the PANAS-x in randomized order. Next, participants responded to the source knowledge item, then the emotion regulation and rumination items from the COPE, ERQ, and RRS (presented in randomized order), and finally the overgeneralization items from the DAQ.

DAQ items were placed last to avoid altering participants' mood and emotion regulation (i.e., evaluating global negative statements about one's life could induce negative mood). However, any influence of previous questions on DAQ items is not

problematic, since that is part of the construct of interest (the extent to which current negative emotional states promote overgeneralizing cognitions).

## CHAPTER III

### RESULTS

All analyses were conducted using the multilevel package in RStudio statistical software. Mood (PANAS-x), emotion regulation (from the ERQ and the COPE inventory), source knowledge (single item measure), and overgeneralizing (DAQ) were level 1 (day) variables, while negative emotion differentiation (NED) and anhedonic depression (Mini-MASQ) were level 2 (person) variables. Rumination was measured both as a baseline variable at intake (level 2), and during daily surveys (level 1).

#### **Preliminary Analyses**

*Negative emotion differentiation.* The negative emotion differentiation score (NED) for each participant was calculated as the reversed ICC between that participant's negative emotion ratings across days (positive emotion ratings were not considered in this study). Nine participants (5%) had negative ICCs, which were assumed to be zero, following the recommendations of Searle et al. (2006) for interpreting negative variance components due to artifacts in estimation procedures. NED was not found to be associated with participant gender, age, or reported GPA, and differences in NED between native and non-native English speakers were not significant.

*Model specification.* A step-by-step approach to model building was taken, following the suggestion of Robson and Pevalin (2016), to keep all models as parsimonious as possible and add levels of complexity only where required. For analyses

that included day level variables, all ANOVA model comparisons revealed that allowing intercepts to vary randomly between participants significantly improved model fit, confirming that a multilevel approach was warranted. Allowing slopes to also vary randomly further improved model fit for analyses involving overgeneralization, therefore random coefficient models were used. For other multilevel analyses, random intercept models were used. For all regression results, reported parameter estimates are standardized, to aid in the interpretation of the coefficients. Person level variables, as well as day level variables in models with a single person level predictor, were grand-mean centered, to examine between person variation. Day level variables for random coefficient models were person-mean centered, to investigate daily variation from each participant's personal average. Diagnostic plots were examined for all regression models to ensure normality and homogeneity of variance among residuals.

*Survey compliance.* A minimum of 10 completed surveys were required for inclusion, to ensure adequate sampling of days across the two-week study period. Most participants (80%) reached this cutoff. However, simulation studies have shown that as few as five level one data points may be acceptable for multi-level modeling (Maas & Hox, 2005), and many studies include even fewer than five observations (e.g., Barrett et al., 2001; O'Toole et al., 2014). To address the possibility that unnecessarily eliminating low compliance participants may have altered the sample characteristics, t-tests were conducted between the low and high compliance groups to test for the presence of significant differences on any variables.

High compliance participants ( $n = 173$ ) were defined as having reached the predetermined cutoff of at least 10 completed surveys. Low compliance participants ( $n = 18$ ) were defined as having completed between five and nine daily surveys. T-tests were carried out using the Welch-Satterwaithe method rather than assuming equal variances, to account for the large difference in group sizes. No significant group differences were found for NED, depression, daily or trait rumination of either type, daily use of emotion regulation strategies of any type, or daily overgeneralizing cognitions. High compliance participants did report significantly more daily source awareness ( $t = -2.85, p = 0.005$ ) than low compliance participants. For this reason, all analyses involving source awareness were conducted both on the original sample of high compliance participants and on the larger sample of participants with at least five surveys ( $n = 191$ ). The direction and significance level of all effects remained the same, therefore results from only the high compliance sample are reported throughout as originally proposed. This was intended to increase the likelihood that observed within-person variation would actually represent day-to-day fluctuations from each individual's average over the course of the study period, rather than only a few potentially non-representative instances.

### **Descriptive Results**

Means, standard deviations, reliabilities, and correlations between person level variables are presented in Table 1. In Table 2, means, standard deviations, and reliabilities of day level variables are presented, as well as the ICC for each variable.

The ICC indicates the proportion of the total variance associated with between-person differences. An ICC below 0.1 or 0.2 (Vajargah & Nikbakht, 2015) would suggest

that analyses could confidently be carried out using standard statistical approaches to examine variation between days only. However, ICCs for all variables were well above this cutoff, indicating that multilevel modeling was necessary to account for the clustering of observations by person.

Table 3 reports the correlations between all day level variables. Values below the diagonal are between the aggregated variables (averaged across days) and indicate patterns at the person level only. Values above the diagonal represent the relationships between disaggregated variables (between days, within persons).

### **Hypotheses Testing**

*Hypothesis 1: Depression.* Pearson's correlation coefficient was calculated between scores on the anhedonic depression subscale of the Mini-MASQ and NED. In accordance with a pre-registered analysis plan, a one-tailed significance test was conducted to preserve power and examine the one-directional hypothesis that NED would negatively predict depression scores, replicating previous research. In confirmation of hypothesis 1 (see Figure 1), depressive symptoms and NED were significantly negatively correlated ( $r = -0.22, p = 0.002$ ). This effect size was similar in magnitude to previous findings in the literature, and from pilot data.

*Hypothesis 2: Source knowledge.* A multilevel regression was conducted to examine the relationship between NED and daily reports of source knowledge and other day level outcome variables (see Table 4). NED did not significantly predict source knowledge ( $b = -0.08, p = 0.13$ ), failing to support the hypothesis that higher differentiators may have more daily awareness of the causes of their emotions.

*Hypothesis 3: Rumination.* As hypothesized, higher NED significantly predicted less daily rumination, and results were almost identical for brooding ( $b = -0.20, p = 0.001$ ) and pondering ( $b = -0.20, p = 0.001$ ) styles of rumination. Additionally, NED was significantly negatively correlated with trait level rumination measured at intake in this sample, for both brooding ( $r = -0.23, p = 0.003$ ) and pondering ( $r = -0.21, p = 0.005$ ).

*Hypothesis 4: Emotion regulation strategies.* NED did not differentially predict the use of daily emotion regulation strategies, contrary to predictions. No significant associations were found between NED and any strategy (suppression:  $b = -0.08, p = 0.18$ ; distraction:  $b = -0.10, p = 0.06$ ; reappraisal:  $b = -0.19, p = 0.36$ ; acceptance:  $b = -0.06, p = 0.26$ ).

*Hypothesis 5: Overgeneralizing cognitions and mood.* As expected, daily negative emotions were significantly positively associated with daily overgeneralizing cognitions ( $b = 0.37, p < 0.001$ ). Allowing slopes to vary randomly between persons significantly improved model fit, indicating that negative mood did not predict overgeneralizing similarly for all individuals (see Figure 2 for a sampling of individuals and their slopes). To examine whether greater NED reduces the impact of mood on the tendency to overgeneralize, a multilevel regression analysis was conducted adding NED and an interaction term between NED and daily negative emotion as predictors. Both day level variables were person-mean centered, to control for between-person intercept differences (that is, higher scores represented days on which an individual endorsed more than his or her average level of negative mood or overgeneralizing). A significant interaction was found between NED and daily negative emotion ( $b = -0.15, p = 0.02$ ), indicating that

greater NED was associated with a weaker relationship between negative mood and overgeneralizing, in support of hypothesis 5 (see Figure 3).

When this interaction was probed further, regression results suggested that the within-person positive correlation of negative mood with overgeneralizing was strongest for participants with low levels of NED ( $b = 0.56, p < 0.001$ ) and remained significant for participants with medium levels of NED ( $b = 0.27, p < 0.001$ ). However, daily negative mood did not significantly predict daily overgeneralizing cognitions for those high in NED ( $b = 0.06, p = 0.16$ ). This last finding should be interpreted cautiously, because regression diagnostics indicated that the residuals were not normally distributed for the model with only high differentiators.

### **Exploratory and Follow-Up Analyses**

*Eliminating days without negative mood.* In an unplanned follow-up analysis of daily emotion regulation strategies and source awareness, days in which participants rated every negative emotion term “not at all” (653 surveys) were removed, and models for hypotheses 2 and 4 were reanalyzed. This was to investigate the possibility that NED is associated with emotion regulation strategy choice and source knowledge, but not in the absence of negative affect (e.g., not when participants were experiencing only positive feelings). Greater NED did significantly predict somewhat less use of distraction strategies on days when participants reported at least some negative affect ( $b = -.13; p = 0.01$ ), but all other effects remained non-significant.

*Controlling for baseline depression in the prediction of daily rumination.* To examine whether low NED was predictive of greater daily rumination above and beyond

baseline depression levels, a follow-up regression analysis was examined. The negative association between NED and daily rumination remained significant with depression in the model, for both brooding ( $b = -0.13, p = 0.02$ ) and pondering ( $b = -0.14, p = 0.01$ ).

*Daily and trait rumination.* The correlations between trait-like rumination scores (measured retrospectively at baseline) and average daily rumination ratings were calculated. Trait rumination scores predicted average daily ratings more strongly for brooding ( $r = 0.52, p < 0.001$ ) than for pondering rumination ( $r = 0.27, p < 0.001$ ), but both associations were positive and significant.

## CHAPTER IV

### DISCUSSION

This study used a daily diary design to examine evidence for several proposed correlates of negative emotion differentiation (NED). Previous findings regarding the negative association between NED and depression were replicated, using a different depression measure than in earlier studies. This offers further support for the increasingly robust link between low granularity of emotional experience and depressive symptoms. A direct, negative association between NED and rumination was observed, consistent with the theoretical suggestion that high differentiators may not need to “sort out” their emotions by mulling over them. In this sample, the relationship between NED and rumination was similar regardless of rumination type (brooding or pondering), both when measured retrospectively and in the moment. Given the well-established and reciprocal relationship between rumination and depression (Nolen-Hoeksema et al., 2008), it is also important to note that the effect of NED on daily rumination remained significant when baseline depression scores were included in the model. This suggests that NED has predictive value above and beyond baseline depression levels and may be related to ruminative thinking independent of the presence of depression symptomology more broadly.

Rumination was measured daily because it was hypothesized that trait-like measures at intake may not capture behavior as accurately. The need for a distinction

between trait and daily measures of rumination was supported by the fact that the two were significantly associated in this sample, but only moderately - on the same order as the associations observed between distinct but closely related constructs such as depression and brooding or brooding and pondering. NED was negatively associated with both trait and day level measures of rumination. These findings suggest that both trait and daily measures of rumination are relevant to emotion differentiation, but they may represent different processes.

Furthermore, NED was found to significantly moderate the positive association between daily negative mood and overgeneralizing cognitions. This finding provides support for one theorized mechanism for the negative association between NED and depression, that low differentiators may be more likely to overgeneralize from a current negative emotion to pessimistic conclusions about their life and future more broadly. The present study represents the first direct test of this commonly cited theory.

It may be the case that a reduction in overgeneralizing from incidental negative mood may also serve to regulate emotion intensity. That is, if a low differentiator experiences a low mood and then draws the conclusion that life will likely always be miserable (overgeneralizing), he or she is likely to feel even more intense negative emotion. On the other hand, if differentiating reduces overgeneralizing, it might also interrupt this cycle and regulate the original sad mood.

A self-report item intended to measure current source knowledge was not found to be associated with NED, failing to provide support for hypothesis 2, that greater differentiation should result in increased awareness of the cause of emotional

experiences. Past research regarding source knowledge has largely been conducted by manipulating participants' attributions in the lab, rather than investigating how source knowledge functions in daily life. To date, no other studies have examined source knowledge in the moment. The first researchers to assess individual differences in source knowledge were Boden & Berenbaum (2011), and the trait-oriented measure the authors developed for that purpose is the only one in use in the literature. The single item, state-oriented measure used in the present study had strong face validity, however it does not have established convergent or divergent validity with related measures and has not been tested in other samples. It is possible that the item did not adequately capture the construct of interest.

Support for the hypothesized relationship between NED and emotion regulation strategy choice was minimal. A negative association with distraction was observable only when days were limited to those in which participants were experiencing negative affect, in an exploratory follow-up analysis. With all observations included, there was no significant association between NED and any strategy. While the idea that NED supports more adaptive emotion regulation strategies is frequently alluded to in the literature, the empirical support for this idea is currently limited. The seminal study by Barrett and colleagues (2001) on this topic only found that high differentiators engaged in more of all types of emotion regulation (when reporting retrospectively). A follow-up study by O'Toole and colleagues (2014) only found partial support for the prediction that NED would be differentially associated with adaptive regulation strategies (higher NED was

associated with more reappraisal only). The present study finds no associations. This raises questions about exactly how differentiation relates to regulation.

First, some research suggests that the ability to flexibly select different strategies as appropriate for the context is adaptive (Sheppes et al., 2014), not necessarily increased access to specific strategies. Perhaps future research can aim to assess “Emotion Regulation Differentiation”, either using a similar approach to measurement as with NED (i.e., the reversed ICC of emotion regulation ratings) or novel methods. Eldesouky and English (2018) have recently examined a construct they call “regulatory flexibility”, by calculating the standard deviation of *number of emotion regulation strategies* used per day and the overall standard deviation of ratings. They found that frequent daily reappraisal (but not frequent daily suppression) was associated with more “regulatory flexibility” in older adults. Caution should be exercised, however, before assuming that greater variation in strategy use is always adaptive. It may be that strategic, appropriate shifts in strategy are beneficial while the frantic, desperate use of every strategy available is not effective. To facilitate a better understanding of such nuances, future research in regulatory flexibility or differentiation should also identify and examine relevant situational, temporal, and cognitive factors whenever possible. For example, one study investigated physiological cues that prompt strategy switching and found that shifting in response to internal cues was adaptive, but random shifts were maladaptive (Birk & Bonanno, 2016).

Second, it may be the case that NED is best conceptualized as a regulatory process itself, without necessarily being linked to other strategies. This is consistent with

the related finding that the activity of emotion labeling disrupts amygdala activity (Lieberman et al. 2007). If that were the case, we might expect high differentiators to engage in other emotion regulation strategies somewhat *less* frequently.

Finally, it is possible that people with higher NED are more *effectively* using the various regulation strategies (e.g., more appropriate to the situation, more competently), but not more or less frequently. For instance, in one sample of PTSD patients, choosing distraction for high intensity emotions and reappraisal for low intensity emotions was adaptive, but selecting in the opposite way was maladaptive (Levy-Gigi et al., 2015). Future NED studies should investigate whether high differentiators select emotion regulation strategies in different ways, at different times, in response to different stimuli than low differentiators.

These results also highlight the importance of determining whether current negative affect is a pre-requisite for meaningful in-the-moment measures of emotion regulation. While previous studies employing daily emotion regulation ratings have included all observations (e.g., Eldesouky & English, 2018; O'Toole et al., 2014), it is reasonable to wonder how endorsements of suppression or reappraisal statements should be interpreted when there is no negative emotion present to regulate. If participants are attempting to regulate positive emotions, for example, is that relevant to hypotheses about *negative* emotion differentiation? Alternatively, perhaps a strategy is so successfully down-regulating the participant's original negative emotion that it is no longer present to be reported.

## **Strengths and Limitations**

The use of a daily diary design is one significant strength of the present study. This methodology provides the ability to obtain spontaneous self-report information about current emotional and cognitive experiences in the participants' natural context.

Additionally, the constructs under investigation ranged in the degree to which they fluctuated in time within persons, which a diary design allows us to study. For example, among all the level 1 variables examined, overgeneralizing and brooding rumination had the highest ICCs (0.72 and 0.63, respectively), indicating that more than half of the variation in daily scores was accounted for by between-person differences. Source knowledge had the lowest ICC (0.38), indicating that most of the variation in scores was due to between-day differences. This has implications for future research, since the density of data collection points chosen for any study should reflect how the variables of interest are theorized to vary in time (Bolger & Laurenceau, 2013, p. 5). It may be the case that brooding and overgeneralizing are more stable, trait-like tendencies, which some participants engage in frequently while others do not at all. While self-report may still be more accurate when assessed in the moment rather than retrospectively, it may not be important to have many repeated instances of measurement for these variables. On the other hand, perhaps the degree to which any person is aware of the source of an emotion depends more heavily on the situation, suggesting that this variable would be best investigated with at least daily observations.

One limitation of the study is that all models are based on cross-sectional data, and cannot provide information about the direction of effects. While a daily diary design

has advantages over reliance on retrospective self-report, the intervals between sampling times make it unfeasible to examine lagged effects (e.g., does sad mood in the morning predict overgeneralizing later in the day?). Even more intensive experience sampling methods, such as brief surveys collected multiple times throughout the day, would likely capture a greater variety of affective and cognitive processes, and allow for observing how these unfold over time.

Secondly, one drawback of repeated measures approaches in general is the possibility of a reactivity effect among participants (Barta et al., 2012). Participation in the study may itself promote heightened awareness of experiences, such as mood states, due to frequent ratings over the two-week period. This in turn may impact participants' cognitions and regulation strategies.

Finally, the present study was conducted with an undergraduate, rather than a clinical or community sample of participants, limiting confidence in the generalizability of the findings.

### **Future Directions**

Critical and basic questions still remain about negative emotion differentiation. Is NED trait-like and stable, or is it malleable? And if it is malleable, under what conditions does it change? For example, greater NED is an increasingly well-established predictor of lower depression symptoms, in both clinical and student samples. However, the direction of this effect is still unknown. Is increased differentiation protective against depression, or is low specificity in labeling emotion experience a symptom of depression? The relationship could also be bidirectional. Future studies should examine changes in NED

and depression over time in a variety of circumstances. For example, in the treatment of depressed patients, many therapy modalities introduce processes that seem likely to improve the ability to identify emotions with specificity (e.g., daily thoughts and feelings logs, mindful attention to emotion experience). Other interventions, such as behavioral activation or antidepressant medication, do not seem likely to modify emotion labeling processes. If NED improves with treatment in all cases, this would suggest that low NED is a symptom of depression. If NED mediates outcomes in only the former types of treatments, this might indicate that low NED is a vulnerability to depression which is ameliorated with certain interventions. It may even be that low NED patients benefit from different treatments than high NED patients whose depression is driven by other factors, a line of inquiry which would have significant clinical implications.

Secondly, NED researchers can refine and test current methods of measurement. The standard approach of having participants rate many emotion words is not very ecologically valid, since we do not describe our emotion experiences that way in our everyday lives. Can we develop more naturalistic methods to assess this construct using spontaneous and free-form responses from participants? Even when using the current rating method, various studies use different sets of emotion words, usually without supplying rationale. Future researchers should investigate whether including more or fewer emotion words affects findings.

Finally, much of the currently available research on NED is correlational and cross-sectional. Future longitudinal and experimental studies can extend our knowledge

by examining causality among the various processes that have been identified as salient thus far.

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APPENDIX A

TABLES AND FIGURES

**Table 1. Means, Standard Deviations, Reliabilities, and Correlations for Person Level Variables**

	M	SD	$\alpha$	<i>1</i>	<i>2</i>	<i>3</i>
1. NED	.30	.27	-			
2. MASQ-AD	21.56	6.68	.88	-.22**		
3. RRS-brooding	12.06	3.84	.75	-.23**	.28**	
4. RRS-pondering	10.92	3.84	.82	-.21*	.20*	.46**

\* $p < 0.05$ ; \*\* $p < 0.01$

**Table 2. Means, Standard Deviations, ICCs, and Reliabilities for Day Level Variables**

	M	SD	ICC	$\alpha$
RRS-brooding	7.50	3.58	.63	.89
RRS-pondering	7.04	3.06	.56	.86
ERQ-suppression	7.59	3.31	.50	.84
COPE-distraction	7.55	3.23	.49	.76
COPE-reappraisal	8.31	3.18	.48	.86
COPE-acceptance	9.01	2.94	.47	.81
Source Knowledge Item	5.77	1.20	.38	-
DAQ	5.57	3.08	.72	.90

**Table 3. Correlations Among Day Level Variables**

	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
1. RRS-brooding		.60	.22	.17	.14	.16	.04	.41
2. RRS-pondering	.84		.17	.16	.13	.13	.05	.34
3. ERQ-suppression	.52	.49		.45	.38	.35	.03	.18
4. COPE-distraction	.41	.40	.81		.47	.33	.00	.10
5. COPE-reappraisal	.22	.22	.63	.75		.51	.06	.07
6. COPE-acceptance	.21	.21	.57	.60	.72		.13	.08
7. Source Knowledge	-.18	-.16	-.13	-.13	.07	.21		.01
Item								
8. DAQ	.74	.60	.42	.25	.04	.10	-.18	

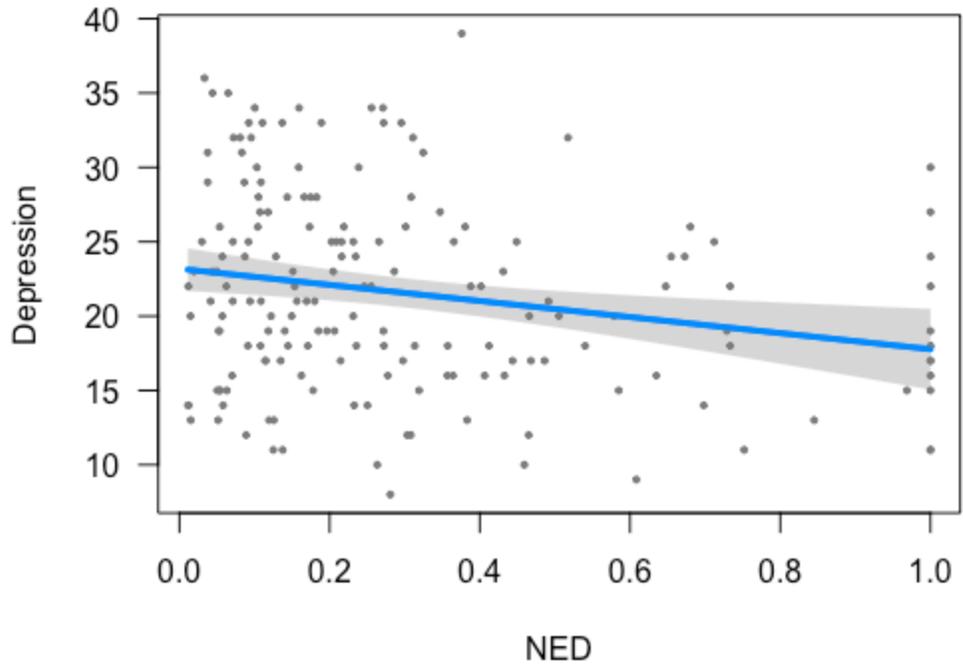
*Note:* Within person estimates are above the diagonal, and between person estimates are below.

**Table 4. NED Predicting Day Level Outcome Variables (Hypotheses 2, 3, and 4)**

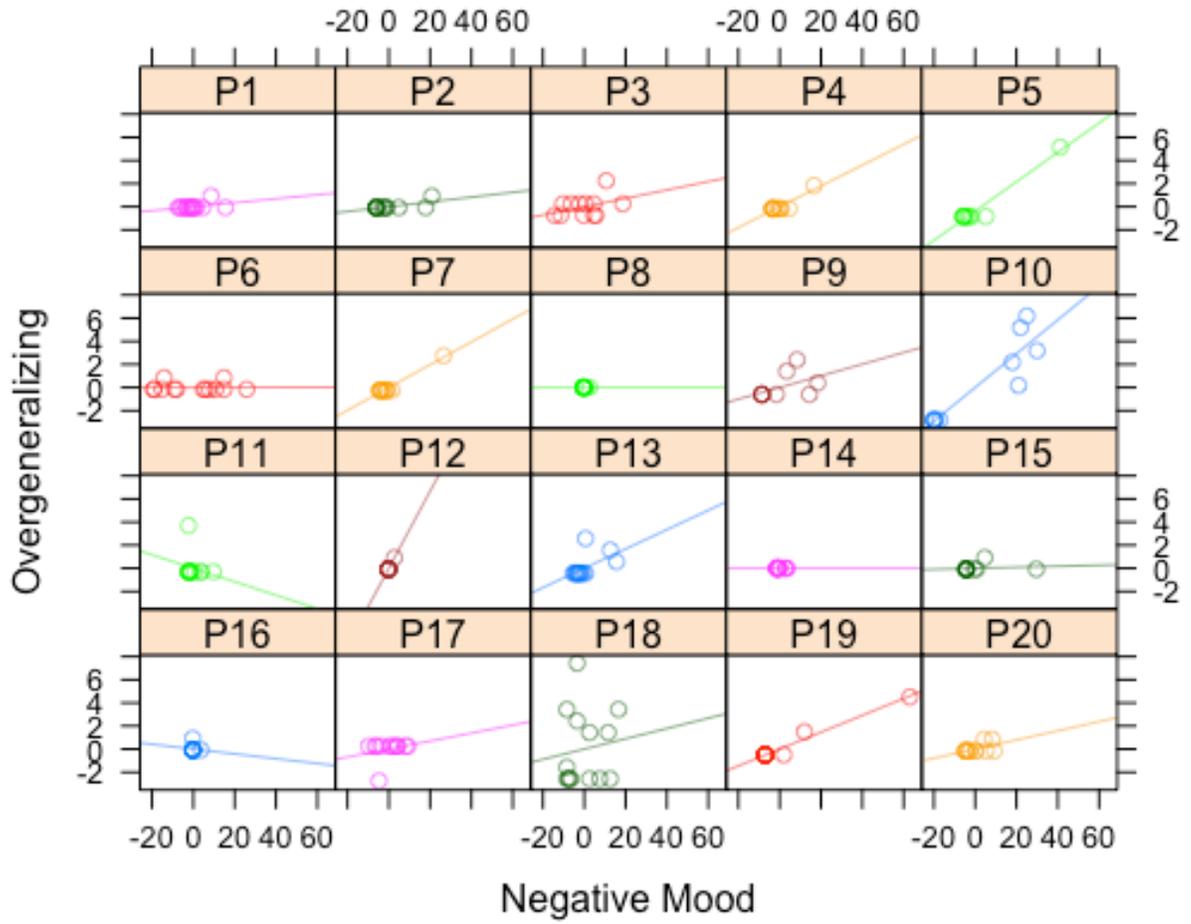
<i>Outcome</i>	Negative Emotion Differentiation		
	<i>b</i>	<i>SE</i>	<i>p</i>
Source Knowledge Item	-0.08	0.05	.13
RRS-brooding	-0.20	0.06	<.01**
RRS-pondering	-0.20	0.06	<.01**
ERQ-suppression	-0.08	0.06	0.18
COPE-distraction	-0.10	0.05	0.06
COPE-reappraisal	-0.19	0.20	0.36
COPE-acceptance	-0.06	0.05	0.26

\* $p < 0.05$ ; \*\* $p < 0.01$

**Figure 1. NED and Depression Symptoms (Hypothesis 1)**

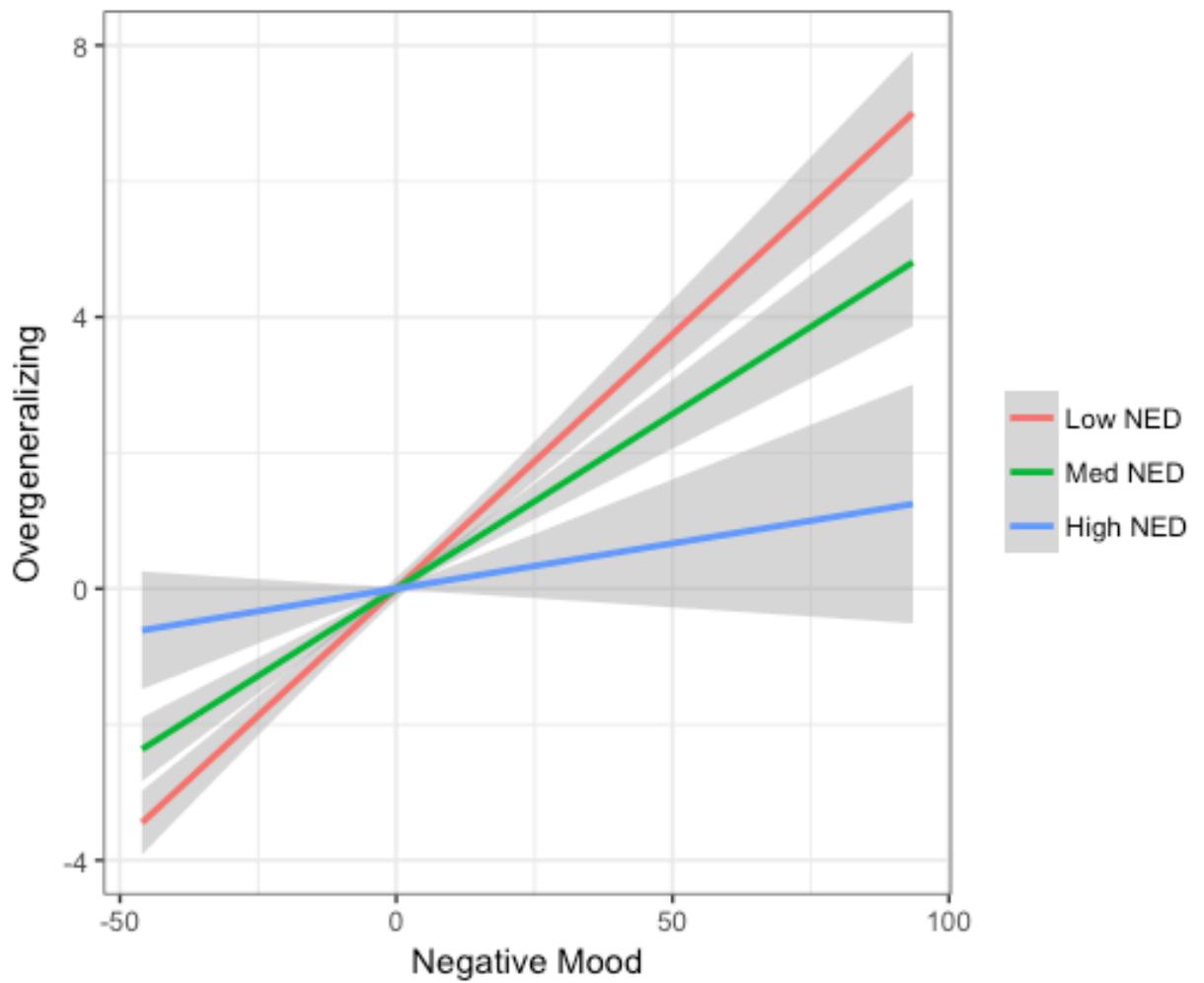


**Figure 2. Illustration of Relationship Between Negative Mood and Overgeneralizing (Slope) in Twenty Participants**



*Note.* Points represent daily ratings with each participant's overall average set to zero

**Figure 3. Effect of Negative Mood on Overgeneralizing, by Levels of NED (Hypothesis 5)**



*Note.* For Low NED (red),  $b = 0.56$ ,  $p < 0.001$ , for Medium NED (green),  $b = 0.27$ ,  $p < 0.001$ , and for High NED,  $b = 0.06$ ,  $p = 0.16$ .

APPENDIX B  
QUESTIONNAIRE ITEMS

**Anhedonic Depression Subscale of Mini-MASQ**

**Instructions:** Below is a list of feelings, sensations, problems, and experiences that people sometimes have. Read each item and then select the number that best describes **how much you have felt or experienced things this way during the past week, including today.**

**Responses:** 1 (not at all), 2 (a little bit), 3 (moderately), 4 (quite a bit), 5 (extremely)

<b>Number on full Mini-MASQ</b>	<b>Item</b>
1 (reversed)	Felt really happy
5	Felt withdrawn from other people
9 (reversed)	Felt like I had a lot to look forward to
11	Felt like nothing was very enjoyable
15 (reversed)	Felt like I had a lot of interesting things to do
19 (reversed)	Felt really lively, “up”
23 (reversed)	Felt like I had a lot of energy
25 (reversed)	Felt like I was having a lot of fun

Casillas & Clark, 2000

### PANAS-x Items

**Instructions:** This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then select an answer, indicating **how much you are feeling this way right now.**

**Responses:** 1 (very slightly or not at all), 2 (a little), 3 (moderately), 4 (quite a bit), 5 (extremely)

Items	Subscale
afraid, scared, frightened, nervous, jittery, shaky	Fear
sad, blue, downhearted, alone, lonely	Sadness
guilty, ashamed, blameworthy, angry at self, disgusted with self, dissatisfied with self	Guilt
angry, irritable, hostile, scornful, disgusted, loathing	Hostility
cheerful, happy, joyful, delighted, enthusiastic, excited, lively, energetic	Joviality
proud, strong, confident, bold, fearless, daring	Self-Assurance
alert, attentive, concentrating, determined	Attentiveness
calm, relaxed, at ease	Serenity

Watson & Clark, 1994

### Emotion Regulation Items

**Instructions:** The next set of items are statements that describe various strategies that people use to cope, or deal with their feelings. Please select the response that describes how much you have been using each strategy **in response to the emotions you are feeling right now**. If an item doesn't seem to apply to you, just select 0 (I haven't been doing this at all).

**Responses:** 0 (I haven't been doing this at all), 1, 2, 3 (I've been doing this a lot)

Original Item	Reworded Item	Scale (subscale)	Factor Loading
I control my emotions by not expressing them.	Right now, I'm controlling my emotions by not expressing them.	ERQ (Suppression)	0.72 <sup>1</sup> , 0.89 <sup>2</sup>
I keep my emotions to myself.	I'm keeping my emotions to myself right now.		0.68 <sup>1</sup> , 0.70 <sup>2</sup>
I've been trying to see it in a different light, to make it seem more positive.	I'm trying to see things in a different light, to make them seem more positive right now.	COPE (Positive Reframing)	0.77 <sup>3</sup>
I've been looking for something good in what is happening.	Right now, I'm looking for something good in what is happening.		0.72 <sup>3</sup>
I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.	Right now, I'm doing things to think less about how I'm feeling, such as watching movies or TV, reading, daydreaming, sleeping, or shopping.	COPE (Self-Distraction)	0.82 <sup>3</sup>
I've been turning to work or other activities to keep my mind off things.	Right now, I'm turning to work or other activities to keep my mind off how I'm feeling.		0.54 <sup>3</sup>
I've been learning to live with it.	I'm learning to live with the emotions I'm having right now.	COPE (Acceptance)	0.80 <sup>3</sup>
I've been accepting the reality of the fact that it has happened.	I'm accepting the reality of the way I feel right now.		0.55 <sup>3</sup>

1. Melka et al., 2011
2. Wiltink et al., 2011
3. Monzani et al., 2015

### Modified RRS

**Instructions:** The next questions are about some of the many things people may do or think about when they are feeling down or sad. Please select the answer that shows how much you've been doing each item today.

**Responses:** 0 (I haven't been doing this at all), 1, 2, 3 (I've been doing this a lot)

Number on Full RRS	Item (all verbs changed to the present continuous tense from the original)	Subscale
5	Thinking "What am I doing to deserve this?"	Brooding
10	Thinking "Why do I always react this way?"	
13	Thinking about a recent situation, wishing it had gone better	
15	Thinking "Why do I have problems other people don't have?"	
16	Thinking "Why can't I handle things better?"	
7	Analyzing recent events to try to understand why I'm feeling the way I am.	Reflection
11	Going away by myself to think about why I feel this way.	
12	Writing down what I am thinking and analyzing it.	
20	Analyzing my personality to try to understand why I'm feeling this way.	
21	Going someplace alone to think about my feelings.	

Treynor et al., 2003

### Depressive Attributions Questionnaire (DAQ) Items

**Instructions:** For this last set of items, please indicate how much you agree with each statement.

**Responses:** 0 (not at all), 1, 2, 3, 4 (very strongly)

Original Item	Reworded Item	Factor Loading
When bad things happen to me, I can't see anything positive in my life.	Right now, I can't see anything positive in my life.	0.87
When bad things happen to me, I think my life will never get better.	Right now, I think my life will never get better.	0.86
When bad things happen, nothing seems to be in place anymore.	Right now, I feel like nothing seems to be in place anymore.	0.82
When bad things happen to me, I am sure it will happen again.	I am sure that the bad things that have been happening to me will only happen again.	0.82

Kleim et al., 2011