Emotion

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# Emotion Differentiation and Behavioral Dysregulation in Clinical and Nonclinical Samples: A Meta-Analysis

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Behavioral dysregulation that may manifest as the use of maladaptive behaviors aimed at regulating or avoiding distress, despite potential negative health consequences, is central to the development and maintenance of common psychological disorders. However, less is known about factors that may influence the engagement of these maladaptive behaviors. Recent research suggests that negative emotion differentiation (NED) may be important. The present investigation was a meta-analysis examining the relationship between NED and maladaptive behaviors ranging from binge drinking and nonsuicidal self-injury to treatment noncompliance, in clinical and nonclinical samples across 17 included studies obtained via electronic literature searches. Despite between-study methodological heterogeneity, our results indicated that NED was negatively associated with the enactment of maladaptive behaviors ($r$ = –.15). Additionally, no significant differences in effect sizes were observed between clinical ($n$ = 7; $r$ = –.15) and nonclinical ($n$ = 10; $r$ = –.16) samples. Critically, the relationship between NED and maladaptive behaviors remained significant even after controlling for negative affect (NA; $n$ = 11; $r$ = –.09). This association also did not depend on levels of NA. Overall, our findings suggest that NED is generally associated with reduced engagement of maladaptive behaviors, regardless of diagnostic status and NA, and have important clinical implications for understanding and treating psychological disorders involving behavioral dysregulation.

*Keywords:* emotion differentiation, emotion regulation, behavioral dysregulation, maladaptive behaviors, psychopathology

*Supplemental materials:* https://doi.org/10.1037/emo0000968.supp



Colloquially, individuals often try to "drown their sorrows" with alcohol or attempt to "eat their feelings" away despite detrimental consequences. Although these behaviors are seemingly different, they appear to serve a similar function: to escape or avoid negative emotional experiences. Indeed, several clinical (Hayes et al., 1996; Linehan, 1993) and social (Baumeister & Scher, 1988) psychological theories posit that individuals engage in a wide variety of impulsive, self-destructive behaviors (e.g., substance use, self-handicapping, avoidance, and neglecting one's health) as ways to downregulate intense negative emotions. Even though such behaviors often bring about only short-term gratification or relief (e.g., pleasure from drinking alcohol), they also carry long-term costs (from a hangover to increased negative affect [NA] and the development of addiction) that typically outweigh the immediate benefits. As such, it is important to identify factors that might influence the use of maladaptive behaviors to cope with negative emotions. Moreover, it is clear that these behaviors interfere with treatment response and progress, negatively affect patients' health and prognosis, and increase the risk of relapse (e.g., Blakey & Abramowitz, 2016; Chalker et al., 2015; Federici & Kaplan, 2008). Critically, such behavioral choices are not static because patients may also switch from one negative behavior (e.g., weight-control activities) to another (e.g., substance use) as ways to cope with negative emotions (Federici & Kaplan, 2008).

Baumeister and Scher (1988) argued that individuals tend to engage in such maladaptive behaviors (termed *tradeoffs*) when faced with situations that invoke multiple conflicting goals. For example, an individual may choose to drink alcohol to feel less stressed out in the moment but forsake a long-term goal of staying sober or skip a doctor's appointment to avoid the fear associated with its outcome but forsake their long-term goal of staying healthy. Such poor behavioral choices are thought to stem from a greater focus on immediate results, thereby making the short-term benefits more apparent and the long-term costs more obscure. Further, this focus on temporary benefits may be magnified by the demands of transient psychological states, such as the desire to escape negative emotional experience or aversively high self-focus (e.g., after experiencing failure or rejection). Accordingly, these behaviors likely get reinforced over time despite their deleterious consequences.

Of clinical relevance, engagement in maladaptive behaviors is central to the development and maintenance of psychopathology

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and a common feature across numerous psychological disorders, including depression (Joiner et al., 1999), social anxiety (Clark & Wells, 1995), eating disorders (Claes et al., 2005), substance abuse (Khantzian, 1997), and borderline personality disorder (BPD; Linehan, 1993). These behaviors vary in severity, ranging from low-risk behaviors like avoidance in anxiety disorders to high risk, life-threatening behaviors like nonsuicidal self-injury in BPD. Although there is considerable variability in the type of maladaptive behaviors engaged in across clinical populations, theorists concur that these behaviors are functionally similar in that they are used to cope with negative emotions (e.g., Swerdlow et al., 2020). Indeed, Linehan (1993) argued that the engagement of impulsive behaviors in BPD reflects maladaptive attempts to manage negative emotions. Hayes et al. (1996) reasoned that maladaptive behaviors, although distinct, serve a common underlying function (termed *experiential avoidance*) of enabling individuals to escape/avoid aversive internal experiences, such as negative thoughts and emotions, albeit ineffectively. Finally, building on these theories, Selby et al. (2008) described the role of "emotional cascades," referring to a negative-feedback loop resulting from the interaction between NA and rumination, as a key driver of behavioral dysregulation. Specifically, as one ruminates intensely on their negative emotional experience, this results in further increases in NA. To terminate this "cascade," individuals are thought to engage in maladaptive behaviors as a means of distraction from negative cognitions and emotions. In line with these hypotheses, empirical evidence indicates that behavioral dysregulation tends to occur in the context of negative emotional states (Leith & Baumeister, 1996; Nolen-Hoeksema et al., 2007) and appears to be a transdiagnostic vulnerability (Johnson et al., 2013). Further, such impulsive behaviors are more prevalent among clinical populations (Chamorro et al., 2012). Consequently, interventions (e.g., dialectical behavior therapy) have focused on increasing tolerance of NA to prevent engagement in maladaptive behaviors. However, because these behaviors tend to provide patients with immediate relief, they are typically treatment refractory and pose challenges to current treatments. Therefore, it is pertinent to examine factors that might protect against maladaptive behaviors across populations.

Recent reviews (Kashdan et al., 2015; Smidt & Suvak, 2015) suggest that emotion differentiation (ED) may be important. ED is commonly conceptualized as the ability to recognize, identify, and label emotions discretely and, in so doing, discriminate between similarly valenced emotional states (Barrett et al., 2001). Empirically, ED is predominately operationalized as the consistency with which individuals report their emotional experiences using a range of affect terms from moment to moment (Kashdan et al., 2015). Utilizing experience-sampling methodology, ED is most often measured by examining how strongly these affect terms covary across time or whether they are experienced independently from each other. Individuals who are better at differentiating their emotions are believed to be more able to distinguish among emotional states with precision and use different adjectives to make distinctions about the presence and intensity of *specific* emotions (e.g., fear vs. sadness vs. anger). In contrast, individuals who are poor differentiators may experience greater difficulties separating between emotional experiences and tend to represent their emotions as more *general* feeling states. For instance, different adjectives such as "fear," "sadness," and "anger" may be "lumped" together to describe an unpleasant experience.

Because discrete emotions offer information regarding appropriate behavioral responses to contextual demands (Schwarz & Clore, 2003), the capacity to differentiate emotions may be beneficial in situations involving intense negative emotions by increasing emotional awareness, understanding, and regulation (Barrett et al., 2001). Consequently, ED may also enhance one's perceived self-efficacy to manage negative emotions, thereby facilitating more adaptive downregulation of NA. Indeed, high differentiators tend to use a broader range of strategies and are also more successful in managing negative emotions (Barrett et al., 2001; Kalokerinos et al., 2019). Further, past research on affect labeling indicates that labeling one's feelings in response to emotional stimuli dampens amygdala activation (Lieberman et al., 2007) and is associated with decreases in fear response during spider exposure (Kircanski et al., 2012) and lower physiological reactivity during public speaking (Niles et al., 2015). Moreover, research on ED is highly consistent with that on alexithymia (a conceptual cousin of ED), where greater awareness, understanding, and expression of one's emotional experience is associated with less use of maladaptive behaviors to cope with negative emotions (Taylor et al., 1997).

In the context of behavioral dysregulation, ED is thought to be protective because it enables the perception of more nuanced contextual information regarding one's negative emotional experience and, in so doing, fosters more adaptive behavior toward ameliorating NA (e.g., "I feel lonely, so I should reach out to a friend"). Indeed, several lines of research have found ED, particularly negative ED (NED), to be diminished in disorders involving affect and behavioral dysregulation, such as depression (Demiralp et al., 2012), social anxiety disorder (SAD; Seah et al., 2020), autism spectrum disorder (Erbas et al., 2013), and BPD (Suvak et al., 2011; Zaki et al., 2013). Most important, however, is that extant research has found negative associations between NED and various maladaptive behaviors. For example, among clinical populations (including BPD, anorexia nervosa, substance dependence, SAD, and those with chronic medical conditions), NED appears protective against maladaptive behaviors that are treatment interfering and worsen prognosis. These include behaviors that serve as a means of distraction from distress, such as nonsuicidal self-injury (Zaki et al., 2013) and spending more money than intended (Tomko et al., 2015), relapse following substance use treatment (Anand et al., 2017), and excessive exercise (Selby et al., 2014), as well as behaviors that serve to avoid or diminish fear, such as social avoidance (Seah et al., 2020) and avoidance of essential health screenings (Coifman et al., 2014). Similarly, among nonclinical populations (i.e., college students and community participants), NED appears protective against behaviors that increase the risk of disease, such as binge drinking (Kashdan, et al., 2010); risky sex, aggression, and drunk driving (Emery et al., 2014); reckless driving and binge-eating (Dixon-Gordon et al., 2014); and avoidance of social activities (Seah et al., 2020), as well as behaviors that negatively affect health (e.g., cigarette smoking [Sheets et al., 2015], excessive caloric consumption [Jones & Herr, 2018]), and aggression (Edwards & Wupperman, 2017; Pond et al., 2012). Taken together, these findings suggest that NED is generally protective against a wide range of maladaptive behaviors across clinical and nonclinical populations.

At present, most research examining associations between ED and maladaptive behaviors has employed experience-sampling approaches (Kashdan et al., 2015). This method allows the

investigation of the relationship between affect and behavior in daily life. Besides experience sampling, other studies have used different behavioral tasks that involve having participants provide affect ratings following exposure to standardized sets of emotional stimuli (e.g., pictures or scenarios [Jones & Herr, 2018]) or paradigms to elicit positive/negative affect (e.g., recalling past events [Edwards & Wupperman, 2017]). Regardless of the assessment approach, an index of ED is obtained by calculating the respective correlations across negative or positive affect ratings. As such, ED is commonly conceptualized as a person-level, trait-like construct that is stable across time and situation. Despite these similarities, there remains considerable between-study variability among experience-sampling protocols used to examine ED that has been largely ignored in the literature. Critically, studies differ substantially on such key variables as the experience-sampling duration and frequency, emotion words used, behaviors assessed, and statistical analyses used to derive the ED index. Further, recent research has begun to conceptualize ED as more malleable and less trait-like by examining changes in ED across time (Tomko et al., 2015). Therefore, given the substantial variability in methodology, a systematic review documenting the procedures used to assess ED is warranted to advance future research.

Indeed, a recent meta-analysis by O'Toole et al. (2020) attempted to examine the association between emotional complexity and behavioral adaptation more generally. Although the authors included ED in their analyses, the findings were more broadly focused on a range of cognitive-emotional processes (e.g., emotion covariation, emotional variability) at the trait and state levels in relation to behavioral *adaptation* (broadly operationalized as physiological, cognitive, and overt behavioral responses) and reported relatively small effect sizes. However, ED as a construct is now quite well defined, and although it shares overlap with other cognitive-emotional processing, ED has a unique potential for manipulation in treatment and could serve as a treatment target (e.g., Van der Gucht et al., 2019). Moreover, a focus exclusively on overt maladaptive behavioral *choices* (e.g., substance use, binge-eating, and avoidance), as assessed in real time and/or through retrospective self-report (e.g., questionnaires, clinical interviews), given their theoretical and clinical importance in psychopathology (e.g., addiction, eating disorders, and anxiety), is needed and highly consistent with empirical research demonstrating maladaptive behaviors as a clear transdiagnostic dimension of psychopathology (e.g., Johnson et al., 2013). Finally, while O'Toole and colleagues included clinical and nonclinical samples, they did not examine diagnostic status as a moderator. Hence, it is yet unclear if there are meaningful differences between healthy and patient groups in the potential salutary benefits of ED. This is key information that could guide specific targeted interventions, given the high rate and cost of problematic behaviors across clinical samples (Chamorro et al., 2012).

The primary aim of the present investigation was twofold. First, although extant research suggests that NED may be protective against behavioral dysregulation across clinical and nonclinical samples, no meta-analytic study has been conducted specifically to support this assertion. Moreover, no research to date has directly examined whether diagnostic status affects this association. This is important because impulsive behaviors are common and problematic in the treatment of psychological disorders. Further, past research indicates that NED tends to be diminished in clinical samples (Smidt & Suvak, 2015) and that maladaptive behaviors tend to be more common in clinical populations (Chamorro et al., 2012). Therefore, we sought to examine the relationship between NED and maladaptive behaviors by means of a systematic review and meta-analysis. Given that past research has demonstrated statistical and theoretical overlap between NED and mean NA (e.g., Dejonckheere et al., 2019) and that mean NA is often a strong predictor of maladaptive behaviors (e.g., Selby et al., 2008), we also controlled for mean NA in our meta-analysis to parse out variance specifically between NED and behaviors *and* also considered mean NA as a moderator. Because past research suggests that NED is associated with less maladaptive behaviors at high levels of NA (Barrett et al., 2001; Kashdan et al., 2010; Pond et al., 2012), NED may thus be most protective only at high levels of NA when maladaptive behaviors are most likely. Moreover, clinical samples generally report higher NA than healthy adults (Seah et al., 2020; Zaki et al., 2013). Therefore, exploring mean NA as a moderator provides a continuous test of the influence of NED across the range of psychological health. The results from this investigation would enable us to (a) determine the strength of the association between NED and maladaptive behaviors; (b) examine whether diagnostic status (i.e., clinical vs. nonclinical) moderates this link; and (c) assess if NED relates to maladaptive behaviors above and beyond mean NA, as well as whether this association is dependent on levels of mean NA. Considering that past research indicates NED is generally protective against behavioral dysregulation in clinical and nonclinical samples, we predicted that NED would be negatively associated with maladaptive behaviors regardless of diagnostic status. Finally, given the varied methodologies used to study ED, a secondary aim was to also provide a narrative review of the methods utilized to measure ED.

## Method

### Literature Search

Following PRISMA guidelines (Moher et al., 2009), a literature search (Search 1) was conducted by the primary author and a trained research assistant using the PsycINFO and PubMed electronic databases to obtain studies on NED and maladaptive behaviors from the earliest publication dates available through December 2018. During the peer-review process, a second literature search (Search 2) was conducted by the first author using the same databases to obtain studies published from January 2019 through June 2020. To address potential issues pertaining to publication bias, data from unpublished studies were obtained by reaching out to authors who have published research on ED and through requests posted in the listservs of relevant psychology research groups (i.e., *Society for Affective Science, Society for Personality and Social Psychology, Association for Cognitive and Behavioral Therapies, and Society for Research in Psychopathology*). The search terms used were "emotion differentiation," "emotion granularity," and "emotion complexity," in combination with the terms "behaviors" and "symptoms." We searched using these terms in order to capture as comprehensive a literature as possible. The titles, abstracts, and texts of the retrieved articles were scanned to determine eligibility. References in the included articles were examined for additional relevant studies.

## Inclusion and Exclusion Criteria

Studies investigating the relationship between NED and maladaptive behaviors were included if they met the following criteria: (a) written in the English language, (b) published in a peer-reviewed journal, and (c) reported a correlation between NED and maladaptive behavior(s). Here, we defined maladaptive behaviors as behaviors that may manifest as ways to avoid or downregulate negative emotion or decrease distress, with the potential for negative health consequences. This definition is highly consistent with models of behavioral dysregulation in the clinical literature that have examined maladaptive behaviors as a class (e.g., Johnson et al., 2013; Selby et al., 2008; Swerdlow et al., 2020). If a study did not provide information regarding the correlation coefficient, the corresponding authors were contacted and asked to provide the necessary information. Studies that only examined the association between NED and psychological symptoms (e.g., depressed mood, anxiety, pain, etc.) and/or emotion regulation strategies (e.g., suppression, cognitive reappraisal) but not maladaptive behaviors were excluded because we were specifically interested in examining the association between NED and emotion-linked behaviors.

## Coding and Averaging Procedures

Studies were primarily coded for diagnostic status (clinical or nonclinical) for the purpose of conducting the moderation analysis. This was coded based on participant information reported in individual studies. Samples were coded as clinical (1) if participants met the criteria for a psychological disorder determined by diagnostic interviews ($n = 6$) or were diagnosed with a major medical condition ($n = 1$). The specific clinical diagnosis (e.g., depression, BPD, SAD) was not coded due to a limited number of clinical samples. All other sample types (i.e., college students and/or community participants) were coded as nonclinical (0). To examine methodological variability in ED assessment across studies, we noted the following (see Table S1 in the online supplemental materials): (a) type of construct examined (ED, emotion granularity, or emotion complexity), (b) type of ED assessment (e.g., experience sampling, performance-based task), (c) type of statistic used to index ED (e.g., interitem correlation, intraclass correlation coefficient), (d) affect terms utilized to derive ED, and (e) type of behavior(s) assessed. Additionally, other sample characteristics, such as age, gender, and race/ethnicity, were noted.

To examine NA as a moderator, study-level mean values were extracted from studies included in the meta-analysis (see Table S1 in the online supplemental materials). If information on mean NA was unavailable, we reached out to the corresponding authors. Because mean NA was assessed using different metrics across studies (e.g., 5-point vs. 7-point Likert scale), we applied min-max normalization to normalize these values into a continuous 0–1 interval, thereby making them comparable (Lin et al., 2020; McCarthy & Wood, 1985). The equation for the normalization procedure is as follows:

$$X_{\text{norm}} = \frac{(X_m - X_{\min})}{(X_{\max} - X_{\min})},$$

where $X_m$ denotes the initial mean NA score for a particular study; $X_{\text{norm}}$ denotes the normalized mean NA score; and $X_{\min}$ (e.g., 1) and $X_{\max}$ (e.g., 5) denote the minimum and maximum possible scores on the scale (e.g., 5-point Likert scale) used in the study, respectively.

## Calculation of Effect Sizes

Effect sizes were expressed as correlation coefficients (*r*s) due to their ease of interpretation (Rosenthal & DiMatteo, 2001). Effect sizes were calculated following the procedures recommended by Borenstein et al. (2009). First, all correlation coefficients (*r*s) were extracted and transformed to Fisher's *z* such that negative associations indicated that a higher level of NED is associated with a lower likelihood of engaging in maladaptive behaviors. If a study included multiple clinical and/or nonclinical samples, we obtained separate correlation coefficients for each sample and considered them as separate studies. If a study examined associations between NED and multiple behavioral outcomes, these effect sizes were aggregated into a composite effect size to reduce dependencies in the data. The meta-analysis was performed using these indices. These values were then transformed back to correlation coefficients upon completion of all analyses. Following Cohen (1992), effect sizes were considered large if $r > .5$, medium if $r > .3$, and small if $r > .1$.

To control for mean NA in the relationship between ED and maladaptive behaviors, we derived study-level partial correlations. This involved gathering information on the correlations between NED and maladaptive behavior ($r_{12}$), NED and mean NA ($r_{13}$), and maladaptive behavior and mean NA ($r_{23}$). Note that we were able to obtain these values from 11 of the 17 included studies: 5 studies included these values in their manuscripts, whereas the authors of 6 studies provided the requested data; the remaining 6 studies did not provide the necessary data to calculate partial correlations. We then entered these values into the following formula (Pedhazur, 1997, p. 162) to obtain the corresponding partial correlation ($r_{12.3}$) for each study:

$$r_{12.3} = \frac{r_{12} - r_{13}r_{23}}{\sqrt{(1 - r_{13}^2)(1 - r_{23}^2)}}$$

## Data Analytic Strategy

Meta-analyses were conducted using Comprehensive Meta-Analysis (Version 2.0) to calculate the mean effect size of the relationship between NED and maladaptive behaviors. This involved examining zero-order and partial correlations (controlling for mean NA), respectively. To examine diagnostic status as a moderator, subgroup analysis was planned for clinical versus nonclinical samples using meta-analysis of variance (Borenstein et al., 2009). We also examined study-level mean NA as a continuous moderator across all studies and within each sample type using metaregression (method of moments). Analyses of mean effect sizes were based on a random-effects model because it assumes variability in effect sizes between studies (Hedges & Olkin, 1985). Accordingly, moderation analyses were based on mixed-effect models. The heterogeneity of effect sizes between studies was also assessed using $Q$ and $I^2$ statistics. Significant heterogeneity is indicated by a $Q$ test with $p \leq .05$ (Cochran, 1954), whereas the $I^2$ is

employed to quantify the degree of such heterogeneity (Higgins & Thompson, 2002). $I^2$ values of 0%, 25%, 50%, and 75% indicate no, low, moderate, and high heterogeneity, respectively.

To address issues pertaining to publication bias, the Duval and Tweedie (2000) trim-and-fill procedure was used. This statistical method derives a funnel plot that depicts the association between sample size and effect size. If there is no evidence of publication bias, the plot will be shaped like an inverted funnel, where effect sizes are distributed symmetrically around the main effect, and no adjustment of the effect size estimates is necessary. If publication bias is evident, and the expected effect size is negative, fewer studies than expected are found in the bottom-right section of the funnel plot, thereby making the funnel plot asymmetrical (Borenstein et al., 2009). The trim-and-fill procedure then balances the plot by estimating the number of outliers in the funnel and trimming them off accordingly. The observed and computed effect sizes are then used to obtain an adjusted effect size (an estimate of the true mean) that controls for publication bias. Additionally, the fail-safe *N* (Rosenthal, 1979) was used to examine the data for publication bias. The fail-safe *N* refers to the total number of missing studies needed to nullify the observed overall effect size. Therefore, a greater fail-safe *N* value indicates a more robust effect and that publication bias is unlikely.

# Results

## Literature Search

A description of the information flow regarding study selection is included in Figure S1 in the online supplemental materials. The electronic searches yielded a total of 1,920 articles. Six additional studies were obtained from the reference lists of articles included in the meta-analysis ($n = 1$) and from responses through the listservs ($n = 5$). After removing duplicates, 1,867 articles were identified and screened by title and abstract. Many of the articles were excluded ($n = 1{,}803$), which was likely due to the broad literature search and the use of search terms that gave rise to irrelevant hits (e.g., "symptoms"). The remaining 64 articles underwent full-text evaluation, of which 49 were excluded. The main reasons for exclusion were that the studies did not examine ED ($n = 29$) and/or maladaptive behaviors ($n = 20$). As a result, 15 articles were eligible for inclusion. Six articles did not provide the necessary effect sizes for the meta-analysis, in which case we contacted the corresponding authors and were able to obtain the requested information from five out of six authors. One author was unable to provide the data for two studies (Kashdan et al., 2010; Study 2 in Pond et al., 2012), and therefore these studies were excluded. Of the remaining 14 articles, one article included two clinical samples (Tomko et al., 2015), one article (Pond et al., 2012) included two separate studies (Study 1 and 3) involving college samples, and one article (Seah et al., 2020) included two separate studies involving clinical (Study 1) and college (Study 2) samples. As such, we analyzed each study sample's effect size separately. Studies by the same authors were examined for overlapping samples by reviewing the articles to determine if the same sample was used. After applying the previously described criteria, 14 articles were included in the meta-analysis, comprising a total of 17 samples (3 articles included two separate samples, each with available data).

## Study Characteristics

Information regarding relevant study characteristics for all 17 samples included in the meta-analysis is described in Table S1 in the online supplemental materials. These 17 samples ranged in year of publication from 2012 to 2020, with a total sample size of 2,182 (range: 29–482) participants. The mean age of these participants ranged from 17.86 to 43.01 years. The total sample was mostly female (79.4%) and White/Caucasian (67.4%). There were seven clinical samples diagnosed with various psychological disorders, such as BPD (Tomko et al., 2015; Zaki et al., 2013), depression (Seah et al., 2020; Tomko et al., 2015), anorexia nervosa (Selby et al., 2014), SAD (Seah et al., 2020), and substance abuse (Anand et al., 2017), as well as chronic medical conditions, such as thalassemia (Coifman et al., 2014). The remaining 10 studies included nonclinical samples of college students ($n = 8$) and community participants ($n = 2$).

### *Assessment of Emotion Differentiation*

All 17 studies examined ED using a variety of methods that involved having participants report on their emotional experience multiple times across several situations or scenarios. Most studies ($n = 15$) assessed ED using experience-sampling approaches, albeit with varying protocols, particularly in the frequency and duration of data collection (see Table S1 in the online supplemental materials). These ranged from obtaining six assessments conducted over a period of 4–6 months to 28 assessments over the course of 24 hr. Consequently, studies also varied considerably in the total number of possible signals obtained from participants (range: 6–224 signals). Two studies used performance-based tasks to index ED: Jones and Herr (2018) used a scenario-rating task, where participants read 10 positive and 10 negative hypothetical scenarios and then provided affect ratings across six positive and six negative emotion words; Edwards and Wupperman (2017) utilized a writing exercise in which participants recalled three negative and three positive or neutral experiences, wrote these experiences down, and then provided affect ratings about how they felt during the time of each incident.

Despite the differences in methodology used to examine ED, all studies similarly assessed ED by deriving a statistical index based on participants' ratings of positive or negative affect items. These items, however, were obtained from various sources, such as affective circumplex models (Barrett, 1998; Larsen & Diener, 1992; Rafaeli et al., 2007; Russell, 1980), the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988; PANAS-X; Watson & Clark, 1994), and the Profile of Mood States (POMS; Lorr & McNair, 1971). In addition, one study (Sheets et al., 2015) included items from the Minnesota Nicotine Withdrawal Scale (Etter & Hughes, 2006) to specifically assess affect pertaining to acute tobacco abstinence.

All studies included in the meta-analysis used similar statistical procedures described in Smidt and Suvak (2015) to derive indices of ED (see Table S1 in the online supplemental materials). These procedures typically involved calculating the average correlation among affect ratings, separately for positive and negative items, across occasions. As a result, these procedures

provide a person-/trait-level measure of ED. Two common statistical approaches were employed: Two studies used the average interitem correlation coefficient (AIC; Barrett et al., 2001), whereas 14 studies used the average intraclass correlation coefficient (ICC; Kashdan et al., 2010; Tugade et al., 2004).[1] The AIC approach involves calculating the average zero-order correlation between each set of affect ratings across all occasions. The ICC approach involves obtaining the average intraclass correlation with absolute agreement of a set of affect ratings across all occasions. Therefore, this statistic reflects the level of concordance among self-reported emotional states for each signal across time. In both cases, individuals who tend to report the same level of negative emotions (e.g., sadness and fear) will produce a correlation that is close to +1.0, suggesting a lack of distinction between emotions (i.e., low ED). Moreover, for ease of interpretation, researchers often reverse the score so that a higher correlation coefficient indicates better ED. Beyond examining ED as a person-level variable, Tomko et al. (2015) examined ED in three ways: at the person, day, and occasion level. At the occasion level, an ICC for each measurement occasion was calculated across different affect subscales (fear, hostility, and sadness) using generalizability theory (ICC-G), which is different from the ICC described previously. Day- and person-level indices were then obtained by deriving the average ICC-G for each day and across all occasions, respectively. Consequently, this method enabled the investigation of ED as a dynamic process characterized by both within- and between-person differences across time. However, given that ED is still predominately measured at the person level, we opted to include the person-level index in our analyses to be consistent with prior research.

### *Assessment of Maladaptive Behaviors*

Widely ranging behaviors were examined across the 17 samples (see Table S1 in the online supplemental materials). These included (a) eating-related behaviors, such as weight-loss activities (Selby et al., 2014), caloric consumption (Jones & Herr, 2018), emotional eating (Mikhail et al., 2020), and binge-eating and food restriction (Williams & Crowther, 2018); (b) externalizing behaviors, such as impulsive aggression (Edwards & Wupperman, 2017) and aggressive tendencies (Pond et al., 2012); (c) substance use, such as cigarette smoking (Sheets et al., 2015; Williams & Crowther, 2018), alcohol consumption (Emery et al., 2014; Williams & Crowther, 2018), and relapse following substance use treatment (Anand et al., 2017); (d) nonsuicidal self-injury (Zaki et al., 2013); (e) avoidance behaviors, such as treatment nonadherence (Coifman et al., 2014) and avoidance of social activities (Seah et al., 2020); and research that examined (f) impulsive behaviors as a class (e.g., binge-eating, reckless driving, self-injury, etc. [Dixon-Gordon et al., 2014; Tomko et al., 2015]). Most studies assessed the frequency of these behaviors using experience sampling ($n$ = 12). Other methods of assessment included (a) self-report questionnaires to examine aggressive tendencies (Edwards & Wupperman, 2017), cigarette smoking motives (Sheets et al., 2015), and alcohol-related problems (Emery et al., 2014); (b) observing actual caloric consumption (Jones & Herr, 2018); and (c) clinical interview to estimate substance use relapse (Anand et al., 2017).

## Association Between NED and Maladaptive Behaviors

We first tested whether higher levels of NED were associated with a lower likelihood of engaging in maladaptive behaviors across all sample types. The results of the meta-analysis indicated a relatively small and significant effect size, $n$ = 17; $r$ = –.15, 95% confidence interval (CI) [–.21, –.09], $p < .001$ (see Figure 1 for forest plot). Therefore, consistent with our hypothesis, greater NED was generally associated with a lower tendency to engage in maladaptive behaviors. The results of the meta-analysis also indicated moderate between-study heterogeneity ($Q$ = 28.48, $p$ = .03, $I^2$ = 43.8%), suggesting that a moderate amount of variance between studies was due to true variation in effect sizes across studies rather than sampling error.

To examine the association between NED and maladaptive behaviors after controlling for mean NA at the study level, we ran another meta-analysis using partial correlations obtained from 11 of the 17 included studies (nonclinical sample: $n$ = 4; clinical sample: $n$ = 7). As in the previous results, NED was negatively associated with maladaptive behaviors even after accounting for the effects of mean NA ($r$ = –.09, 95% CI [–.16, –.01], $p$ = .023; see Figure S2 in the online supplemental materials for forest plot).

## Moderation Analyses

### *Diagnostic Status*

Next, we proceeded to examine diagnostic status (clinical vs. nonclinical) as a moderator of the association between NED and maladaptive behaviors. The results of the moderation analysis indicated that NED was negatively associated with maladaptive behaviors regardless of diagnostic status ($Q$ = .01, $p$ = .91), although the relationship appeared to be stronger in the nonclinical group ($n$ = 10; $r$ = –.16, 95% CI [–.23, –.09], $p < .001$) compared with the clinical group ($n$ = 7; $r$ = –.15, 95% CI [–.27, –.03], $p$ = .017; see Figure 2 for forest plot). Therefore, consistent with our hypothesis, NED was negatively associated with maladaptive behaviors regardless of diagnostic status.

### *Mean NA*

Finally, we explored if the link between NED and maladaptive behaviors depended on levels of mean NA using metaregression, testing mean NA as a moderator. Overall, mean NA did not emerge as a significant moderator ($n$ = 17; slope point estimate: .33, $Q$ = 1.28, $p$ = .258). Similarly, within each sample type, no significant moderation effect was observed for the clinical ($n$ = 7; slope point estimate: .99, $Q$ = 2.05, $p$ = .153) and nonclinical ($n$ = 10; slope point estimate: .20, $Q$ = .36, $p$ = .548) samples.

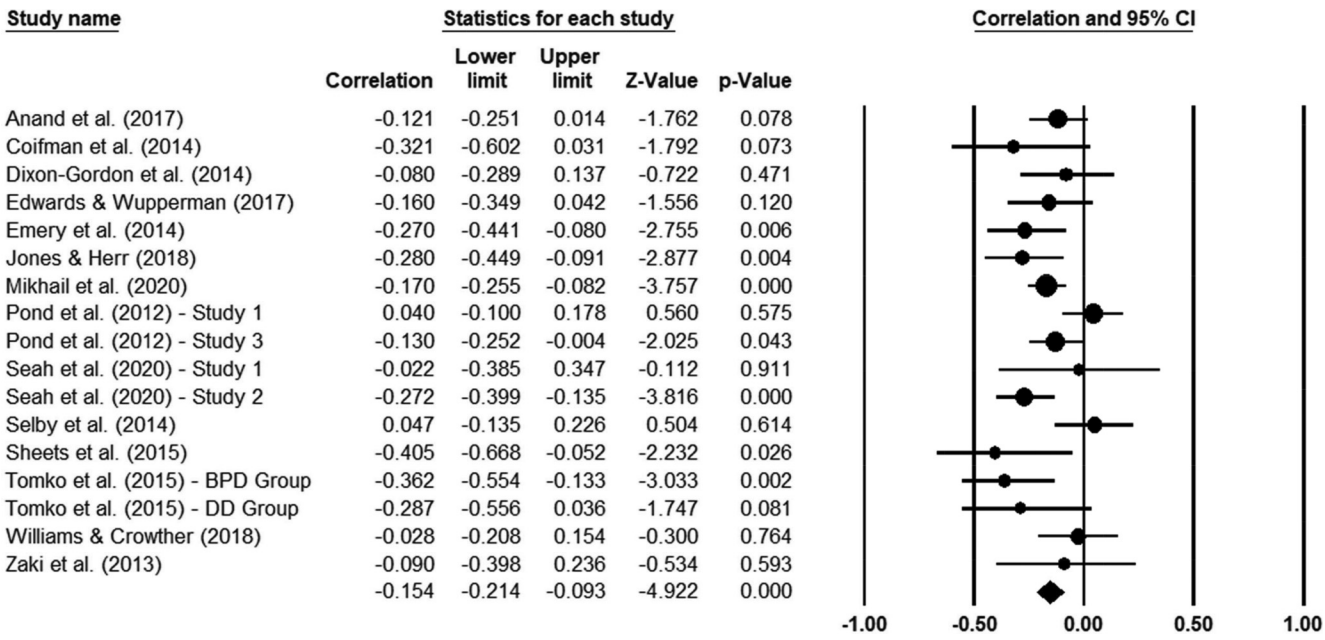
## Publication Bias

The data were examined for possible publication bias in several ways. First, we visually inspected the funnel plot (see Figure S3 in online supplemental materials) and found that it displayed

[1] One study (Mikhail et al., 2020) derived both AIC and ICC values, and they were highly correlated, $r$ = .83, $p < .001$. To be consistent with current conventions in ED research, we opted to include the ICC rather than AIC measure from Mikhail et al. (2020) in our meta-analysis. Further, the results remained unchanged when we used the AIC.

**Figure 1**

*Forest Plot of the Effect Sizes for Studies Included in the Overall Meta-Analysis of the Association Between Negative Emotion Differentiation and Maladaptive Behaviors*




reasonable symmetry, with studies relatively evenly distributed about the mean, suggesting that publication bias was unlikely. However, the trim-and-fill approach indicated that publication bias was likely. After imputing the missing studies ($n$ = 2), the effect size remained significant ($r$ = –.14, 95% CI [–.18, –.10]. Finally, we calculated Rosenthal's fail-safe $N$ and found that the total number of missing studies needed to nullify the observed overall effect size was 187. However, given that we were able to identify only 17 samples that examined the relationship between NED and maladaptive behaviors, it is doubtful that 187 studies were missed. Therefore, this suggests that publication bias is unlikely and that the overall observed negative association between NED and maladaptive behaviors is relatively robust.

## Discussion

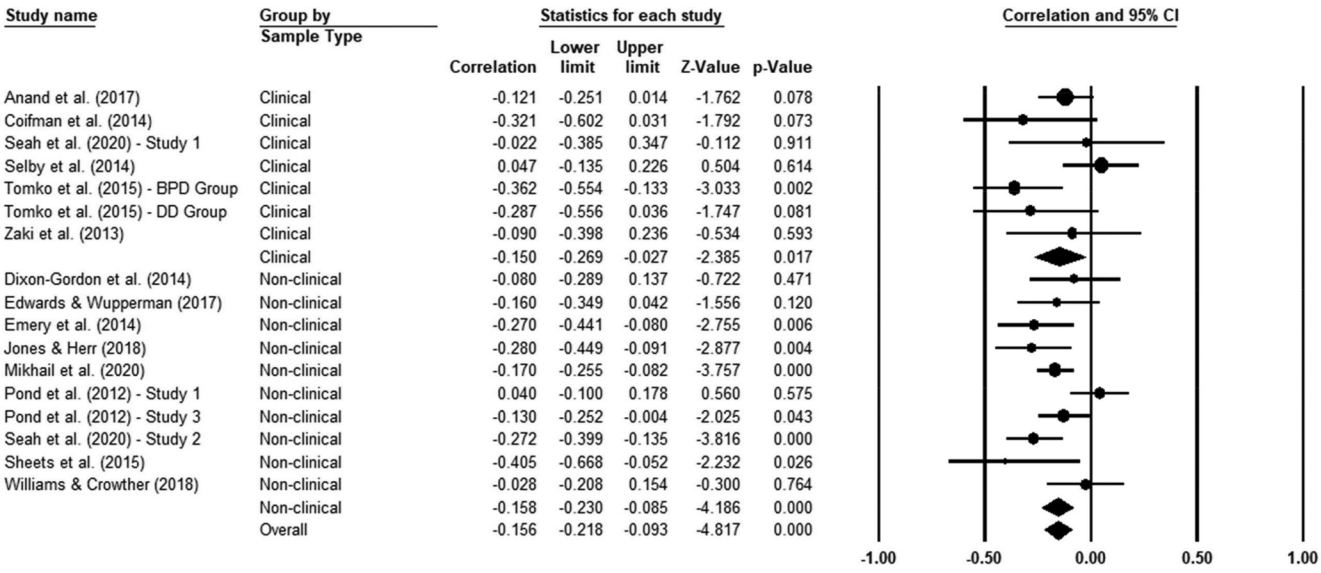
Past research suggests that NED may offer protection against the enactment of maladaptive behaviors (e.g., self-injury, aggression, avoidance, etc.) in response to negative emotional states, although no meta-analytic studies have been conducted to support this assertion. Therefore, the primary aim of the present investigation was to conduct a systematic and meta-analytic review examining the relationship between NED and maladaptive behaviors and whether diagnostic status (healthy vs. patient samples) affects this link. In line with our hypotheses, the results of the meta-analysis indicated an overall significant negative association between NED and maladaptive behaviors regardless of diagnostic status. Critically, this association held even after controlling for mean NA (NA as covariate) and also did not vary as a function of mean NA (NA as moderator). Taken together, these findings suggest that NED may be generally protective against behavioral dysregulation.

The findings from the current investigation build on a growing body of work exploring the relationship between ED and maladaptive behaviors. Our findings suggest that NED may be protective against a myriad of low-risk (e.g., social avoidance) to high-risk (e.g., nonsuicidal self-injury) behaviors. Indeed, the results reported here seem to parallel those described by O'Toole et al. (2020), where NED is associated with behavioral adaptation (including cognitive and physiological outcomes) in nonclinical samples ($r$ = .15, $p < .001$). However, this association was not observed in clinical samples ($r$ = .08, $p$ = .055), which contradicts our findings. Several reasons may account for this main difference. First, we adopted a narrower yet clinically meaningful definition of maladaptive behaviors as our chosen covariate of NED. Therefore, the types of studies that met the inclusion criteria were different from O'Toole et al.'s despite some overlap. Next, different coding criteria were used to determine samples as clinical versus nonclinical. In the present meta-analysis, samples were coded as clinical if participants met the diagnostic criteria for a psychological disorder or medical condition. In contrast, O'Toole et al. (2020) included analogue samples (e.g., college students with high depressive symptoms) as part of the clinical group. Given that clinical samples tend to report more severe symptoms than analogue samples (e.g., Cox et al., 1999), this may have contributed to the relatively stronger effects observed in our meta-analysis. Nevertheless, considering the small sample size of the clinical studies included in both meta-analyses, future replication is needed when more studies are available.

Our findings also extend existing theoretical models of behavioral dysregulation (e.g., Baumeister & Scher, 1988; Selby et al., 2008) suggesting that the ability to differentiate between emotions

**Figure 2**

*Forest Plot of the Effect Sizes for Studies Included in the Subgroup (Clinical Versus Nonclinical) Meta-Analysis of the Association Between Negative Emotion Differentiation and Maladaptive Behaviors*




during a negative emotional experience may prevent the use of self-destructive behaviors to escape aversive emotional states. This has important clinical implications, particularly in the context of psychotherapy, because patients tend to view negative emotional experiences as undesirable and attempt to avoid feeling them (Hayes et al., 1996). Our findings suggest that perhaps more emphasis on emotion language training in therapy could be beneficial. This is crucial because meta-analyses examining the effects of psychotherapy have mostly reported small to moderate effect sizes (e.g., Cuijpers et al., 2014; Westen & Morrison, 2001). However, it is important to note that the overall effect size reported here is relatively small and accounted for approximately 2.3% of the variance. A potential reason for this small effect size could be that we only examined naturalistic observations of NED. As such, although the overall effect size is small, the finding remains clinically meaningful because it suggests that perhaps explicit training in ED may increase this effect. Indeed, nascent research on brief interventions targeting ED through emotion word learning (Matt et al., 2020), affect labeling (Kircanski et al., 2012), and mindfulness training (Van der Gucht et al., 2019) in nonclinical samples have shown relative promise. Nevertheless, future research should consider examining the impact of long-term interventions targeting ED and whether these effects may hold in clinical samples.

Critically, the negative association between NED and maladaptive behaviors held even after controlling for mean NA, despite the theoretical and statistical overlap between these constructs. Moreover, mean NA did not emerge as a significant moderator in our analyses. This might seem surprising because one would expect greater difficulty differentiating emotions when NA is experienced more intensely, and high NA typically drives maladaptive behaviors. Yet our findings suggest that ED may offer protection against behavioral dysregulation across levels of NA. Indeed, previous research has found ED to be protective even after controlling for levels of NA and other idiographic risk factors in both clinical and nonclinical samples (e.g., history of alcohol use [Kashdan et al., 2010], psychiatric history [Zaki et al., 2013]). These findings highlight the beneficial role that ED might play in reducing dependence on maladaptive behaviors to downregulate NA. This has important clinical implications, particularly because patients often appear to exhibit lower variability in NA, with a tendency for highly polarized and less informed conceptualization of emotional experience (Barlow et al., 2004; Beck, 2011). In addition, past studies have generally found NED to be diminished in clinical versus nonclinical samples (Kashdan et al., 2015). Taken together, these findings underscore the importance of investigating ED-related processes (e.g., emotion labeling) in treatment.

The results from our narrative review also advance the field of ED by scrutinizing the diverse methods used among studies included in the current meta-analysis. Overall, we found substantial heterogeneity in ED assessment procedures across studies; most relied on experience sampling to examine emotional experiences in daily life, whereas a few utilized standardized emotional provocations in the laboratory. Notably, there were significant methodological differences between studies that utilized experience sampling, highlighting the lack of a gold-standard assessment in ED research.

A common methodological issue was the difference in experience-sampling frequency and duration between studies, which may limit the number of data points and ability to capture variability in emotional experience (e.g., occurrence of stressful events in daily life). Past research suggests that these issues can influence the reliability of the ICC measure of ED (e.g., Erbas et al., 2018). First, as described by Shrout and Fleiss (1979), the ICC is essentially an index of reliability. Therefore, it is influenced by the number of observations included in its calculation, where more data points likely lead to a more reliable ICC. Second, the ICC

measuring absolute agreement (which was the case for most studies included in the current meta-analysis) considers both the correlations and intensity of experienced emotions (Erbas et al., 2014). As such, capturing a variety of emotional experiences of varying intensity may allow for a more reliable estimate of the ICC. Therefore, future research should aim for as high of a frequency/duration of experience sampling as practically possible (depending on the research question) to capture a greater diversity of experiences, thereby allowing for a more reliable estimate of ED. Further, given its theoretical and statistical importance, it would be advantageous to consider statistically controlling for emotion intensity. Relatedly, all but two studies derived a statistical index of ED by calculating the ICC between affect ratings across time instead of AIC, although both indices appear highly correlated (e.g., Mikhail et al., 2020). Further, one study (Tomko et al., 2015) examined momentary, day, and person levels of ED by calculating the ICC-G, which permitted the examination of within-person changes in ED across time. Given these differences in statistical approaches, more rigorous inquiry is needed to establish their reliability and validity. In so doing, a more accurate index of ED may be obtained, with important implications for predicting clinically relevant outcomes.

Finally, studies frequently differed in the number and type of affect terms used to assess ED, with most studies utilizing affect items from affective circumplex models or the PANAS. This issue parallels the findings discussed at length by Brose et al. (2020) regarding inconsistencies in the selection of affect terms used to measure within-person variations in affective experience, with consequences for the reliability of indices (e.g., ED) derived from them. Indeed, work by Erbas et al. (2019) highlights the importance of how affect terms may influence the magnitude and reliability of ICCs because individuals appear to be more able to differentiate between categories (e.g., sad vs. fear) of negative emotion as opposed to within a category (e.g., fear, nervousness, anxiety). As such, we have concerns about using only measures like the PANAS to examine ED, given that it includes subscales containing overlapping affect terms (e.g., "scared," "afraid," "frightened") assessing specific discrete emotions (e.g., fear). Indeed, Brose and colleagues argue that affect terms should be selected intentionally, with careful consideration of theoretical, methodological, and statistical rationales. Nevertheless, it is important to note that all studies relied solely on affect ratings obtained from close-ended prompts, which has been argued to be problematic because it may not truly assess ED in vivo (Kashdan et al., 2015). Indeed, several preliminary studies suggest that the frequency of emotion assessments (Widdershoven et al., 2019) and the emotion-reporting format, such as open- versus close-ended (Ottenstein & Lischetzke, 2020), may affect ED. As such, these differences could account for some of the observed inconsistencies in the association between NED and maladaptive behaviors between studies.

The interpretation of the current study's findings should be understood in light of the following limitations. First, only a small number of studies were included in the meta-analysis, which limits the amount of statistical power available to detect a difference in average effect size between the clinical and nonclinical groups. Moreover, given that findings from the ED literature have generally reported small effect sizes, it is likely that a larger number of studies is needed to detect a difference in small effects in clinical versus nonclinical populations. The small sample size also precluded examining other moderators. Therefore, besides examining diagnostic status and mean NA, future research should consider other factors that may affect the link between ED and behaviors when more studies are available. Next, we only sampled a subset of studies from the broad ED literature, where there is, in fact, much more heterogeneity in methodology. For instance, other studies have utilized self-report ED measures (Kang & Shaver, 2004) and laboratory paradigms to assess ED (Erbas et al., 2014). Therefore, recommendations from the present review should be taken with caution. Third, the small number of clinical samples reflecting different diagnostic outcomes prevented the examination of transdiagnostic effects. Given the increasing emphasis on targeting transdiagnostic processes in treatment (e.g., Barlow et al., 2004), this remains an important avenue for future research. Fourth, most studies included in the meta-analysis examined maladaptive behaviors via self-report, which may be influenced by social desirability bias. Further, the types of behaviors assessed were relatively limited. Still, given that engaging in maladaptive behaviors is argued to serve a similar function of downregulating NA, NED's protective effects likely permeate across behaviors. Finally, the included studies utilized correlational analyses, which prevent conclusive interpretations about the causal effects of NED on maladaptive behaviors. However, research involving experimental manipulation of ED via direct instruction (Cameron et al., 2013) and emotional labeling (Kircanski et al., 2012) provide preliminary evidence for the downstream effects of ED on behaviors. Nevertheless, more research is needed to establish causality.

The present study is the first meta-analysis directly examining the relationship between NED and maladaptive behaviors. Overall, our findings contribute to growing research demonstrating the negative association between NED and behavioral dysregulation. Importantly, this association did not vary as a function of diagnostic status and mean NA. These findings have important clinical implications for improving the understanding and treatment of disorders involving behavioral dysregulation. Additionally, our findings extend various clinical and theoretical models of behavioral dysregulation in which the capacity to differentiate emotional states is associated with more beneficial outcomes. The present review also revealed significant inconsistencies in ED measurement, which highlight the need for the field to develop standardized approaches to improve the reliability and validity of ED assessment. In so doing, this may enable more rigorous inquiry to uncover the basic mechanisms underlying ED's beneficial effects and optimize therapeutic treatments for various clinical disorders.

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