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Dimensions of Emotion Dysregulation in Anorexia Nervosa and Bulimia Nervosa: A Conceptual Review of the Empirical Literature

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Abstract

Several existing conceptual models and psychological interventions address or emphasize the role of emotion dysregulation in eating disorders. The current article uses Gratz and Roemer's (2004) multidimensional model of emotion regulation and dysregulation as a clinically relevant framework to review the extant literature on emotion dysregulation in anorexia nervosa (AN) and bulimia nervosa (BN). Specifically, the dimensions reviewed include: (1) the flexible use of adaptive and situationally appropriate strategies to modulate the duration and/or intensity of emotional responses, (2) the ability to successfully inhibit impulsive behavior and maintain goal-directed behavior in the context of emotional distress, (3) awareness, clarity, and acceptance of emotional states, and (4) the willingness to experience emotional distress in the pursuit of meaningful activities. The current review suggests that both AN and BN are characterized by broad emotion regulation deficits, with difficulties in emotion regulation across the four dimensions found to characterize both AN and BN, although a small number of more specific difficulties may distinguish the two disorders. The review concludes with a discussion of the clinical implications of the findings, as well as a summary of limitations of the existing empirical literature and suggestions for future research.

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Keywords

eating disorders; affect; emotion regulation; affect regulation; affect dysregulation

Anorexia nervosa (AN) is characterized by restriction of energy intake resulting in significantly low weight, fear of weight gain, and significant body image concerns (American Psychiatric Association, 2013). The disorder has two diagnostic subtypes, restricting type (ANr) and binge eating/purging type (ANbp), the latter of which is characterized by recurrent binge eating and/or purging behaviors. Bulimia nervosa (BN) shares the excessive concerns about body shape and weight often found in AN, but not the emaciation and extreme starvation. Rather, BN is characterized by binge eating (consuming large quantities of food with a concurrent perception of loss of control over eating) and consequent compensatory behaviors (e.g., purging, fasting, excessive exercise; APA, 2013). Both disorders are associated with significant psychosocial impairment, severe medical complications, and increased suicide risk (Arcelus, Mitchell, Wales, & Nielsen, 2011; Jenkins, Rienecke Hoste, Meyer, & Blissett, 2011; Mitchell & Crow, 2006).

An expansive literature suggests that disturbances in the experience of emotions are common to eating disorder (ED) psychopathology. For instance, high rates of co-occurring mood and anxiety disorders have been reported in both AN and BN (e.g., Hudson et al., 2007; Kaye et al., 2004; Lilenfeld, 2004). Findings from studies using dimensional measures also suggest that AN and BN are characterized by elevated negative emotionality (e.g., depressive symptoms, overall negative affect, specific negative affective states; Allen, Scannell, & Turner, 1998; Engel et al., 2005; Pollice, Kaye, Greeno, & Weltzin, 1997; Stice, Nemeroff, & Shaw, 1996; Waller et al., 2003). Finally, personality traits (e.g., neuroticism) and/or other psychiatric disorders associated with disturbances in emotional functioning (e.g., borderline personality disorder) are also common among individuals with AN and BN (Cassin & von Ranson, 2005).

In addition to addressing emotional disturbance in the form of heightened negative emotionality, an alternative perspective emphasizes that, beyond just emotional intensity, the response to and regulation of affective experiences are important processes. Given the increasing recognition of the role of emotion regulation processes in psychopathology (see Aldao, Nolen-Hoeksema, & Schweizer, 2010), clinically-informed conceptualizations emphasizing the link between emotion dysregulation and maladaptive behaviors have emerged (e.g., Mennin & Fresco, 2009; Selby, Anestis, & Joiner, 2008). Of particular relevance to this review, a number of theories (e.g., Haynos & Fruzzetti, 2011; Pearson, Wonderlich, & Smith, in press) and treatments (e.g., Wildes & Marcus, 2011; Wonderlich et al., 2014) have been developed that are consistent with an emotion dysregulation conceptualization of ED psychopathology.

Framework for the Current Review

Rationale for Framework

Although various models of emotion regulation have been proposed, Gratz and Roemer's (2004) multidimensional model of emotion regulation and dysregulation was selected as the

framework for this review. This broadly conceptualized, clinically-informed model emphasizes adaptive responding to emotional distress versus efforts to rigidly control or suppress emotional arousal. Deficits in one or more of four dimensions (described in the next section) are conceptualized as reflecting emotion dysregulation, and are thus theorized to function as potential etiological and/or maintaining factors for various forms of psychopathology.

A potential alternative framework would have been based on another model of emotion regulation, such as Gross' (1998a; 1998b) process model, which classifies regulatory processes as antecedent-focused (i.e., those employed early in the emotion generation process) or response-focused (i.e., those that modulate the physical, behavioral, or experiential responses characterizing an emotional experience once it occurs). However, the Gratz and Roemer conceptualization provides several benefits compared to this and other approaches. First, the multidimensional model has been directly applied in numerous studies of EDs (e.g., Brockmeyer et al., 2012; Harrison et al., 2009; Harrison, Sullivan, et al., 2010; Racine & Wildes, 2013). Second, the multidimensional model is more strongly clinically-informed, as it was developed specifically in the context of understanding emotion dysregulation as it relates to maladaptive behaviors and psychopathology. As such, this model is ideally suited to conceptualizing the link between emotional and behavioral dysregulation, both of which are characteristic of AN and BN (Fischer et al., 2008). Further, compared to Gross' approach, other emotion-related factors that have been widely studied in the ED literature and that are of relevance to understanding emotion dysregulation in AN and BN (e.g., alexithymia, distress tolerance, experiential avoidance, negative urgency) are more directly relatable to dimensions within the multidimensional model.

There are additional benefits to utilizing the multidimensional framework for the current review. For instance, the model is diagnostically agnostic, allowing for an examination of these dimensions across various forms of psychopathology and in relation to diagnostic co-occurrence. Additionally, there is empirical support for the model, including evidence that (a) individuals with a variety of psychiatric disorders characterized by emotional disturbances display elevated difficulties in multiple emotion regulation dimensions (e.g., Williams, Grisham, Erskine, & Cassedy, 2011; Steenkamp, Suvak, Dickstein, Shea, & Litz, in press; Svaldi, Griepenstroh, Tuschen-Caffier, & Ehring, 2012); (b) individuals with various forms of psychopathology display improvements in multiple dimensions of emotion dysregulation following treatment (e.g., Gratz, Tull, & Levy, 2013; Safer, Robinson, & Jo, 2010; Wonderlich et al., 2014); and (c) the dimensions have displayed differential associations with various psychopathological symptoms (e.g., Gratz & Tull, 2010; Racine & Wildes, 2013; Williams & Grisham, 2012).

Dimensions of the Gratz and Roemer (2004) Multidimensional Model

Dimension 1: To what extent is one able to flexibly use adaptive and situationally appropriate strategies to modulate emotional duration/intensity?
—The first dimension focuses on the application of strategies to modulate the duration or intensity of an emotional response in a flexible manner that is appropriate to a given situation. This dimension is related to perceptions about one's ability to effectively manage

emotions, as well as the extent to which one actually possesses adequate skills to effectively and adaptively modulate emotional experiences.

Dimension 2: How well is one able to inhibit impulses and remain goal-directed when distressed?—This dimension emphasizes the ability to maintain behavioral control in the context of heightened negative emotional arousal. More specifically, the first component of this dimension refers to the ability to inhibit impulsive behaviors when distressed, whereas the second component refers to the capacity for engaging in goal-directed behaviors when distressed.

Dimension 3: What is one's level of emotional awareness, clarity, and acceptance?—The third dimension integrates perceptions of and reactions to one's emotional experiences. Awareness refers to the importance of caring about and being attentive to one's emotions, while clarity refers to the understanding of emotional experiences and the ability to differentiate between affective states. The third component is acceptance of emotions, referring to the extent to which one accepts or rejects emotional experiences. Rejection of emotional experiences is posited to result in secondary negative affective states regarding the primary emotional response.

Dimension 4: How much is one willing to experience emotional distress to pursue meaningful activities?—This dimension emphasizes the importance of being willing and able to tolerate aversive emotional experiences in the context of pursuing activities that are meaningful to an individual. This is relevant to both willingness to remain in a distressing situation, as well as willingness to approach a situation when it is anticipated that it may be emotionally aversive.

Emotion Dysregulation Dimensions in AN and BN

Do individuals with AN or BN display deficits in the flexible use of adaptive and situationally appropriate strategies to modulate emotional duration/intensity? (Gratz & Roemer Model, Dimension 1)

This section reviews data from empirical research addressing two separate, but related, areas: (1) studies examining global emotion dysregulation; and (2) studies of emotion regulation skills deficits and the tendency to underutilize adaptive emotion regulation strategies. Table 1 provides a summary of the primary measures and constructs relevant to this section. For this review, this dimension is referred to as *Emotion Regulation Strategies*.

Anorexia Nervosa—A small body of self-report research has demonstrated that individuals with AN display trait-level impairments in regulating emotional states. Overall, findings suggest that those with AN consistently display higher levels of global emotion dysregulation compared to controls (Gilboa-Schechtman, Avnon, Subery, & Jeczmien, 2006; Harrison et al., 2009; Harrison, Sullivan, et al., 2010; Svaldi et al., 2012), and that AN diagnostic subtypes do not differ in global emotion dysregulation (e.g., Brockmeyer et al., 2014; Haynos, Roberto, Martinez, Attia, & Fruzzetti, 2014). Results from studies examining global emotion regulation difficulties in both currently ill and recovered AN samples have been mixed, with some suggesting greater difficulties in currently ill versus recovered AN

groups (Harrison, Tchanturia, & Treasure, 2010), and others finding no significant differences (e.g., Brockmeyer et al., 2012). Consistent with the latter findings, preliminary evidence also suggests no difference in emotion regulation between those with acute AN and weight-restored individuals (Haynos et al., 2014). Consequently, the extent to which global emotion regulation deficits are an enduring trait of those with AN (and potentially a predisposing factor for this disorder) versus a characteristic of the acute illness remains uncertain and will require prospective research to clarify this issue.

Other studies have examined more specific deficits in adaptive emotion regulation skills in AN. For example, compared to controls, individuals with AN display deficits in the perceived effectiveness of their emotion regulation strategies (Brockmeyer et al., 2014; Harrison et al., 2009; Harrison, Sullivan, et al., 2010; Svaldi et al., 2012). Further, studies have found lower scores on measures of specific adaptive strategies in those with AN versus controls, including cognitive reappraisal, reframing and growth, mindful observation, and positive thoughts (Davies, Swan, Schmidt, & Tchanturia, 2011; Svaldi et al., 2012). Preliminary findings also suggest possible AN diagnostic subtypes differences in cognitive reappraisal (Danner, Sternheim, & Evers, 2014). Overall, evidence thus supports the idea that AN is associated with broad emotion regulation deficits, as well as deficits in particular adaptive emotion regulation skills.

Bulimia Nervosa—Compared to the literature in AN, there are somewhat fewer studies relevant to this dimension in BN samples. Existing evidence suggests that, similar to findings in AN, those with BN report overall greater global difficulties with emotion regulation compared to controls (Brockmeyer et al., 2014; Gilboa-Schechtman et al., 2006; Harrison, Sullivan, et al., 2010; Svaldi et al., 2012). However, of note, studies have typically not found AN and BN groups to significantly differ in terms of overall emotion dysregulation (Brockmeyer et al., 2014; Gilboa-Schechtman et al., 2006; Harrison, Sullivan, et al., 2010).

Regarding deficits in more specific forms of adaptive emotion regulation in BN, findings have been mixed. Some studies have found greater deficits in the perceived effectiveness of emotion regulation strategies in BN versus control samples (Brockmeyer et al., 2014; Harrison, Tchanturia, et al., 2010; Svaldi et al., 2012), as well as a reduced tendency to utilize cognitive reappraisal (Danner et al., 2014; Svaldi et al., 2012). However, other studies have found no differences between BN and control groups in terms several adaptive strategies, including reframing and growth, mindful observation, positive thoughts, and cognitive reappraisal (Davies et al., 2011; Svaldi et al., 2012). As such, additional research in this area is needed.

Are individuals with AN or BN less able to inhibit impulses and remain goal-directed when distressed? (Gratz & Roemer Model, Dimension 2)

In this section, relevant research from four areas is reviewed : (1) studies of behavioral control difficulties when distressed and trait-level negative urgency (i.e., the tendency to act rashly in the face of negative affect); (2) studies assessing trait-level global distress tolerance (i.e., the capacity to tolerate aversive psychological states); (3) real-time, naturalistic studies

of the link between negative affect and ED behaviors using ecological momentary assessment (EMA; Stone & Shiffman, 1994); and (4) studies using mood induction and feeding laboratory paradigms. Table 2 provides a summary of the primary measures and constructs relevant to this section. For this review, this dimension is referred to as *Behavioral Control When Distressed*.

Anorexia Nervosa—A growing literature supports the existence of greater difficulties related to behavioral control during times of emotional distress in AN versus control groups (Brockmeyer et al., 2014; Harrison et al., 2009; Harrison, Sullivan, et al., 2010; Svaldi et al., 2012), including deficits in the inhibition of impulsive behaviors and the maintenance of goal-focused behavior in the context of distress. Although preliminary, some research on AN diagnostic subtypes also suggests greater difficulties with impulsive behaviors when distressed in ANbp versus ANr (Brockmeyer et al., 2014). Further, difficulties maintaining goal-focused behavior when distressed may improve with weight restoration (Haynos et al., 2014).

With regard to overall distress tolerance, findings have been inconsistent. One study with a pure AN sample found no significant differences between those with AN and controls on a measure of accepting distress and coping with appropriate behavioral responses (Hambrook et al., 2011). In contrast, in a study with a mixed ED sample (which included those with AN), lower accepting distress and coping with adaptive behaviors was found for the ED group compared to controls (Corstorphine et al., 2007). Given the mixed findings of this limited body of existing research, additional studies are needed to elaborate on the nature of distress tolerance in AN.

EMA studies in AN samples have reported significant associations between affect lability and ED behaviors (Engel et al., 2005; Lavender, De Young, Anestis, et al., 2013), and have also identified distinct daily patterns of anxiety that are associated with ED behavior occurrence and timing (Lavender, De Young, Wonderlich, et al., 2013). Further, higher daily levels of negative affect have been found to predict an increased likelihood of dietary restriction on subsequent days in AN (Engel et al., 2013). While these studies suggest that ED behaviors in AN are associated with elevated negative affect, additional research has sought to more clearly delineate the experience of negative affect around ED behaviors in AN, particularly in terms of the potential functional significance of such behaviors. Although evidence supports the presence of high or increasing negative affect prior to a variety of ED behaviors in AN, findings regarding the nature and direction of changes in negative affect following these behaviors have been mixed, in part due to the statistical approaches used to address this question (see Engel et al., 2013).

Research on AN combining mood induction and feeding laboratory paradigms has been extremely limited. In one study, women with AN were randomized to a negative or neutral mood induction and then completed a test meal (Wildes et al., 2012). Results revealed a greater increase in self-reported ED symptoms in the negative versus neutral mood condition, although no effect was found for objectively measured eating behavior (i.e., caloric intake during the test meal). Given the limited body of existing research in this area, additional research is thus needed.

Bulimia Nervosa—Despite the apparent salience of negative urgency to BN symptoms (Fischer et al., 2008), there has been limited research in this area in BN samples. Nonetheless, available evidence is consistent with greater behavioral control deficits during times of distress in BN/subthreshold BN versus controls (Brockmeyer et al., 2014; Fischer, Settles, Collins, Gunn, & Smith, 2012; Fischer, Smith, Annus, & Hendricks, 2007; Harrison, Sullivan, et al., 2010; Svaldi et al., 2012). Of note, findings also suggest that AN and BN do not significantly differ in behavioral control when distressed (Brockmeyer et al.; Harrison, Sullivan, et al.; Svaldi et al.).

As with AN, relatively few studies have examined global distress tolerance in BN versus controls. In the Corstorphine and colleagues (2007) study noted in the AN section above, a mixed ED sample (which also included those with BN) displayed deficits in accepting distress and coping with adaptive behaviors compared to controls. Preliminary results based on the same measure also suggest no significant differences between AN and BN (Raykos et al., 2009).

A number of EMA studies have examined affect in relation to ED behaviors in BN, producing mixed findings. Some studies examining trajectories of momentary affect have reported a pattern in which negative affect increases prior to ED behaviors, and decreases after the behaviors (e.g., Berg et al., 2013; Smyth et al., 2007). In contrast, other studies have found elevated negative emotional states prior to binge eating that further increase after the behavior (e.g., Hilbert & Tuschen-Caffier, 2007). However, findings also suggest that negative emotions may decrease following purging (Alpers & Tuschen-Caffier, 2001). In recent a meta-analysis of EMA studies of binge eating (in which BN was the most common ED diagnosis), Haedt-Matt and Keel (2011) reported on mood before and after bulimic behaviors. Analyzing data using single ratings given pre- and post-behavior, they found elevated negative affect before binge eating that subsequently increased; negative affect was found to decrease after purging episodes. Additional EMA research has shown that individual difference variables (e.g., personality traits, co-occurring psychopathology) may impact the association between affect and ED behaviors (e.g., Engel et al., 2007; Selby et al., 2012). Finally, daily patterns of negative affect have been found to be associated with binge eating and purging in BN (Crosby et al., 2009), suggesting the importance of considering variability, in addition to intensity, of negative affect.

There has been limited research using laboratory-based methods to assess the link between affect and objectively measured eating behavior in BN. One study examined the impact of fasting on mood, food cravings, and food intake in individuals with BN and controls (Moreno-Dominguez, Rodríguez-Ruiz, Fernández-Santaella, Ortega-Roldán, & Cepeda-Benito, 2012). Both groups experienced increased cravings and consumed a similar amount of food after fasting, however mood improved after fasting in the BN group and deteriorated in controls.

Do individuals with AN or BN show deficits in emotional awareness, clarity, or acceptance? (Gratz & Roemer Model, Dimension 3)

This section reviews studies addressing the extent to which difficulties in emotional awareness (i.e., attention to emotions), clarity (i.e., understanding and distinguishing

between emotional states), or acceptance (i.e., accepting or rejecting emotions) are exhibited by individuals with AN and BN. Areas of empirical research most relevant to this topic include: (1) studies of alexithymia (i.e., disturbance in the ability to describe and identify emotional states) and emotional awareness in the self, (2) studies of emotion recognition in others, and (3) studies of emotion avoidance, expression/suppression, and nonacceptance. Table 3 provides a summary of the primary measures and constructs relevant to this section. For this review, this dimension is referred to as *Emotion Understanding and Acceptance*.

Anorexia Nervosa—An extensive body of evidence suggests that individuals with AN exhibit deficits in the awareness and recognition/discrimination of emotional states. Findings from numerous studies using self-report measures suggest that those with AN exhibit greater alexithymia compared to controls (Corcos et al., 2000; Nandrino, Doba, Lesne, Christophe, & Pezard, 2006; Nowakowski, McFarlane, & Cassin; 2013; Schmidt, Jiwany, & Treasure, 1993; Taylor, Parker, Bagby, & Bourke, 1996; Zonnevylle-Bender, van Goozen, Cohen-Kettenis, van Elburg, & van Engeland, 2004). In light of the elevated depression and anxiety symptoms that are common in AN and are also associated with alexithymia, other studies have controlled for these co-occurring symptoms and produced mixed results. In some studies, differences between AN and control groups were not significant when accounting for depression, anxiety, or both (Eizaguirre, De Cabezon, De Alda, Olariaga, & Maite, 2004; Gilboa-Schechtman et al., 2006; Parling, Mortazavi, & Ghaderi, 2010). Other investigations have reported greater alexithymia in AN versus controls even when controlling for relevant affective constructs (Montebarocci et al., 2006; Speranza et al., 2005). There has also been mixed evidence regarding AN diagnostic subtype differences in levels of alexithymia (e.g., Rozenstein, Latzer, Stein, & Eviatar, 2011; Schmidt et al., 1993; Sexton, Sunday, Hurt, & Halmi, 1998).

Research on related constructs, such as emotional awareness, is also of relevance. Studies using performance-based measures in AN samples have reported mixed results. Some findings suggest deficits in the ability to infer emotions in the self in acute AN (but not recovered AN; Oldershaw, Hambrook, Tchanturia, Treasure, & Schmidt, 2010), whereas other findings suggest no apparent deficits (Parling et al., 2010). In contrast, studies using self-report measures have more consistently found greater emotional clarity and awareness deficits in AN versus controls (Brockmeyer et al., 2014; Harrison et al., 2009; Harrison et al., 2010; Svaldi et al., 2012), but AN diagnostic subtypes have not been found to differ (Brockmeyer et al., 2014).

Another area of AN research has examined awareness/recognition of emotions in others. Findings from studies using facial emotion recognition tasks in AN samples (or mixed ED samples comprised predominately of those with AN) have been mixed. Some research has found no differences between AN and control groups in terms of emotion recognition (Kessler, Schwarze, Filipic, Traue, & von Wietersheim, 2006), whereas other research has reported findings that differ based on the methodology used (i.e., use of forced-choice versus free labeling paradigms; Zonnevylle-Bender et al., 2004). However most studies support emotion recognition deficits in AN compared to controls, although findings have differed somewhat for various specific emotions (e.g., Castro, Davies, Hale, Surguladze, & Tchanturia, 2010; Jansch, Harmer, & Cooper, 2009; Kucharska-Pietura, Nikolaou, Masiak,

& Treasure, 2004; Oldershaw et al., 2011; Pollatos, Herbert, Schandry, & Gramann, 2008). A related line of research has utilized theory of mind-based tasks, with results further suggesting deficits in the recognition of complex emotions in AN versus controls (Harrison et al., 2010; Oldershaw et al., 2010; Russell, Schmidt, Doherty, Young, & Tchanturia, 2009). Indeed, a meta-analysis of socio-emotional processing in AN by Oldershaw and colleagues (2011) supports deficits in the ability to recognize emotions in others, and further suggests that the recognition of more complex (versus basic) emotions in more difficult tasks (free-labeling versus forced-choice) may be particularly impaired in AN.

Additional relevant research addresses emotional acceptance deficits in AN, particularly in the form of emotion avoidance and suppression, as well as negative beliefs about emotions. Self-report findings suggest greater experiential and emotional avoidance in those with AN compared to controls (Rawal, Park, & Williams, 2010; Wildes, Ringham, & Marcus, 2010). However, research on emotion expression and suppression in AN has produced somewhat inconsistent findings. Some studies suggest no differences between AN and control groups or find greater suppression but not lower expression (Breaux & Moreno, 1994; Fassino, Daga, Piero, Leombruni, & Rovera, 2001; Waller et al., 2003), but a larger number of studies indicate the presence of greater suppression and reduced expression of emotions in AN (Danner et al., 2014; Davies et al., 2011; Geller, Cockell, Hewitt, Goldner, & Flett, 2000; Jansch et al., 2009; Oldershaw et al., 2012; Svaldi et al., 2012). Further, preliminary evidence suggests no differences between AN diagnostic subtypes in terms of emotion suppression (Danner et al., 2014). Finally, experimental studies of outward expressions of affect in response to emotion- eliciting cues have revealed that those with AN are less facially and verbally expressive than controls (Davies, Schmidt, Stahl, & Tchanturia, 2011; Davies, Swan, Schmidt, & Tchanturia, 2011).

Several theoretical models of AN emphasize the role of negative beliefs about emotions in AN, which may be construed as relevant to emotional expression (Schmidt & Treasure, 2006; Wildes et al., 2010), and empirical findings support these conceptual accounts. For instance, research supports the presence of greater negative beliefs about emotions in current AN (but not recovered AN) versus controls (Oldershaw et al., 2012). Further, several studies using self-report measures have revealed greater emotional nonacceptance in AN versus controls (Brockmeyer et al., 2014; Harrison et al., 2009; Harrison, Sullivan, et al., 2010; Svaldi et al., 2012), but one study found no differences between AN diagnostic subtypes (Brockmeyer et al., 2014).

Bulimia Nervosa—There have been numerous studies on alexithymia and emotional awareness in BN, as well as a growing literature on emotional avoidance, expression, and nonacceptance. In contrast, there has been somewhat less research on emotion recognition in BN. A majority of the relevant research in BN suggests greater alexithymia compared to controls (e.g., Corcos et al., 2000; Jimerson, Wolfe, Franko, Covino, & Sifneos, 1994; Nowakowski et al., 2013; Sureda, Valdes, Jodar, & de Pablo, 1999), although results are less consistent when controlling for depression and/or anxiety (e.g., Eizaguirre et al., 2004; Gilboa-Schechtman et al., 2006; Montebarocci et al., 2006; Rozenstein et al., 2011; Speranza et al., 2005). In contrast, findings on emotional awareness have been more consistent, suggesting deficits in BN versus controls (Brockmeyer et al., 2014; Bydlowski et

al., 2005 [mixed ED sample]; Harrison et al., 2010; Legenbauer, Vocks, & Ruddel, 2008; Sim & Zeman, 2004; Svaldi et al., 2012).

Compared to the corresponding literature in AN, a smaller number of studies have examined deficits in the ability to recognize emotions in others among those with BN. Overall, results suggest that those with BN do not display substantial emotion recognition deficits compared to controls for most emotions using a variety of measures (e.g., Harrison et al., 2010; Kenyon et al., 2012; Legenbauer et al., 2008), although the limited number of studies precludes any firm conclusions (see DeJong et al., 2013).

Although the theoretical role of emotional avoidance in BN has been emphasized (e.g., Heatherton & Baumeister, 1991), the literature directly examining related constructs is somewhat limited. Evidence using self-report measures suggests greater emotion suppression in BN versus controls (Danner et al., 2014; Davies et al., 2011; Svaldi et al., 2012). Studies of expression and suppression of anger specifically have produced less consistent findings, with some research suggesting both greater anger suppression and outward anger expression (Krug et al., 2008 [mixed ED sample with mostly BN participants]), and other research suggesting greater anger suppression in BN versus controls, but not greater anger expression (Breaux & Moreno, 1994; Waller et al., 2003). Relatedly, available evidence suggests greater nonacceptance of emotions in BN versus controls (Brockmeyer et al., 2014; Harrison et al., 2010; Svaldi et al., 2012).

Do individuals with AN or BN display less willing to experience emotional distress to pursue meaningful activities? (Gratz & Roemer Model, Dimension 4)

Two areas of empirical research are relevant to this section. However, studies of relevant constructs have often included mixed AN and BN samples, thus limiting the specificity of the data. Areas of empirical research reviewed below include: (1) studies of the avoidance of situations that elicit emotional arousal and (2) studies of approach/avoidance and reward/ punishment sensitivity. The primary measures and constructs relevant to this section are shown in Table 4. For this review, this dimension is referred to as *Emotion Approach and Tolerance*.

Anorexia Nervosa—Given evidence suggesting that AN is characterized by various forms of emotional avoidance, it would be theoretically consistent for individuals with AN to display a tendency to avoid emotion eliciting situations. Evidence of elevated experiential avoidance in those with AN compared to controls (Rawal et al., 2010) is also consistent with this notion. A small number of studies in this area have utilized combined ED samples (including those with AN), producing mixed results. One study found greater behavioral avoidance of positive affect, but not negative affect, in a mixed ED versus control group (Lampard et al., 2011). In contrast, another study did find support for greater avoidance of situations that would trigger negative affect (Corstorphine et al., 2007), and avoidance of negative affect-eliciting situations has been found to differentiate those with AN from healthy controls (Hambrook et al., 2011). Given the limited research in this area, particularly in pure AN samples, further research is needed.

Regarding approach and avoidance motivation in AN, processes consistent with those described in Reinforcement Sensitivity Theory (see Corr, 2004) may be involved in the etiology and/or maintenance of EDs (Harrison, Treasure, & Smillie, 2011; Loxton & Dawe, 2006). For example, the high levels of anxiety often seen in AN may be linked to trait-oriented differences in punishment sensitivity (i.e., behavioral inhibition system). Similarly, binge eating and purging have been posited to be associated with increased reward sensitivity (Beck, Smits, Claes, Vandereycken, & Bijttebier, 2009). However, results from studies of approach and avoidance tendencies in AN have been somewhat inconsistent. While some studies suggest AN is associated with increased approach behavior and reward sensitivity (Glashouwer, Bloot, Veenstra, Franken, & de Jong, 2014; Jappe et al., 2011), others suggest the opposite and also fail to identify consistent diagnostic subtype differences in approach behavior (Claes, Mitchell, & Vandereycken, 2012; Claes, Nederkoorn, Vandereycken, Guerrieri, & Vertommen, 2006; Claes, Robinson, Muehlenkamp, Vandereycken, & Bijttebier, 2010; Harrison, Treasure, et al., 2011).

Evidence more clearly indicates that avoidance tendencies and punishment sensitivity are elevated in AN (Claes et al., 2006, 2010; Glashouwer et al., 2014; Harrison, et al., 2011; Jappe et al., 2011). Findings from studies with recovered ED samples suggest that these propensities may persist with recovery (e.g., Harrison et al.; Wagner et al., 2006), although other results suggest differences between ill and recovered groups (e.g., Frank, Shott, Hagman, & Mittal, 2013). In a review of this particular literature, Harrison, O'Brien, et al. (2010) noted the heterogeneity of existing results, but a general pattern emerged in which ANr was characterized by lower levels of reward sensitivity/novelty seeking, whereas ANbp was characterized by normative levels. Both subtypes appear to be characterized by elevated punishment sensitivity/harm avoidance.

Bulimia Nervosa—As noted for AN, the small body of relevant studies on avoidance of emotion-eliciting situations is based on mixed ED samples, which also included those with BN. Given the lack of BN-specific results in this area, as well as the mixed findings from studies of combined ED samples, there is a need for more research on avoidance of situations associated with affective experiences in BN samples.

Findings regarding approach and avoidance tendencies in BN have generally found that those with BN display heightened reward sensitivity and/or novelty seeking versus controls (e.g., Abbate-Daga, Piero, Gramaglia, Fassino, 2005; Frank et al., 2013; Frank, Reynolds, Shott, & O'Reilly, 2011; Kane, Loxton, Staiger, & Dawe, 2004; Wagner et al., 2006). Additionally, studies have typically reported findings suggesting elevated punishment sensitivity and/or harm avoidance in those with BN versus controls (e.g., Abbate-Daga et al., 2005; Frank et al., 2013; Wagner et al., 2006). This pattern of heightened reward and punishment sensitivity in BN is consistent with findings reported in a meta-analytic study (Harrison, O'Brien, et al., 2010)

Discussion

The current review of emotion dysregulation dimensions in AN and BN was framed around a multidimensional model of emotion regulation (Gratz & Roemer, 2004). This framework

was selected over other potential approaches (e.g., Gross' process model) due to its prior application in ED research, its more direct clinical utility, and to facilitate the integration of a variety of emotion-related constructs that are salient to ED psychopathology and that are more immediately relatable to and consistent with the multidimensional conceptualization.

The review of the first emotion dysregulation dimension (*Emotion Regulation Strategies*) in AN and BN focused on studies of global, trait-oriented emotion dysregulation, and on more specific emotion regulation deficits and the tendency to underutilize adaptive emotion regulation skills. Taken together, findings suggest that both AN and BN are characterized by global difficulties with regulating affective states. This finding was particularly pronounced for AN, for which there are a larger number of relevant studies, though findings support a similar conclusion for BN. Additionally, possessing a limited repertoire of adaptive emotion regulation skills and a tendency to utilize more maladaptive skills appears to be characteristic of both AN and BN. Overall, these findings are consistent with theoretical models in which ED behaviors are posited to function as maladaptive methods for regulating aversive affective states. What remains unclear is the extent to which such skills deficits function as risk factors (i.e., ED behaviors developing due to a lack of skills for managing emotions), maintenance factors (i.e., repeated use of ED behaviors to manage emotions promoting symptom maintenance), or both. Regardless of the exact role of these deficits, enhancing an individual's repertoire of emotion regulation skills and the ability to effectively apply them may be promising targets for AN and BN interventions.

The review of the second emotion regulation dimension from Gratz and Roemer's (2004) model (*Behavioral Control When Distressed)* included studies of negative urgency, distress tolerance, associations between negative affect and ED behaviors in the natural environment, and laboratory studies of emotion and eating behaviors. Available evidence suggests that behavioral control deficits during periods of emotional distress are common to AN and BN. Similarly, both AN and BN appear to be characterized by a reduced capacity for tolerating emotional distress. However, more research is needed to confirm these findings, as most of the relevant studies were cross-sectional and correlational, utilized only self-report measures, and often used data from mixed ED samples. However, findings from EMA research suggest that affective states are strongly implicated as common antecedents to ED behaviors. The extent and direction of change in negative affect following ED behaviors, however, remains a source of debate. Findings from the limited number of laboratory-based studies investigating eating behavior in response to experimentally induced negative affect in those with AN and BN are preliminary, and additional experimental studies are needed in both populations to further clarify the role of negative affect as a precipitant of objectively measured ED behaviors. Finally, the findings reviewed here as part of this literature suggest that addressing strategies for responding to negative affect, as well as maintaining overall behavioral control and self-regulation, may have utility in the treatment of AN and BN.

Studies reviewed for the third emotion regulation dimension (*Emotion Understanding and Acceptance*) included those addressing awareness/recognition of emotion in the self and others, as well as emotional avoidance, expression, and suppression. Overall, there was evidence supporting the presence of reduced emotional self-awareness and greater emotion

suppression/nonacceptance in AN. Similarly, the reviewed studies suggest that those with AN display deficits in the ability to recognize emotions in others, particularly complex emotions, and that levels of alexithymia in AN are elevated, although the extent to which this is due to co-occurring affective disturbance is unclear. Evidence also suggests that BN is characterized by elevated emotion suppression and nonacceptance and emotional self-awareness deficits, whereas compared to those with AN, individuals with BN do not tend to display substantial deficits in recognizing emotions in others. Findings related to this dimension are relevant to understanding the socio-emotional functioning of those with AN and BN, and suggest the potentially beneficial role for treatment techniques that encourage or enhance the awareness and acceptance of emotional experiences.

The literature reviewed for the fourth emotion regulation dimension (*Emotion Approach and Tolerance)* in AN and BN included studies that assessed avoidance of emotion-eliciting situations, as well as reward and punishment sensitivity (i.e., in relation to tendencies for behavioral approach and avoidance). Overall, preliminary findings suggest EDs may be characterized by a heightened tendency to avoid emotion-eliciting situations, although the limited body of research with AN- and BN-specific samples limits the ability to make firm conclusions. In contrast, available evidence more consistently suggests that AN (both diagnostic subtypes) and BN are characterized by heightened punishment sensitivity and harm avoidance. Further, findings indicate that ANr in particular is characterized by an insensitivity to reward, whereas evidence suggests that individuals with BN display a heightened sensitivity to reward and novelty seeking. Taken together, these findings thus suggest the possible utility of addressing emotion regulation skills in treatment that are particularly relevant to social encounters and other situations that one would anticipate might trigger aversive emotions, as well as reducing overall patterns of avoidance in those with AN and BN.

Finally, although this review focused on studies related to the presence of elevated deficits across various emotion regulation dimensions in AN and BN, it should be noted that other studies have assessed the degree to which emotion dysregulation is associated with severity of symptoms within ED groups. Generally, findings from such studies suggest that a greater degree of emotion dysregulation across various dimensions is associated with greater ED symptom severity. Results from research using Gratz and Roemer's (2004) measure of emotion dysregulation suggest that overall emotion dysregulation is positively associated with ED severity in both AN and BN, with various emotion dysregulation dimensions differentially related to ED symptoms in each disorder (Lavender et al., 2014; Racine & Wildes, 2013). Findings further suggest that various constructs related to the emotion dysregulation dimensions addressed in this review are associated with degree of ED symptoms in ED samples (e.g., negative beliefs about emotions; Hambrook et al., 2011), general clinical samples (e.g., negative urgency; Anestis, Smith, Fink, & Joiner, 2009), and non-clinical samples (e.g., experiential avoidance; Hayaki, 2002).

Limitations of Existing Studies and Future Directions

Although it has grown in recent years, there remain limitations to the literature on the role of emotion in AN and BN, including: (1) a limited number of studies directly addressing

certain important dimensions of emotion dysregulation such as avoidance of emotion-eliciting situations, negative urgency, and distress tolerance, particularly in clinical populations (e.g., Corstorphine et al., 2007; Fischer et al., 2007; 2012; Hambrook et al., 2011; Raykos et al., 2009); (2) the preponderance of cross-sectional studies, with a smaller body of prospective/longitudinal studies (e.g., Combs, Pearson, & Smith, 2011; Haynos et al., 2014; Racine et al., in press; 2013), and (3) a variety of issues related to sampling. More specifically, many studies utilized small samples or mixed ED samples, which limits the ability to arrive at firm conclusions regarding certain emotion dysregulation dimensions, particularly with regard to disorder-specific and/or subtype-specific findings. Further, existing research in this area has been characterized by predominantly female samples with limited or unreported ethnic diversity, thus limiting the ability to generalize findings to males and ethnic minority populations. Relatedly, although some of the studies in this review focused on adolescents (e.g., Lock et al., 2011; Marsh et al., 2011; Sim & Zeman, 2004, Zonnevylle-Bender et al., 2004), most of the relevant research has been conducted in adult samples, thus caution should be taken in generalizing these findings to younger populations (i.e., children and adolescents).

Diagnostic considerations in relation to the current review should also be noted. Specifically, studies reviewed here primarily relied on a nosology (the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* [DSM-IV]; APA, 1994) that has recently been updated (DSM-5; APA, 2013). Although the overall symptoms characterizing AN and BN remain mostly consistent, future studies utilizing the new nosology may include participants with AN or BN diagnoses who would not have previously met criteria for the disorders. As such, the findings of this review will need to be confirmed in samples diagnosed using the new criteria. Relatedly, in light of evidence that diagnostic crossover within (e.g., from ANr to ANbp) and between (e.g., from AN to BN) ED diagnoses is a common phenomenon over the long term (e.g., Eddy et al., 2008), interpretation of existing findings should take into account the possibility that an individual with a given ED diagnosis may have previously met criteria for another ED, which is a limitation for studies seeking to identify differences across EDs and ED subtypes.

The current review further suggests that there remain gaps in the literature with regard to utilizing methodologies other than self-report. For example, there have been few studies in AN and BN using designs combining mood induction and feeding laboratory procedures to examine the impact of negative affect on objectively measured ED behaviors, or changes in affect following those behaviors. Given that many theories of the role of emotion in AN and BN posit negative affect as a trigger of ED behaviors, as well as suggesting that such behaviors may be maintained through negative reinforcement (e.g., reduction of negative affect), the lack of data from studies using experimental designs in laboratory settings is a limitation of the current literature. Studies utilizing EMA designs also provide a method of examining antecedent and consequent emotion around ED behaviors, and such data has the added benefit of enhanced ecological validity. However, the addition of experimental studies with the greater control provided by laboratory settings and the ability to assess certain variables more objectively (e.g., direct measurement of caloric consumption) would enhance the evidence of negative affect as an antecedent/trigger of ED behavior, and would help to

clarify some inconsistencies regarding negative affective experiences following the occurrence of ED behaviors.

Another valuable approach to assessing emotional responding in AN and BN would be the use of psychophysiological assessments, including facial electromyography (e.g., examining movement of facial muscles known to correspond to expressions of particular emotions), as well as assessing various indices of autonomic activity including respiration, heart rate, and skin conductance (Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000). Such approaches have the benefit of providing an objective measure of emotion-based physiological changes, overcoming certain limitations of self-report (e.g., lack of emotional awareness, response bias due to social desirability, demand characteristics). For example, studies could examine psychophysiological indices of emotional reactivity in response to either ED specific cues (e.g., food- or body-related stimuli), or to emotion-eliciting cues more broadly (e.g., images or film clips known to produce particular affective responses). Ultimately, given the potential for differing findings resulting from varying methods of assessing emotional responding and regulation in EDs, future studies with multi-method designs combining self-report, physiological, and behavioral measures will likely provide the most comprehensive empirical evidence regarding emotion dysregulation in AN and BN.

Relatedly, as emotion-based models of ED psychopathology continue to evolve, there has been a parallel increase in the scientific consideration of neurobiological processes underlying eating behavior and emotion in EDs (Frank & Kaye, 2012; Kaye, 2008). A growing number of neuroimaging studies have identified alterations in neurobiological functioning in relation to emotional, inhibitory, reward, and interoceptive processes in AN and BN. For example, studies in individuals recovered from AN and BN have revealed abnormal responses to monetary choices in reward and emotional salience circuitry (e.g., anterior ventral striatum), consistent with a shared trait for emotion dysregulation (e.g., Wagner et al., 2007; Wagner, 2010; Wierenga et al., 2015). Moreover, recent studies have revealed abnormal functioning in neurocircuitry underlying executive processes in AN and BN (e.g., Lock et al., 2011; Marsh et al., 2009, 2011; Wagner et al., 2007; Zastrow et al., 2009), which is relevant to dysregulated behaviors in BN and overregulated behaviors in AN, particularly ANr. There has also been considerable speculation that the insula, a brain region that is important for emotional processing and self-awareness, may play a critical role in altered interoceptive awareness and ED symptoms in AN and BN (Craig, 2009; Nunn, Frampton, Fuglset, Törzsök-Sonnevend, & Lask, 2011; Wagner et al., 2008).

Despite the increasing number of neuroimaging studies in AN and BN in recent years, additional research is needed to examine neurobiological alterations or deficits underlying the emotion dysregulation processes discussed in this review. Potential topics on which to focus future research include structural or functional abnormalities related to emotion generation processes. Additionally, future neuroimaging studies may further clarify potential neurobiological contributions to emotion dysregulation dimensions, including emotional clarity/awareness deficits and the link between emotional and behavioral disinhibition. Although there are certain unique considerations and limitations for neuroimaging in ED research (e.g., effects of starvation state in AN), examining the underlying neurobiology of

emotional functioning AN and BN remains a promising and important area for future research.

In sum, there are several lines of research using various methodologies that would contribute to the existing literature on emotion dysregulation in AN and BN. However, in addition to the recommendations for future research noted above, there are several additional lines of research that would help clarify the nature of emotion regulation deficits in EDs. First, it remains unclear to what extent emotion dysregulation predates the onset of ED psychopathology and thus functions as a risk factor, develops as a result of the disorder and thus functions as more of a maintenance factor, or both predisposes one to the development of ED symptoms and is then exacerbated by those symptoms over time. Prospective research studies will be needed to address this particular issue. A second question regards the specificity of emotion regulation deficits in the context of ED psychopathology (see Svaldi et al., 2012). Healthy control groups (versus samples with other forms of psychopathology) are the most common comparison sample in studies examining emotion dysregulation in those with an ED, thus limiting the ability to evaluate the nature and degree of emotion dysregulation in EDs versus other psychiatric disorders. Further, other important variables may moderate the association between emotion dysregulation and ED symptoms. In particular, personality (e.g., perfectionism) and neurocognitive (e.g., cognitive control, reward processes) variables may be of particular relevance to AN and BN. For instance, it may be that emotionally dysregulated individuals who also display greater cognitive control deficits may be at greater risk of displaying particular forms of ED behavior (e.g., binge eating, purging). Future studies assessing such relationships will thus be useful in clarifying the role of potential moderating variables.

Finally, although this paper focused on reviewing studies of those with AN and BN, there may also be utility in exploring the role of emotion dysregulation in relation to subthreshold ED symptoms in non-clinical samples. Such research may have relevance for understanding the contribution of emotion dysregulation to ED symptoms early in the course of an ED (e.g., as some subthreshold cases may go on to full ED status), as well as elucidating underlying processes that may be occurring at multiple levels of ED symptom severity. Further, although it was not addressed in this review, there is a growing literature on emotion dysregulation in binge eating disorder (BED). Preliminary evidence suggests that BED is characterized by difficulties across multiple emotion dysregulation dimensions that are similar to those found in AN and BN. For instance, when compared to either overweight or normal weight controls, evidence suggests that those with BED exhibit greater nonacceptance of emotions, reduced emotional clarity and awareness, more emotion-based impulse control problems, and reduced access to adaptive emotion regulation strategies (e.g., Brockmeyer et al., 2014; Svaldi et al., 2012). Further, in a recent review of experimental studies relevant to the affect regulation model of binge eating in BED, Leehr and colleagues (2015) reported that negative affect appears to be a trigger for binge eating in BED, and there is also preliminary evidence supporting improvements in mood following binge eating in this diagnostic group. However, similar to the limited body of research on certain constructs in AN and BN samples (e.g., avoidance of situations prompting emotional arousal, distress tolerance, negative urgency), there is a need for further research on

constructs consistent with various emotion dysregulation dimensions that are conceptually relevant to BED.

Conclusion

Existing evidence supports the view that both AN and BN are broadly characterized by emotion dysregulation, with certain dimensions present across both disorders (e.g., emotional nonacceptance, elevated punishment sensitivity/harm avoidance) and others exhibiting potential differences across diagnoses (e.g., deficits in recognizing emotions in others, reward sensitivity). Future research using multi-method designs will help clarify the nature of emotion dysregulation in AN and BN, and prospective research will provide further data on the extent to which emotion regulation deficits function as risk and/or maintenance factors for ED psychopathology. Findings from studies such as those recommended here will allow for the refinement of existing emotion based theoretical and treatment models for EDs, and thus have the potential to enhance existing interventions and inform the development of new evidence-based treatments for AN and BN.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Appendix

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Highlights

- Emotion dysregulation is addressed in many eating disorder theoretical and treatment models

- Emotion dysregulation across multiple dimensions is common to both anorexia nervosa and bulimia nervosa

- Limitations of existing research include reliance on self-report, small and widely varying samples, and few longitudinal studies

- Possible directions for future research are discussed

Table 1

Measures and Constructs Relevant to Review of Dimension 1 (Emotion Regulation Strategies) in AN and BN

Measure	Primary Construct	Format	# Items
Emotion Regulation Questionnaire (ERQ: Gross & John, 2003) - Cognitive Reappraisal Subscale	Emotion Regulation	7-point Likert-type scale; *strongly disagree to strongly agree*	6 (subscale) 10 (total)
Negative Mood Regulation Scale (NMRS; Catanzaro & Mearns, 1990)	Emotion Regulation	5-point Likert-type scale; *strongly disagree to strongly agree*	30
Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) – Limited Access to Effective Strategies subscale	Emotion Regulation	5-point Likert-type scale; *almost never to almost always*	8 (subscale) 36 (total)
Inventory of Cognitive Affect Regulation Strategies (Wolfsdorf Kamholz et al., 2006)	Emotion Regulation	4-point Likert-type scale; *I don't do this at all to I do this a lot*	59

Table 2

Measures and Constructs Relevant to Review of Dimension 2 (Behavioral Control When Distressed) in AN and BN

Measure	Primary Construct	Format	# Items
UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001) - Negative Urgency subscale	Negative Urgency	4-point Likert-type scale; *agree strongly to disagree strongly*	12 (subscale) 45 (total)
Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) - Impulse subscale	Emotion Regulation	5-point Likert-type scale; *almost never to almost always*	6 (subscale) 36 (total)
DERS (Gratz & Roemer, 2004) - Goals subscale	Emotion Regulation	5-point Likert-type scale; *almost never to almost always*	5 (subscale) 36 (total)
Distress Tolerance Scale (DTS-S; Simons & Gahers, 2005)	Distress Tolerance	5-point Likert-type scale; *strongly agree to strongly disagree*	15
Distress Tolerance Scale (DTS-C; Corstorphine et al., 2007)	Distress Tolerance	5-point Likert-type scale; *never to all the time*	20
Ecological Momentary Assessment designs	Varied	Momentary assessments of emotional states; format varies	-

Table 3

Measures and Constructs Relevant to Review of Dimension 3 (Emotion Understanding and Acceptance) in AN and BN

Measure	Primary Construct	Format	# Items
Toronto Alexithymia Scale-26 (TAS-26; Taylor et al., 1985) and TAS-20 (Bagby et al., 1994a,b)	Alexithymia	5-point Likert-type scale; *strongly disagree to strongly agree*	26 (TAS-26) 20 (TAS-20)
Bermond-Vorst Alexithymia Questionnaire (BVAQ: Vorst & Bermond, 2001)	Alexithymia	5-point Likert-type scale; *definitely applies to me to in no way applies to me*	40 (Two 20-item parallel forms)
Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) - Clarity subscale	Emotional Clarity	5-point Likert-type scale; *almost never to almost always*	5 (subscale) 36 (total)
DERS (Gratz & Roemer, 2004) - Awareness subscale	Emotional Awareness	5-point Likert-type scale; *almost never to almost always*	6 (subscale) 36 (total)
Levels of Emotional Awareness Scale (LEAS; Lane et al., 1990)	Emotional Awareness	6-point scale (0 to 5) used to rate participant descriptions of anticipated emotions in self and other in vignettes	20 vignettes (Two 10-item parallel forms)
Emotional Avoidance Questionnaire (EAQ: Taylor et al., 2004)	Emotional Avoidance	5-point Likert-type scale; *not true of me to very true of me*	20
Acceptance and Action Questionnaire - 9-item version (AAQ; Hayes et al., 2004)	Experiential Avoidance	7-point Likert-type scale; *never true to always true*	9
State-Trait Anger Expression Inventory 1/2 (STAXI; Spielberger, 1988; 1999) – Anger Expression (In & Out) & Anger Control (In & Out) subscales	Emotion Expression	4-point Likert-type scale; *almost never to almost always*	8 (subscales) 44/57 (total)
Silencing the Self Scale (STSS; Jack & Dill, 1992) – Self-Silencing subscale	Emotion Expression	5-point Likert-type scale; *strongly disagree to strongly agree*	31
Emotional Expressiveness Scale (EES; Hayaki et al., 2002)	Emotion Expression	Forced-choice; Yes/No	7
Emotion Regulation Questionnaire (ERQ: Gross & John, 2003) - Suppression Subscale	Emotion Suppression	7-point Likert-type scale; *strongly disagree to strongly agree*	4 (subscale) 10 (total)
Beliefs about Emotions Scale (Rimes & Chalder, 2010)	Emotional Acceptance	7-point Likert-type scale; *totally agree to totally disagree*	12
DERS (Gratz & Roemer, 2004) - Nonacceptance subscale	Emotional Acceptance	5-point Likert-type scale; *almost never to almost always*	6 (subscale) 36 (total)
Inventory of Cognitive Affect Regulation Strategies (Wolfsdorf Kamholz et al., 2006) - Acceptance of Feelings subscale	Emotional Acceptance	4-point Likert-type scale; *I don't do this at all to I do this a lot*	2 (subscale) 59 (total)
Reading the Mind in the Eyes task (RME; Baron-Cohen et al., 2001)	Emotion Recognition	Participants view sets of eyes and select from four words to indicate the person's likely emotional/mental state	36 sets of eyes
Reading the Mind in the Voice task (RMV; Golan et al., 2007)	Emotion Recognition	Participants listen to sentences and select from four words to indicate the person's likely emotional/mental state	25 spoken sentences
Reading the Mind in Films task (RMF; Golan et al., 2006)	Emotion Recognition	Participants watch film clips and select from four words to indicate the protagonist's likely emotional/mental state	22 film clips

Table 4

Constructs and Measures Relevant to Review of Dimension 4 (Emotion Approach and Tolerance) in AN and BN

Measure	Primary Construct	Format	# Items
Behavioral Inhibition System and Behavioral Activation System Scales (BIS/BAS; Carver & White, 1994) - BAS Scales (Fun Seeking, Reward Responsiveness, and Drive)	Behavioral Activation	4-point Likert-type scale; *very true for me* to *very false for me*	4 or 5 (subscales) 20 (total)
Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia et al., 2001) - Sensitivity to Reward scale	Reward Sensitivity	Forced-choice; Yes/No	24 (subscale) 48 (total)
Tridimensional Personality Questionnaire (TPQ; Cloninger, 1987) - Novelty Seeking Scale	Novelty Seeking	Forced-choice; True/False	34 (subscale) 100 (total)
Temperament and Character Inventory (TCI; Cloninger et al., 1994) - Novelty Seeking Scale	Novelty Seeking	Forced-choice; True/False (5-point Likert-type scale for TCI-R)	Varies by version
Distress Tolerance Scale (Corstorphine et al., 2007) - Avoidance of Affect subscale	Distress Tolerance	5-point Likert-type scale; *never* to *all the time*	6 (subscale) 20 (total)
TPQ (Cloninger, 1987) - Harm Avoidance Scale	Harm Avoidance	Forced-choice; True/False	34 (subscale) 100 (total)
TCI (Cloninger et al., 1994) - Harm Avoidance Scale	Harm Avoidance	Forced-choice; True/False (5-point Likert-type scale for TCI-R)	Varies by version
BIS/BAS (Carver & White, 1994) - BIS Scale	Behavioral Inhibition	4-point Likert-type scale; *very true for me* to *very false for me*	7 (subscale) 20 (total)
SPSRQ (Torrubia et al., 2001) - Sensitivity to Punishment scale	Punishment Sensitivity	Forced-choice; Yes/No	24 (subscale) 48 (total)