



## Relationships between Nonappearance Self-discrepancy, Weight Discrepancy, and Binge Eating Disorder Symptoms

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### Abstract

**Purpose**—Self-discrepancy (i.e., perceived differences between one’s actual self and personal standards) has been associated with binge eating disorder (BED) symptoms. However, little is known about how weight discrepancy (i.e., the difference between one’s actual and ideal weights) interacts with or is distinguished from nonappearance self-discrepancy (discrepancy unrelated to weight or shape) in predicting BED severity. The current study examined how these two forms of discrepancy independently and interactively relate to BED and associated symptoms to elucidate how facets of self-discrepancy may operate to precipitate and maintain BED.

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**Methods**—Adults with BED (N=111) completed questionnaires and interviews prior to treatment that assessed self-discrepancy (Computerized Selves) and weight discrepancy (assessed during the Eating Disorder Examination [EDE]) as predictors of global eating disorder (ED) symptomatology (EDE Global score), depression (Beck Depression Inventory), anxiety (State-Trait Anxiety Inventory), self-esteem (Rosenberg Self-Esteem Scale), and ED-related impairment (Clinical Impairment Assessment).

**Results**—Multivariate regression models indicated nonappearance self-discrepancy and weight discrepancy were not significantly related to the severity of global ED symptoms, but both independently predicted impairment ( $p < .05$ ). Nonappearance self-discrepancy, but not weight discrepancy, was also associated with higher depression ( $p = .001$ ), anxiety ( $p < .001$ ), and lower self-esteem ( $p < .001$ ).

**Conclusion**—These findings suggest distinct associations of weight discrepancy and nonappearance self-discrepancy with ED and related symptoms, as well as each of these constructs' relevance to everyday functioning in BED. The results also highlight potential avenues for future research to examine mechanistic pathways by which self-discrepancy influences BED severity.

**Level of evidence**—Level V, descriptive cross-sectional study.

## Keywords

Binge Eating Disorder; Self-Discrepancy; Weight Discrepancy; Binge Eating

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Binge eating disorder (BED) is an eating disorder that is associated with a range of psychological and medical comorbidities, impairment, and increased mortality [1–4]. Despite the clinical severity of this disorder, outcomes of psychological and behavioral treatments for BED remain suboptimal [5], which indicates a need to identify relevant maintenance factors that could inform more effective intervention approaches. Self-discrepancy, the degree to which individuals perceive a difference between their actual self and their personal standards (referred to as self-guides), has been identified as a possible risk and maintenance factor of various types of psychopathology [6], including some eating disorders [7,8]. Self-discrepancy theory proposes the existence of multiple cognitive self-representations that are components of self-evaluation, including the actual self (i.e., what individuals perceive themselves to be), the ideal self (i.e., a mental representation of attributes individuals would ideally like to possess), and the ought self [i.e., a representation of attributes individuals believe they are obligated to attain; 9].

According to self-discrepancy theory, high degrees of self-discrepancy can lead to negative affective states, which can contribute to the engagement in a variety of maladaptive behaviors and ultimately the development of psychiatric disorders [10]. Previous research has focused on the impact of self-discrepancy on the maintenance of depression and anxiety [e.g., 6]. Consistent with tenets of self-discrepancy theory, a meta-analysis of research on self-discrepancy across psychopathology showed a relationship between self-discrepancy and psychopathology (e.g., anxiety and depression) and indicated that self-discrepancy was also linked to negative emotions, including general negative affect, anger, and guilt/shame [11]. However, while self-discrepancy theory originally posited that specific self-

discrepancies differentially relate to particular emotional states, with actual:ideal discrepancy linked to depression and actual:ought discrepancy being associated with anxiety, this meta-analysis did not find support for this distinction. Rather, actual:ideal discrepancy was more strongly associated with depression and anxiety compared to actual:ought discrepancy.

Self-discrepancy theory has also been applied to eating disorders and is thought to be an important eating disorder intervention target. Self-discrepancy may trigger symptom expression and is a central component of integrative cognitive-affective therapy (ICAT), an evidence-based treatment developed for bulimia nervosa [BN; 12,7] and more recently adapted for BED. Early research on self-discrepancy in the context of eating disorder symptoms showed that, in both men and women, bulimic behaviors were associated with actual:ideal discrepancy and that anorexic symptoms were linked to actual:ought discrepancy, suggesting specific associations between an individual's self-discrepancy and various forms of eating pathology [8]. More recent research has shown that across eating disorder diagnoses such as BN and BED, actual:ought discrepancy is directly linked with purging, binge eating, and overall eating pathology [13]. Relatedly, the meta-analysis mentioned above showed positive correlations between self-discrepancy and eating disorder symptoms, supporting the relevance of self-discrepancy theory to eating pathology [11].

One specific manifestation of self-discrepancy that may be pertinent to eating pathology is weight discrepancy [14,15], or the difference between an individual's perception of their actual weight and the weight the person would ideally like to be. Previous research indicates a link between weight discrepancy and binge eating in nonclinical samples. One study demonstrated this link among college students, finding that a measure of weight and size discrepancy predicted body dissatisfaction, binge eating, and low levels of physical activity and fruit and vegetable consumption [16,8]. Another study showed that, among young girls, a larger perceived body size and a smaller idealized body size were precursors to eating disorder symptoms [17]. Given these findings, it stands to reason that a high weight discrepancy might be a marker of more severe symptoms in eating disorders. Consistent with this possibility, individuals with BN and anorexia nervosa (AN) have been shown to have lower weight goals than those without these disorders [18,19].

However, little research has investigated weight discrepancies among individuals with binge eating disorder (BED), despite evidence that body image disturbance and overvaluation are relevant to individuals with BED [e.g., 20,21]. Specifically, among individuals with BED, those who report clinically significant overvaluation of shape and weight report greater eating psychopathology and poorer psychological functioning compared to those with subclinical overvaluation of shape and weight [22]. Several other studies support the contention that individuals with BED exhibit disturbances in the cognitive-affective component of body image distinct from controls with obesity [23] and similar to those with anorexia or bulimia nervosa [20,21]. This research implies that individuals with BED could have elevated weight discrepancy, which could, in turn, impact the severity of symptoms. A greater desire to lose large amounts of weight could suggest greater concerns about weight and eating in this group, but, to our knowledge, the topic has not been directly studied. The growing evidence that the overvaluation of shape and weight is an indicator of BED severity

implies that a greater weight discrepancy could also provide information about the nature or severity of BED symptoms [24].

Taken together, both nonappearance self-discrepancy (i.e., self-discrepancy in areas that are not related to weight or appearance, such as in areas of intelligence or happiness) and weight discrepancy are relevant constructs and potential treatment targets for individuals with eating disorders. However, to our knowledge, no previous research has investigated these constructs in BED or examined the independent and interactive associations of both weight discrepancy and nonappearance self-discrepancy with eating pathology. That is, when considering the role of weight discrepancy in BED, it is important to investigate whether the role of weight discrepancy in eating disorder symptomatology functions separately from that of nonappearance self-discrepancy, and whether these two forms of self-discrepancy interact to predict symptom severity and clinical impairment. That is, it may be that weight-discrepancy adds information above and beyond nonappearance self-discrepancy about eating disorder symptoms. This is consistent with tenets of previous models of eating disorders which emphasize the role of body dissatisfaction and self-evaluation based on shape and weight as having particular importance in eating disorder maintenance beyond that of general low self-esteem [25,26].

Beyond their impact on BED-specific symptoms, weight discrepancy and nonappearance self-discrepancy may have an impact on other areas of psychological health for individuals with BED. Given the close links among affect, emotion dysregulation, and binge eating, it is possible that various aspects of self-discrepancy have particular relevance in maintaining negative affective states and co-occurring mood and anxiety symptoms in BED [e.g., 27]. It may be that self-discrepancy and weight-discrepancy generate negative affect, which in turn precipitates both eating disorder and co-occurring symptoms. The theoretical model underlying ICAT, for example, posits that having a high actual:ideal or actual:ought self-discrepancy could trigger or maintain eating disorder symptoms due to its impact on affect, regardless of whether those discrepancies are weight-based [28,7]. Likewise, the dual-pathway model contends that body dissatisfaction can contribute to negative affect and restrained eating, which, in turn, contributes to eating disorder symptoms [29,26]. However, some research suggests that this model does not account for all of the variance linking body dissatisfaction to eating disorder symptoms, and there may be other ways of conceptualizing body dissatisfaction, such as through a weight discrepancy lens, that may shed more light on the nature of this relationship, particularly in the context of BED.

Relatedly, there is some evidence that among individuals with BED, body dissatisfaction and self-esteem are closely linked [30–32], suggesting the possible role of weight discrepancy in self-esteem for individuals with BED. For example, an experiment among individuals with BED found that inducing a state of low self-esteem impacted measures of body dissatisfaction but not emotional ratings, indicating a potential distinct association between self-esteem and body dissatisfaction [31]. These findings warrant further investigation of the nature of the relationship between body dissatisfaction and self-esteem in BED, perhaps by studying weight discrepancy and its distinct impact on self-esteem.

The current study sought to disentangle weight discrepancy and nonappearance self-discrepancy and their relation to symptom severity and clinical impairment in BED. The study focused on actual:ideal weight discrepancy and actual:ideal nonappearance self-discrepancies that were not weight- or shape-based. Characterizing how each of these types of self-discrepancy relates to symptoms in BED could clarify aspects of the disorder's maintenance cycle as well as which treatment targets may be most important for this group of patients. Given the potential impact of self-discrepancy on self-esteem, anxiety, mood, and clinical impairment, the current study also examined the relation between self-discrepancy and these constructs.

Considering the evidence that overvaluation of shape and weight is clinically meaningful in BED and that nonappearance self-discrepancy also seems to correlate with eating disorder-related symptoms [24,13], it is possible that both weight discrepancy and nonappearance actual:ideal self-discrepancy independently contribute to eating disorder-related symptoms. Moreover, the effects of each could be additive or intensify the impact of the other. Specifically, given that overvaluation of shape and weight is particularly pertinent to BED [20,21], it is possible that having higher levels of weight discrepancy, one variable that is closely tied with that overvaluation, leaves an individual more vulnerable to the potential negative impact of other areas of self-discrepancy on their mental health. We therefore hypothesized that both weight and nonappearance self-discrepancies would significantly predict eating disorder severity and associated symptoms (i.e., anxiety, depression, self-esteem, and clinical impairment), and that these two constructs would interact, such that the relationship between nonappearance self-discrepancy and symptoms would be stronger among individuals with higher weight discrepancies.

## Methods

### Participants

Participants consisted of 111 adults who were recruited for a two-site randomized clinical trial for BED. All participants met the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) criteria for BED (American Psychiatric Association, 2013). Exclusion criteria included the following: (1) unable to read English, (2) BMI less than 21, (3) lifetime history of psychotic symptoms or bipolar disorder, (4) substance use disorder within six months of enrollment, (5) medically or psychiatrically unstable (e.g., acute suicidality), (6) purging behavior (self-induced vomiting, misuse of laxatives or diuretics) more than once per month for the previous three months, (7) current diagnosis of BN, (8) medical condition impacting eating or weight (e.g., thyroid condition), (9) history of gastric bypass surgery, (10) currently pregnant or lactating, (11) currently receiving weight loss or eating disorder treatment, (12) taking any medication impacting eating or weight (e.g., stimulants) or (13) psychotropic medication changes in the six weeks prior to enrollment.

### Procedure

Participants were recruited between 2014 and 2017 at two study sites in the Midwestern region of the United States. Strategies for recruitment included at eating disorder clinics, social media postings, and community advertisements. All participants provided informed

consent to participate in the study; while they did not know the particular goal of the current study, they were informed about the treatment components of the larger experiment on which the current study is based.

After initial screenings, eligible participants completed a baseline study visit that included semi-structured interviews and questionnaires assessing past and current eating disorder symptoms and comorbid psychopathology. Diagnoses of mental disorders were provided based on the Structured Clinical Interview for DSM-IV [33]. Height and weight were also measured to calculate BMI. The present study utilized only the baseline (pre-treatment) assessments prior to randomization; full study protocol and treatment outcome data are presented elsewhere (Peterson et al., under review).

## Measures

**The Eating Disorder Examination 16.0 [34; EDE]**—The EDE is a semi-structured investigator-based interview, was used to assess baseline eating disorder symptoms and verify that participants met DSM-5 BED diagnostic criteria. It has been shown to have good reliability and validity and is a widely-used measure for eating pathology [35,36]. Interview assessors were trained and received routine supervision from a licensed psychologist. For the present study, the EDE global score was used as an outcome and appeared to have acceptable reliability in the current sample,  $\alpha = .74$ . The binge eating frequency item of the EDE was also used as an outcome. Weight discrepancy was based on the EDE desired weight item (*On average, over the past month what weight have you wanted to be?*) and calculated as the difference between the participants' current weight and desired weight.

**Computerized Selves [CS; 37]**—The CS is an adapted version of the computerized Selves Questionnaire [6], in which participants provide reports of perceived actual self and self-standards. Participants are asked to list words describing their ideal self and ought self, after which they rate each descriptor using 1–7 Likert scales based on how far they are from possessing the descriptor (1–7 scale). These scores were used as indices of actual:ideal and actual:ought self-discrepancy, respectively. There is limited information about the psychometrics of the CS, but it has been used in a number of studies focused on measuring self-discrepancy, and the questionnaire on which it was based, the Selves Questionnaire, has been described as the most widely used measure of self-discrepancy [38,37,39,40,6].

While there are both actual:ideal and actual:ought self-discrepancy constructs, the current study used only the actual:ideal self-discrepancy CS measure. This choice was due to our desire to directly compare nonappearance self-discrepancy and weight discrepancy, and our measure of weight discrepancy seemed to reflect an actual:ideal discrepancy more so than an actual:ought discrepancy. Specifically, the wording of the EDE item used to calculate weight discrepancy (i.e., “*On average, over the past month what weight have you wanted to be?*”) aligned more directly with an actual:ideal discrepancy (which refers to discrepancies with one's own standards) compared to actual:ought discrepancy (which refers to discrepancies with perceived standards from others).

Given that participants could have included weight- or appearance-related words in their CS actual:ideal assessment, all ratings on appearance-related words reported on the CS were



removed before scoring the CS actual:ideal measure. This approach was taken to ensure that the EDE measure of weight discrepancy and the CS measure of nonappearance self-discrepancy assessed distinct components of self-discrepancy. Two coders (E.L. and K.S.) reviewed all participants' CS responses and distinguished nonappearance from appearance-related words in order to remove appearance-related words prior to CS scoring. Any discrepancies between coding (of which there were only two) were handled in a conservative manner: the words in question were removed to ensure that the measure included only nonappearance actual:ideal self-discrepancy. Nonappearance actual:ideal self-discrepancy was then calculated using a mean of all of the remaining nonappearance word ratings for each participant.

**Clinical Impairment Assessment [CIA; 41]**—The CIA is a 16-item self-report measure of psychosocial impairment related to eating disorder symptoms, which assesses the degree to which individuals' eating habits, exercising, or feelings about eating, shape, or weight, have affected their life over the past four weeks. It asks participants are asked to rate to what extent their eating habits, exercising, or feelings about their eating, shape or weight have influenced various experiences, such as to what extent it has “interfered with [their] relationship with others.” Participants then identify each of these items as happening “not at all,” “a little,” “quite a bit,” or “a lot.” The CIA has been shown to have acceptable test-retest reliability and internal consistency in eating disorder samples [41,42]. The measure also has several studies providing population norms for the measure [e.g., 43] and it appears to have construct validity based on its relationship to clinical impairment ratings made by clinicians and measures of eating pathology (Bohn et al., 2008). The CIA had excellent reliability in the current sample,  $\alpha = .92$ .

**Beck Depression Inventory [BDI; 44]**—The BDI is a 21-item multiple choice questionnaire measuring symptoms of depression over the past week. Items ask participants about various symptoms, including hopelessness, irritability, and fatigue, and they range in ratings from 0–3, which are defined differently for each item. This measure has been widely used in research to measure depression symptoms, and it has been shown to have good psychometric properties in clinical and nonclinical populations [45]. In the current study, the BDI had good reliability,  $\alpha = .87$ .

**State-Trait Anxiety Inventory [STAI; 46]**—The STAI is a 40-item self-report measure of anxiety symptoms. It includes items that asks participants to report how they “feel in this moment” and how they feel “in general” to measure both their current state and their trait-level anxiety. Participants respond to items such as, “I feel at ease” and “I am a steady person” and rate each of these on a scale of 1–4 (ranging from “not at all” to “very much so”). The measure has been widely used and has been shown to have good internal consistency and test-retest reliability [47,48], and had excellent reliability in the current sample,  $\alpha = .92$ .

**Rosenberg Self-Esteem Scale [RSES; 49]**—The RSES is a 10-item measure of self-esteem and self-worth. It has a scale from 1–4 of strongly agree to strongly disagree for items focused on self-esteem such as, “I feel that I'm a person of worth, at least on an equal

plane with others.” The RSES is considered to be the most widely-used measure of self-esteem and has shown to be a reliable and valid measure across a number of studies [50,51]. It had excellent reliability in the current sample,  $\alpha = .92$ .

### Data Analytic Strategy

Prior to our analyses, the normality of all dependent variables was confirmed, the variables were mean-centered before computing the interaction term, and multicollinearity was examined and found not to be a problem for any of the analyses. The independent and interactive effects of weight discrepancy and actual:ideal nonappearance self-discrepancy were entered into multiple linear regression models as predictors of each outcome (i.e., eating disorder severity [EDE global], depression [BDI-II], anxiety [STAI], self-esteem [RSES], and clinical impairment [CIA]). All models were examined with and without BMI as a covariate, which did not significantly change the pattern of results. We removed participants for analyses when they had missing data. Analyses were based on available data without imputation. Only one participant was removed for one analysis.

### Results

The participants was comprised of 69.1% women, with 72.4% of individuals identifying as Caucasian ( $M_{\text{age}} = 39.38 \pm 13.51$  years, ranging from 18 to 64). The participants exhibited a mean body mass index (BMI) of  $35.00 \pm 8.54$  kg/m<sup>2</sup> (range = 21.41– 62.03; details of the study are available elsewhere; Peterson et al., under review). Within the sample, 11.6% met criteria for a current DSM-5 mood disorder diagnosis, and 19.6% met criteria for a current DSM-5 anxiety disorder. See Table 1 for descriptive statistics of the study’s major variables.

Table 2 displays the results of linear regression models. The main effects of actual:ideal weight discrepancy, actual:ideal nonappearance self-discrepancy, and their interaction were not significantly associated with eating disorder severity as measured by the EDE global score,  $F(3, 108) = 2.56, p = .06, R^2 = .07$ , or by reported binge frequency,  $F(3, 108) = 0.56, p = .65, R^2 = .02$ . A linear regression model including actual:ideal weight discrepancy, actual:ideal nonappearance self-discrepancy and their interaction indicated that greater actual:ideal nonappearance self-discrepancy was significantly related to higher depression symptoms as measured by the BDI-II, while actual:ideal weight discrepancy was not significantly related to depression symptoms. However, their interaction was not significantly associated with depression symptoms. The overall model accounted for 14% of the variance in BDI-II scores,  $F(3, 106) = 5.88, p < .01, * R^2 = .14$ . Similar to the depression model, greater actual:ideal nonappearance self-discrepancy was significantly associated with higher anxiety symptoms as measured by the STAI, while actual:ideal weight discrepancy and the interaction term were not significant. The model for anxiety accounted for 19% of the variance in STAI scores,  $F(3, 108) = 8.44, p < .001, * R^2 = .19$ .

With respect to self-esteem (i.e., RSES scores), there was a significant main effect of actual:ideal nonappearance self-discrepancy, such that greater nonappearance self-discrepancy was associated with lower self-esteem, while actual:ideal weight discrepancy was not significantly associated with self-esteem. The interaction term was also not



significant. The model accounted for 16% of variance in RSES scores,  $F(3, 108) = 6.98, p < .001, * R^2 = .16$ .

Finally, both actual:ideal nonappearance self-discrepancy and actual:ideal weight discrepancy had significant main effects on clinical impairment as measured by the CIA, such that greater nonappearance and weight discrepancies were independently related to higher levels of impairment. The interaction term was not significantly associated with the CIA. The model for impairment accounted for 14% of variance in CIA scores,  $F(3, 107) = 5.95, p = .001, * R^2 = .14$ .

## Discussion

The current study found that in a sample of individuals with BED, nonappearance self-discrepancy and weight discrepancy were not significantly related to the severity of ED symptoms, as measured by the EDE global score and binge eating frequency; however, both forms of self-discrepancy independently predicted eating disorder-related clinical impairment. Nonappearance self-discrepancy was also significantly related to depression, anxiety, and self-esteem, but weight discrepancy was not. These findings suggest that nonappearance self-discrepancy and weight discrepancy contribute uniquely to functioning in BED.

In the present sample, nonappearance actual:ideal discrepancy predicted emotions or mood-based symptoms, such as anxiety, depression, and self-esteem beyond the impact of weight discrepancy. This finding is consistent with some self-discrepancy literature showing that self-discrepancy across many constructs relates to mood and anxiety [6]. The finding may have important implications for understanding the etiology and maintenance of BED, given that some researchers argue that BED has a distinct neurobiological phenotype that is marked by emotional dysregulation [27]. Specifically, self-discrepancy in areas *outside* of shape and weight concerns may negatively impact the emotional health of those with BED, even in the absence of full-threshold mood and anxiety disorder diagnoses (in the current sample, 11.6 met criteria for a mood disorder and 19.6% met criteria for an anxiety disorder). This evidence suggests that BED interventions that address self-discrepancy broadly across multiple areas [e.g., ICAT; 7], as opposed to merely addressing overvaluation of shape and weight and binge eating symptoms, could be particularly useful to improve individuals' overall functioning and mood.

The current finding that both weight discrepancy and nonappearance self-discrepancy were independently related to clinical impairment also suggests that addressing each of these domains in the treatment of BED may be beneficial to a patient's overall functioning. Each domain may influence clinical impairment in a different manner. For instance, based on our results, perhaps nonappearance self-discrepancy influences impairment through emotion-based factors [52], while weight discrepancy through a pathway that may not be directly linked to ED psychopathology (e.g., weight-related quality of life factors). Furthermore, it suggests that BED treatment models should perhaps separate the influence of nonappearance and weight discrepancies in the maintenance cycle of the disorder. This shift in conceptualization is relevant to several eating disorder treatments and models (e.g., cognitive

behavioral therapy enhanced, the dual pathway model, and ICAT) that have focused on maintenance factors relevant to these constructs, such as the overvaluation of shape and weight, internalization of the thin ideal, body dissatisfaction, and nonappearance self-discrepancy [25,26,12]. In addition, during active treatment, new strategies could be used to address these constructs. For example, treatments could target nonappearance self-discrepancy and weight discrepancy through explicit discussion, education about the distinct impact of these various types of self-discrepancies, and application to the individual patient. BED patients could increase awareness of where their nonappearance self-discrepancies lie, and how to reduce them, as well as consider how extreme nonappearance self-discrepancies might affect their emotions. In addition, treatments could explicitly define the numeric value patients' current weight discrepancy and how this discrepancy might be impacting their quality of life. Subsequently, treatment might focus on helping these patients reduce these discrepancies or loosen any rigidity around these discrepancies. Part of the approach might also involve helping the patient set realistic and achievable self-standards.

The unexpected finding that nonappearance self-discrepancy and weight discrepancy were not related to eating disorder symptom severity in BED raises a number of questions, as this result runs contrary to research suggesting that self-discrepancy is linked to eating disorder symptoms [8,13,11]. However, it is noteworthy that these previous studies examined a slightly different question in that they included control group comparisons or looked at symptoms in an undergraduate sample, and therefore did not directly examine the relation of self-discrepancy to disorder severity *within* a BED group [13,11,8]. The current finding that neither discrepancy variable predicted either measure of BED-specific symptoms could also provide information on the nature of symptoms in BED; at the group level, behavioral and cognitive eating disorder symptoms (e.g., cognitive restraint and concerns about eating, weight, and shape) may not be a direct response to feelings of inadequacy or difficulty in meeting a self- standard, either related to one's weight or overall self-concept.

Additionally, given the positive associations between nonappearance self-discrepancy and negative affectivity found in the present study, it is possible that self-discrepancy may still have relevance to BED symptoms through an indirect path involving affective responding [52]. Theoretically, greater actual:ideal self-discrepancies may contribute to a higher intensity of negative affect [10], which could trigger binge eating symptoms as a strategy to reduce negative affect [e.g., 52,53]. This possibility may be true not just for self-discrepancy as an overarching construct but also especially for nonappearance self-discrepancy given the current findings. Specifically, nonappearance self-discrepancy may still be relevant to BED severity despite its lack of direct relation in the current study, in that self-discrepancy could contribute to BED symptoms through its impact on affect and mood. This possibility is supported by the significant relationship between nonappearance self-discrepancy, anxiety, and depression in the current study. Thus, it is conceivable that self-discrepancy may have played a role in the onset of BED symptoms by promoting negative affectivity in the first place. Then that negative affectivity may, in turn, maintain or predict BED symptoms independent of self-discrepancy. In addition, it may be that the effects of self-discrepancies on eating disorder symptoms play out on a shorter timescale that could not be captured with the methodology of the present study; for instance, momentary models [e.g., control theory; 54,55] suggest that goal discrepancies trigger states of cognitive rumination and negative

self-focus, which may in turn lead to episodes of eating disorder symptoms. Future longitudinal and intensive longitudinal (i.e., ecological momentary assessment) research is therefore warranted to investigate mediational models that examine potential indirect paths of self-discrepancy leading to negative affect, which then predicts BED symptoms.

Some limitations of the current study include its reliance on self-report data, as well as its cross-sectional nature which limit the current study's ability to draw causal conclusions, and suggests a need for future research to consider these questions in a longitudinal manner. In addition, it is possible that some of the words provided by participants on the CS (e.g., "happy") may have related to some of the outcomes in this study (e.g., depression). The sample also consisted of mostly Caucasian, female, treatment-seeking adults, thus limiting generalization to other demographic groups. However, the study's relatively large sample size improves the current findings' generalizability.

In conclusion, the current study suggests that nonappearance self-discrepancy and weight discrepancy are associated with emotional symptoms, self-concept, and the degree of eating disorder-related impairment. Given the relevance of emotional dysfunction in BED, it will be important for future longitudinal and intensive longitudinal research to investigate mechanisms by which self-discrepancies may indirectly relate to eating disorder symptoms. In addition, the distinct relevance of each type of discrepancy with respect to clinical impairment could inform future adaptations of treatments for BED, as targeting multiple types of self-discrepancies may serve to improve patients' quality of life and overall sense of self.

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## References

1. Becker DF, Grilo CM (2015) Comorbidity of mood and substance use disorders in patients with binge-eating disorder: associations with personality disorder and eating disorder pathology. *J Psychosom Res* 79 (2):159–164. 10.1016/j.jpsychores.2015.01.016 [PubMed: 25700727]
2. Crow SJ, Swanson SA, Peterson CB, Crosby RD, Wonderlich SA, Mitchell JE (2012) Latent class analysis of eating disorders: relationship to mortality. *J Abnorm Psychol* 121 (1):225. 10.1037/a0024455 [PubMed: 21707126]
3. Mitchell JE (2016) Medical comorbidity and medical complications associated with binge-eating disorder. *Int J Eat Disord* 49 (3):319–323. 10.1002/eat.22452 [PubMed: 26311499]
4. Pawaskar M, Witt EA, Supina D, Herman BK, Wadden TA (2017) Impact of binge eating disorder on functional impairment and work productivity in an adult community sample in the United States. *Int J Clin Pract* 71 (7):e12970. 10.1111/ijcp.12970
5. Linardon J (2018) Meta-analysis of the effects of cognitive-behavioral therapy on the core eating disorder maintaining mechanisms: implications for mechanisms of therapeutic change. *Cog Behav Ther* 47 (2):107–125. 10.1080/16506073.2018.1427785
6. Higgins ET, Klein R, Strauman T (1985) Self-concept discrepancy theory: A psychological model for distinguishing among different aspects of depression and anxiety. *Soc Cognit* 3 (1):51–76. 10.1521/soco.1985.3.1.51
7. Wonderlich SA, Peterson CB, Smith TL (2015) Integrative cognitive-affective therapy for bulimia nervosa: A treatment manual. Guilford Publications, New York

8. Strauman TJ, Vookles J, Berenstein V, Chaiken S, Higgins ET (1991) Self-discrepancies and vulnerability to body dissatisfaction and disordered eating. *J Person Soc Psychol* 61 (6):946. 10.1037/0022-3514.61.6.946
9. Higgins ET (1989) Self-discrepancy theory: What patterns of self-beliefs cause people to suffer? In: *Advances in experimental social psychology*, vol 22. Elsevier, Cambridge, MA, pp 93–136. doi:10.1016/S0065-2601(08)60306-8
10. Higgins ET (1987) Self-discrepancy: a theory relating self and affect. *Psychol Rev* 94 (3):319. 10.1037/0033-295X.94.3.319 [PubMed: 3615707]
11. Mason TB, Smith KE, Engwall A, Lass A, Mead M, Sorby M, Bjorlie K, Strauman TJ, Wonderlich S (2019) Self-discrepancy theory as a transdiagnostic framework: A meta-analysis of self-discrepancy and psychopathology. *Psychol Bull* 145 (4):372. 10.1037/bul0000186 [PubMed: 30640499]
12. Wonderlich SA, Peterson CB, Crosby RD, Smith TL, Klein MH, Mitchell JE, Crow SJ (2014) A randomized controlled comparison of integrative cognitive-affective therapy (ICAT) and enhanced cognitive-behavioral therapy (CBT-E) for bulimia nervosa. *Psychol Med* 44 (3):543–553. 10.1002/erv.2288 [PubMed: 23701891]
13. Mason TB, Lavender JM, Wonderlich SA, Crosby RD, Engel SG, Strauman TJ, Mitchell JE, Crow SJ, Le Grange D, Klein MH (2016) Self-discrepancy and eating disorder symptoms across eating disorder diagnostic groups. *Eur Eat Disord Rev* 24 (6):541–545. 10.1002/erv.2483 [PubMed: 27670130]
14. Szymanski ML, Cash TF (1995) Body-image disturbances and self-discrepancy theory: Expansion of the Body-Image Ideals Questionnaire. *J Soc Clin Psychol* 14 (2):134–146. 10.1521/jscp.1995.14.2.134
15. Lantz EL, Gaspar ME, DiTore R, Piers AD, Schaumberg K (2018) Conceptualizing body dissatisfaction in eating disorders within a self-discrepancy framework: a review of evidence. *Eat Weight Disord* 23 (3):275–291. 10.1007/s40519-018-0483-4 [PubMed: 29423688]
16. Anton SD, Perri MG, Riley JR (2000) Discrepancy between actual and ideal body images: Impact on eating and exercise behaviors. *Eat Behav* 1 (2):153–160. 10.1016/S1471-0153(00)00015-5 [PubMed: 15001058]
17. Gardner RM, Stark K, Friedman BN, Jackson NA (2000) Predictors of eating disorder scores in children ages 6 through 14: A longitudinal study. *J Psychosom Res* 49 (3):199–205. 10.1016/S0022-3999(00)00172-0
18. Siever MD (1994) Sexual orientation and gender as factors in socioculturally acquired vulnerability to body dissatisfaction and eating disorders. *J Consult Clin Psychol* 62 (2):252. 10.1037/0022-006X.62.2.252 [PubMed: 8201061]
19. Furnham A, Badman N, Sneade I (2002) Body image dissatisfaction: Gender differences in eating attitudes, self-esteem, and reasons for exercise. *J Psychol* 136 (6):581–596. 10.1080/00223980209604820 [PubMed: 12523447]
20. Barry DT, Grilo CM, Masheb RM (2003) Comparison of patients with bulimia nervosa, obese patients with binge eating disorder, and nonobese patients with binge eating disorder. *J Nerv Ment Dis* 191 (9):589–594. 10.1097/01.nmd.0000087185.95446.65 [PubMed: 14504568]
21. Telch CF, Stice E (1998) Psychiatric comorbidity in women with binge eating disorder: Prevalence rates from a non-treatment-seeking sample. *J Consult Clin Psychol* 66 (5):768. 10.1037/0022-006X.66.5.768 [PubMed: 9803695]
22. Hrabosky JI, Masheb RM, White MA, Grilo CM (2007) Overvaluation of shape and weight in binge eating disorder. *J Consult Clin Psychol* 75 (1):175. 10.1037/0021-843X.117.2.414 [PubMed: 17295577]
23. Lewer M, Nasrawi N, Schroeder D, Vocks S (2016) Body image disturbance in binge eating disorder: a comparison of obese patients with and without binge eating disorder regarding the cognitive, behavioral and perceptual component of body image. *Eat Weight Disord* 21 (1):115–125. 10.1007/s40519-015-0200-5 [PubMed: 26178486]
24. Grilo CM, Hrabosky JI, White MA, Allison KC, Stunkard AJ, Masheb RM (2008) Overvaluation of shape and weight in binge eating disorder and overweight controls: refinement of a diagnostic construct. *J Abnorm Psychol* 117 (2):414 [PubMed: 18489217]

25. Fairburn CG (2008) Cognitive behavior therapy and eating disorders. Guilford Press, New York. doi:10.1002/erv.928
26. Stice E (2001) A prospective test of the dual-pathway model of bulimic pathology: mediating effects of dieting and negative affect. *J Abnorm Psychol* 110 (1):124. 10.1037/0021-843X.110.1.124 [PubMed: 11261386]
27. Leehr EJ, Krohmer K, Schag K, Dresler T, Zipfel S, Giel KE (2015) Emotion regulation model in binge eating disorder and obesity—a systematic review. *Neurosci Biobehav Rev* 49:125–134. 10.1016/j.neubiorev.2014.12.008 [PubMed: 25530255]
28. Wonderlich SA, Engel SG, Peterson CB, Robinson MD, Crosby RD, Mitchell JE, Smith TL, Klein MH, Lysne CM, Crow SJ (2008) Examining the conceptual model of integrative cognitive-affective therapy for BN: Two assessment studies. *Int J Eat Disord* 41 (8):748–754. 10.1002/eat.20551 [PubMed: 18528869]
29. Holmes M, Fuller-Tyszkiewicz M, Skouteris H, Broadbent J (2015) Understanding the link between body image and binge eating: a model comparison approach. *Eat Weight Disord* 20 (1):81–89. 10.1007/s40519-014-0141-4 [PubMed: 25085315]
30. Tiggemann M (2005) Body dissatisfaction and adolescent self-esteem: Prospective findings. *J Body Image* 2 (2):129–135. 10.1016/j.bodyim.2005.03.006
31. Naumann E, Tuschen-Caffier B, Trentowska M, Caffier D, Svaldi J (2015) The effects of a self-esteem manipulation on body dissatisfaction in binge eating disorder. *J Exp Psychopathol* 6 (1):28–39. 10.5127/jep.040213
32. Paxton SJ, Neumark-Sztainer D, Hannan PJ, Eisenberg ME (2006) Body dissatisfaction prospectively predicts depressive mood and low self-esteem in adolescent girls and boys. *J Clin Child Adolesc Psychol* 35 (4):539–549. 10.1207/s15374424jccp3504\_5 [PubMed: 17007599]
33. First MB, Spitzer RL, Gibbon M, Williams JB (2002) Structured clinical interview for DSM-IV-TR axis I disorders, research version, patient edition. SCID-I/P New York, NY, USA.;
34. Fairburn CG (2008) Eating Disorder Examination (Edition 16.0D). In: *Cognitive Behavior Therapy and Eating Disorders*. Guilford Press, New York, pp 265–308
35. Fairburn CG, Cooper D, Phil DP, Zafra, Doll D, Phil HA, O'Connor ME, Bohn D, Phil DP, Kristin, Hawker DM, Wales JA, Palmer RL (2009) Transdiagnostic cognitive-behavioral therapy for patients with eating disorders: a two-site trial with 60-week follow-up. *Am J Psychiatry* 166 (3):311–319 [PubMed: 19074978]
36. Berg KC, Peterson CB, Frazier P, Crow SJ (2012) Psychometric evaluation of the eating disorder examination and eating disorder examination-questionnaire: A systematic review of the literature. *Int J Eat Disord* 45 (3):428–438. 10.1002/eat.20931 [PubMed: 21744375]
37. Shah J, Higgins ET (2001) Regulatory concerns and appraisal efficiency: The general impact of promotion and prevention. *J Person Soc Psychol* 80 (5):693
38. Higgins ET, Shah J, Friedman R (1997) Emotional responses to goal attainment: strength of regulatory focus as moderator. *J Person Soc Psychol* 72 (3):515. 10.1037/0022-3514.72.3.515
39. Shah J, Higgins ET (1997) Expectancy × value effects: Regulatory focus as determinant of magnitude and direction. *J Person Soc Psychol* 73 (3):447. 10.1037//0022-3514.73.3.447
40. Shah J, Higgins T, Friedman RS (1998) Performance incentives and means: how regulatory focus influences goal attainment. *J Person Soc Psychol* 74 (2):285. 10.1037/0022-3514.74.2.285
41. Bohn K, Doll HA, Cooper Z, O'Connor M, Palmer RL, Fairburn CG (2008) The measurement of impairment due to eating disorder psychopathology. *Behav Res Ther* 46 (10):1105–1110. 10.1016/j.brat.2008.06.012 [PubMed: 18710699]
42. Jenkins PE (2013) Psychometric validation of the Clinical Impairment Assessment in a UK eating disorder service. *Eat Behav* 14 (2):241–243. 10.1016/j.eatbeh.2012.12.001 [PubMed: 23557830]
43. Welch E, Birgegård A, Parling T, Ghaderi A (2011) Eating disorder examination questionnaire and clinical impairment assessment questionnaire: general population and clinical norms for young adult women in Sweden. *Behav Res Ther* 49 (2):85–91. 10.1016/j.brat.2010.10.010 [PubMed: 21185552]
44. Beck AT, Ward C, Mendelson M, Mock J, Erbaugh J (1961) Beck depression inventory (BDI). *J Arch Gen Psychiatry* 4 (6):561–571

45. Beck AT, Steer RA, Carbin MG (1988) Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clin Psychol Rev* 8 (1):77–100. 10.1016/0272-7358(88)90050-5
46. Spielberger CD (1983) State-trait anxiety inventory for adults. 10.1037/t06496-000
47. Barnes LL, Harp D, Jung WS (2002) Reliability generalization of scores on the Spielberger state-trait anxiety inventory. *Educ Psychol Meas* 62 (4):603–618. 10.1177/0013164402062004005
48. Spielberger C, Gorsuch RL, Lushene RIPA (1970) STAI manual for the State-Trait Inventory. Consult Psychol Press, Palo Alto
49. Rosenberg M (1965) Rosenberg self-esteem scale (SES). *Soc Adolesc Self-Image*
50. Blascovich J, Tomaka J (1991) Measures of self-esteem. In: *Measures of personality social psychological attitudes*, vol 1. San Diego, CA, pp 115–160
51. Gray-Little B, Williams VS, Hancock TD (1997) An item response theory analysis of the Rosenberg Self-Esteem Scale. *Personal Soc Psychol Bull* 23 (5):443–451. 10.1177/0146167297235001
52. Hilbert A, Tuschen-Caffier B (2007) Maintenance of binge eating through negative mood: A naturalistic comparison of binge eating disorder and bulimia nervosa. *Int J Eat Disord* 40 (6):521–530. 10.1002/eat.20401 [PubMed: 17573697]
53. Hawkins R, Clement PF (1984) Binge eating: Measurement problems and a conceptual model. In: *The binge purge syndrome: Diagnosis, treatment, research*. Springer Pub Co, New York, pp 229–251
54. Martin LL, & Tesser A (1989) Toward a motivational and structural theory of ruminative thought. In: *Uleman JS, & Bargh JA (ed) Unintended thought*. Guilford Press, New York, NY, US, pp 306–326
55. Martin LL, & Tesser A (1996) Some ruminative thoughts. In: *Wyer RS Jr. (ed) Ruminative thoughts*. Erlbaum, Hillsdale, NJ, pp 1–47



**What is already known on this subject?**

Self-discrepancy (i.e., the difference between what people perceive themselves to be and what they would like to be) is related to eating disorder symptoms, and shape and weight concerns appear to be a marker of binge eating disorder (BED) severity. However, little is known regarding how weight discrepancy (i.e., the difference between what a person weighs and what they would like to weigh) and self-discrepancy that is not related to appearance independently and interactively relate to BED and associated symptoms.

**What does this study add?**

Neither form of discrepancy directly related to BED symptoms, but that nonappearance self-discrepancy related positively to depression, anxiety, and self-esteem. In addition, both forms of discrepancy independently and negatively related to quality of life. These results could inform treatments by providing these potential treatment targets (i.e., nonappearance self-discrepancy and/or weight discrepancy), especially when addressing anxiety, depression, self-esteem, or quality of life among BED patients.

**Table 1.**

Descriptive Statistics for Major Variables.

Variable	Mean	Standard Deviation
BMI	35.00	8.54
EDE Global Score	2.63	.90
EDE Binge Frequency	15.75	10.73
BDI-II Total	15.03	10.00
STAI	48.45	11.29
RSES	3.16	1.77
CIA	23.03	9.69
Actual:ideal Nonappearance	7.33	1.70
Self-Discrepancy		
Actual:ideal Weight	54.94	41.49
Discrepancy		
Age	39.38	13.51

Acronyms: Body mass index (BMI), Eating Disorder Examination (EDE), BDI-II (Beck Depression Inventory II), State-Trait Anxiety Inventory (STAI), Rosenberg Self-Esteem Scale (RSES), Clinical Impairment Assessment (CIA).

**Table 2.**

Statistical results for regression analyses including beta values for each predictor.

<b>Outcome</b>	<b>Nonappearance Main Effect</b>	<b>Weight Main Effect</b>	<b>Nonappearance × Weight</b>
EDE Global	<i>beta = .11, p = .25</i>	<i>beta = .13, p = .16</i>	<i>beta = -.17, p = .06</i>
EDE Binge Frequency	<i>beta = .10, p = .29</i>	<i>beta = -.05, p = .64</i>	<i>beta = .05, p = .60</i>
BDI-II	<i>beta = .32, p = .001*</i>	<i>beta = .17, p = .07</i>	<i>beta = -.08, p = .35</i>
STAI	<i>beta = .43, p &lt; .001*</i>	<i>beta = .07, p = .44</i>	<i>beta = .02, p = .84</i>
RSES	<i>beta = -.38, p &lt; .001*</i>	<i>beta = -.14, p = .11</i>	<i>beta = -.02, p = .80</i>
CIA	<i>beta = .29, p &lt; .001*</i>	<i>beta = .21, p = .02*</i>	<i>beta = -.11, p = .22</i>

\*The asterisk indicates a significant result. The term “nonappearance” refers to main effect parameters of nonappearance self-discrepancy, and the term “weight” refers to main effect parameters of weight discrepancy. Acronyms: Body mass index (BMI), Eating Disorder Examination (EDE), BDI-II (Beck Depression Inventory II), State-Trait Anxiety Inventory (STAI), Rosenberg Self-Esteem Scale (RSES), Clinical Impairment Assessment (CIA).