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PERFECTIONISM, BODY DISSATISFACTION, AND SELF-ESTEEM: AN INTERACTIVE MODEL OF BULIMIC SYMPTOM DEVELOPMENT

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The hypothesis that perfectionism, body dissatisfaction, and self-esteem interact to predict bulimic symptom development was tested. This study replicates and extends previous findings (Vohs, Bardone, Joiner, Abramson, & Heatherton, 1999) demonstrating that the joint operation of perfectionism, perceived overweight status, and low self-esteem accounts, at least in part, for bulimic symptom development. Within the context of a longitudinal design, the current study, which used different measurement approaches and operationalizations than Vohs and colleagues, provided strong support for the model's ability to predict bulimic symptom

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development. Moreover, we tested whether the model displayed symptom specificity to bulimic symptoms, as opposed to anxiety and depressive symptoms. Although we found support for the model's specificity with regard to anxiety symptoms, development of depressive symptoms was also predicted by the model. Our findings refine the role of social psychological variables, such as perfectionism and self-esteem, in predicting bulimic symptoms and concomitant conditions.

Theorists, researchers, and practitioners have long believed that perfectionism is an integral component of eating disorders. Perfectionism, the desire to attain idealistic goals without failing (Brouwers & Wiggum, 1993; Slade, Newton, Butler, & Murphy, 1991), seems to drive disordered eating behaviors. Accordingly, many theories posit a link between perfectionism and eating disorders (Bastiani, Rao, Weltzin, & Kaye, 1995; Bruch, 1973; Davis, 1997; Hewitt, Flett, & Ediger, 1995). Despite such theories, previous attempts to empirically validate the relationship between perfectionism and eating disorders have been equivocal (Fryer, Waller, & Kroese, 1997; Minarik & Ahrens, 1996; Pliner & Haddock, 1996).

Recently, Joiner, Heatherton, Rudd, and Schmidt (1997) and Vohs, Bardone, Joiner, Abramson, and Heatherton (1999) proposed and validated a model of bulimic symptom development that conceptualizes perfectionism as the predisposing factor in a vulnerability-stress interaction. Joiner et al. (1997) and Vohs et al. (1999) found that high levels of perfectionism predict development of bulimic symptoms only when combined with perceptions of being overweight. Vohs et al. (1999) refined the vulnerability-stress argument by delineating the role of self-esteem as a moderator, showing that low self-esteem women are most susceptible to the perfectionism × perceived overweight interaction. The current paper extends the perfectionism × perceived weight status × self-esteem model by using different measurement approaches on a sample of participants that differed substantially from those in Vohs et al. (1999). Additionally, the model's symptom specificity is tested using standard measures of anxiety and depression. Convergent results with the findings of Vohs et al. (1999) would lend credence to the model, which could then be considered a robust predictor of bulimic symptom development.

PREVIOUS RESEARCH ON THE INTERRELATIONSHIP OF PERFECTIONISM AND BULIMIC SYMPTOMS

Eating disorders, which are characterized by a rigid desire to attain impossible standards of thinness, embody the nature of perfectionism. Pre-

vious research has not delineated the exact role of perfectionism in eating disorders, especially as it relates to bulimic symptoms. Although some investigations have reported a correlation between perfectionism and bulimic symptoms (Joiner et al., 1997; Rosch, Crowther, & Graham, 1991; Steiger, Leung, Puentes-Neuman, & Gottheil, 1992), others have failed to find a significant relationship (Blouin, Bushnik, Braaten, & Blouin, 1989; Frye et al., 1997; Hurley, Palmer, & Stretch, 1990).

One possible explanation for the inconsistent relationship between perfectionism and bulimic symptoms is that perfectionism is a multifaceted construct (Frost, Marten, Lahart, & Rosenblate, 1990; Hewitt & Flett, 1991). Nevertheless, research using multidimensional models has also failed to clarify the exact nature of the perfectionism-bulimia link. For instance, Minarik and Ahrens (1996) found that two subscales of the Multidimensional Perfectionism Scale (MPS; Frost et al., 1990), Concern Over Mistakes and Doubts About Actions, were significantly associated with measures of disordered eating patterns in nonclinical women. However, Minarik and Ahrens did not find an association between disordered eating measures and other dimensions of perfectionism, such as Personal Standards. Pliner and Haddock (1996) used an experimental setting to examine goal-setting behaviors in relation to self-oriented and socially prescribed perfectionism. Although Pliner and Haddock found that women with high scores on the Eating Attitudes Test (EAT; Garner, Olmstead, Bohr, & Garfinkel, 1982) exhibited more socially-prescribed perfectionism than women with low scores on the EAT, the two groups did not differ in self-oriented perfectionism. Additionally, research emphasizing positive (or adaptive) versus negative (or maladaptive) aspects of perfectionism has failed to yield clear findings. For instance, Terry-Short, Owens, Slade, and Dewey (1995) found that relative to controls, eating-disordered patients reported higher levels of both positive and negative forms of perfectionism.

In summary, previous research, which was generally conducted using correlational and atheoretical designs, had yielded inconsistent findings regarding the relationship between perfectionism and disordered eating. Despite its seemingly obvious connection, the role of perfectionism in predicting bulimic symptoms had been elusive.

PERFECTIONISM, PERCEIVED WEIGHT STATUS, AND SELF-ESTEEM PREDICT BULIMIC SYMPTOMS

Joiner et al. (1997) reconceptualized perfectionism as a predisposing factor in a vulnerability-stress model of bulimic symptoms. In their study of

undergraduate women, Joiner et al. predicted and found that women with perfectionistic tendencies exhibited bulimic symptoms only in conjunction with a self-perception of being overweight. Furthermore, Joiner et al. tested whether perceived weight status (a dichotomous variable created from participants' self-categorization of body weight) or actual weight status produced bulimic symptoms when combined with perfectionism. Their results demonstrate that only the perceived weight status × perfectionism interaction predicts bulimic symptom development.

Vohs et al. (1999) proposed that a moderating factor must exist to distinguish perfectionistic women who counter feeling overweight with goal-directed (i.e., weight-loss) behaviors from those who engage in counterproductive behaviors, such as binge eating. They posited that self-esteem moderates the two-way interaction of perfectionism × perceived weight status. Because self-esteem encompasses both cognitive expectations of success as well as positive feelings about the self (Heatherton & Vohs, 2000), Vohs et al. predicted that self-esteem modifies responses to self-perceptions of being overweight. They hypothesized that perfectionistic high self-esteem women would engage in goal-directed behaviors, whereas perfectionistic low self-esteem women would engage in counterproductive behaviors. Using a longitudinal design over an average of nine months, they found that the perfectionism × perceived weight interaction predicted increased bulimic symptoms among low self-esteem women, but not among high self-esteem women; even when high self-esteem women displayed the same vulnerability-stress conditions of perfectionism and perceived overweight as low self-esteem women, they did not show similar increases in bulimic symptoms. Moreover, the predictability of the three-way interaction of perfectionism × perceived weight status × self-esteem on Time 2 bulimic symptoms was independent of Body Mass Index (BMI) scores and Time 1 bulimic symptoms.

THE CURRENT STUDY

Despite empirical support for the interactive model of bulimic symptom development (Joiner et al., 1997; Vohs et al., 1999), some questions remain. For instance, although Vohs et al. (1999) proposed a general model of bulimic symptom development, the robustness of their longitudinal model has not been assessed using a variety of measurement approaches, distinct samples, or across different time frames. To test the strength of the model, the current study differs from Vohs et al. in the majority of these parameters.

The present study improves upon the Vohs et al. (1999) study in four significant ways. First, the samples selected for each study differ: Vohs et

al. tested the interactive model on a sample of women attending a selective Northeastern college (see Vohs, Heatherton, & Herrin, 2001), whereas the current study tests the interactive model on a sample of women from a Southern state university. Testing the model on a different sample of participants provides information on the model's generalizability. Second, the current study uses a different time period between assessments to examine the model's ability to detect change over a shorter period of time. Vohs et al. examined change in bulimic symptoms from participants' senior year of high school to first year of college (high school and college assessments were separated by an average of nine months), whereas the current study assesses changes in bulimic symptoms over five weeks. Testing the model's ability to predict change over only five weeks is a strong test of the model's sensitivity. Third, the present study varies measurement approaches and operationalization of predictor variables. Whereas Vohs et al. measured self-esteem using the State Self-Esteem Scale (SSES; Heatherton & Polivy, 1991), the current study uses the Rosenberg Self-Esteem Scale (RES; Rosenberg, 1965). Moreover, previous research using the interactive model has operationalized the stressor variable as perceived weight status (i.e., overweight vs. not overweight; Joiner et al., 1997; Vohs et al., 1999), whereas the present study operationalizes the stressor variable as body dissatisfaction. The use of different constructs and operationalizations test the model's construct validity, thereby allowing for a better understanding of the core aspects of the model.

Fourth, the current study tests the model's symptom specificity, an issue not addressed in the studies by Joiner et al. (1997) and Vohs et al. (1999). It is possible that perfectionism, body dissatisfaction, and self-esteem combine to predict psychological disorders in addition to bulimia. In particular, many studies have implicated mood disturbances, such as depression and anxiety, in the development of bulimic symptoms (for a discussion of bulimia as a mood disorder; see Benkert, Wetzel, & Szegedi, 1993; see also Frost et al., 1990; Minarik & Ahrens, 1996; Steiger, Leung, Puentes-Neuman, & Gottheil, 1992). Similarly, previous research has related perfectionism to the development of depression and anxiety symptoms (Hewitt & Flett, 1991). Therefore, the current study uses the three-way interaction of perfectionism × body dissatisfaction × self-esteem to predict change in anxiety and depressive symptoms as a method of assessing the model's symptom specificity. Without tests of symptom specificity, it is unclear whether the model is specific to bulimic symptoms or is a more general model that can predict a variety of symptoms.

In summary, the current study seeks to provide further empirical validation of the interrelationships among perfectionism, body dissatisfaction, self-esteem, and bulimic symptoms and does so by varying the

methods used to test the model. The current study also allows for an examination of the model's symptom specificity, an important consideration. The present study advances our knowledge of the model's abilities and allows for a test of its robustness.

METHOD

PARTICIPANTS

Participants were 70 women from an Introductory Psychology class at a Southern state university. The majority of participants were single (98%) and between 18 and 20 years of age (89%). Ethnic breakdown was as follows: Caucasian (72%); Asian American (11%); Hispanic (11%); African American (5%); 1% were classified as Other. Participants were given class credit in return for their participation under conditions of full informed consent.

PROCEDURE

At initial assessment (Time 1), participants were informed that they would be filling out questionnaires about their personal feelings and attitudes and were asked to return in five weeks for a second session (Time 2). At both Time 1 and Time 2 assessments, participants completed the same packet of materials, which consisted of the Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979), the Beck Anxiety Inventory (BAI; Beck & Steer, 1993), and the Eating Disorders Inventory (EDI; Garner, Olmstead, & Polivy, 1983). The EDI consists of 64 items that form eight subscales: Bulimia, Drive for Thinness, Body Dissatisfaction, Perfectionism, Interpersonal Distrust, Maturity Fears, Interoceptive Awareness, and Ineffectiveness. All subscales were scored continuously, using the entire response scale rather than setting the three lowest values to 0. The current study focused on the subscales of Perfectionism, Body Dissatisfaction, and Bulimia.

PREDICTOR VARIABLES

We measured perfectionism using the EDI-Perfectionism subscale, which is comprised of six items to which participants respond using a 6-point scale (1 = never; 6 = always). The perfectionism subscale includes

questions such as, "I hate being less than best at things." Higher scores indicate higher perfectionism.

The EDI-Perfectionism subscale has been established as a reliable and valid measure. α internal consistency coefficient in the current study was .86, similar to that reported in Vohs et al. (1999). Additionally, Joiner and Schmidt (1995) found that this subscale yields adequate test-retest reliability (.64 and .68, repectively). Last, the EDI-Perfectionism subscale relates to other constructs (e.g., depression) in a manner consistent with studies using other perfectionism measures (Joiner & Schmidt, 1995).

To broaden the theoretical underpinnings of the model, we used the Body Dissatisfaction subscale of the EDI as the "stressor" variable hypothesized to activate perfectionistic tendencies. Body dissatisfaction replaces perceived weight status, which was the operationalization of the "stressor" variable in Joiner et al. (1997) and Vohs et al. (1999). Vohs et al. found that perceived weight status (overweight vs. not overweight, a dichotomous variable derived from participants' self-categorization of weight) was highly negatively correlated with body satisfaction, $r(339) = -.61$. The EDI-Body Dissatisfaction subscale asks participants to respond to nine items that assess satisfaction with size and shape of specific parts of the body, such as "I think my hips are too big," using a scale ranging from 1 to 6, where 1 = always and 6 = never. Coefficient α in this sample was .75. Lower scores indicate greater body dissatisfaction.

Self-esteem was measured using the RSE (Rosenberg, 1965). The RSE is a reliable, valid, and commonly used 10-item scale (Blascovich & Tomaka, 1991). Participants are asked to respond using a four-point scale (1 = strongly disagree; 4 = strongly agree) to questions such as "On the whole, I am satisfied with myself." Coefficient α in this sample was .83, similar to that reported by Blascovich and Tomaka (1991). Higher RSE scores indicate higher self-esteem.

DEPENDENT MEASURES

To assess the robustness of the interactive model, we used the EDI-Bulimia subscale as our measure of bulimic symptoms. Using a scale ranging from 1 to 6 (where 1 = never and 6 = always), participants rated their agreement with seven statements designed to assess bingeing (e.g., "I eat moderately in front of others and stuff myself when they are gone,") and purging (e.g., "I have the thought of trying to vomit in order to lose weight."). Coefficient α was .77. Higher scores indicate more severe bulimic symptoms.

To assess the symptom specificity component, we tested the model on standard measures of depression and anxiety symptoms. Depressive symptoms were assessed using the BDI (Beck et al., 1979), a 21-item self-report inventory comprised of items that are rated on a 0 to 3 scale. Although the BDI is not indicative of the full clinical syndrome of depression, it is a reliable and well-validated measure of depressive symptomatology (for a review see Beck, Steer, & Garbin, 1988). Coefficient α was .84. Higher scores indicate higher levels of depressive symptoms.

To assess anxiety symptoms, we used the Beck Anxiety Inventory BAI (Beck & Steer, 1993). The BAI is a 21-item self-report inventory that assesses general symptoms of anxiety. Individual items are rated on a 0 to 3 scale. In a variety of clinical and nonclinical populations, the BAI's reliability, convergence with other anxiety measures, and discriminant validity with respect to depression measures have been supported (Beck, Epstein, Brown, & Steer, 1988; Beck & Steer, 1993; Clark & Watson, 1991; Steer, Rissmiller, Ranieri, & Beck, 1993). Coefficient α was .90. Higher scores indicate higher levels of anxiety symptoms.

RESULTS

DESCRIPTIVE ANALYSES

Means and standard deviations for Time 1 measures of perfectionism, body dissatisfaction, and self-esteem, as well as assessments of bulimic, depressive, and anxiety symptoms at Times 1 and 2 are presented in Table 1. Zero-order correlations between all measures are also given in Table 1. As can be seen, EDI-Bulimia scores at Time 2 were weakly correlated with EDI-Perfectionism scores at Time 1, $r(68) = -.14$, p = ns, and EDI-Body Dissatisfaction scores at Time 1, $r(68) = .08$, p = ns. Time 2 EDI-Bulimia scores were modestly related to RSE scores at Time 1, $r(68) = -.39$, $p = .001$ (similar to that reported in Vohs et al., 1999), in that lower self-esteem was related to higher bulimic symptoms. In examining the correlations among predictor variables, we found a moderate correlation between scores on the EDI-Perfectionism and EDI-Body Dissatisfaction subscales, $r(68) = .37$, $p = .001$, such that higher perfectionism was related to less body dissatisfaction. We found lower correlations between EDI-Perfectionism and RSE scores, $r(68) = .28$, $p<.05$, and EDI-Body Dissatisfaction and RSE scores, $r(68) = .09$, $p = ns$. The intercorrelations among predictor variables were not high enough to indicate multicollinearity. Among dependent measures, we found only a

Table 1. Descriptive Data and Intercorrelations for Predictor and Dependent Measures

Measure	1	2	3	4	5	6	7	8	9
1. EDI-Perfectionism	-								
M = 14.25									
SD = 7.02									
2. EDI-BD	.37	-							
M = 17.27									
SD = 4.50									
3. RSE	28	.09	-						
M = 11.20									
SD = 6.81									
4. EDI-Bulimia Time	-.15	.08	-.45	-					
M = 7.54									
SD = 5.29									
5. EDI-Bulimia Time	-.14	.08	-.39	.63	-				
M = 7.13									
SD = 4.22									
6. BDI Time	-.23	-.25	-.45	.10	.20	-			
M = 6.41									
SD = 6.01									
7. BDI Time	-.26	-.23	-.26	.01	.16	.58	-		
M = 6.64									
SD = 7.90									
8. BAI Time	-.04	-.03	-.45	.43	.38	.24	.21	-	
M = 12.51									
SD = 9.55									
9. BAI Time	-.19	-.17	-.36	.22	.35	.50	.67	.57	-
M = 8.59									
SD = 7.92									

Note. Perfectionism, body dissatisfaction, and self-esteem refer to Time 1 assessments. RSE stands for Rosenberg Self-Esteem Scale (Rosenberg, 1965); higher scores represent higher self-esteem levels. EDI stands for Eating Disorder Inventory (Garner, Olmstead, & Polivy, 1983). EDI-BD stands for the Body Dissatisfaction subscale of the EDI; lower scores indicate greater body dissatisfaction. Perfectionism represents scores on the EDI-Perfectionism scale; higher scores indicate greater perfectionism. EDI-Bulimia, BDI, and BAI scores were assessed at Time 1 and Time 2. For all correlations, degrees of freedom = 70. Correlations >.23 are significant at the .05 level; correlations > .30 are significant at the .01 level; correlations > .37 are significant at the .001 level.

weak correlation between EDI-Bulimia and BDI scores at both assessments, $r(68) = .10$ at Time 1 and $r(68) = .16$ at Time 2, both $ps = ns$, whereas we found a moderate correlation between EDI-Bulimia and BAI scores, $r(68) = .43$ at Time 1 and $r(68) = .35$ at Time 2, both $ps < .01$. Table 1 shows the intercorrelations among the predictor and dependent measures.

Prediction of Bulimic Symptoms by the Interaction of Perfectionism, Body Dissatisfaction, and Self-Esteem. Following the procedures used by Joiner et al. (1997) and Vohs et al. (1999), as well as those recommended by Cohen and Cohen (1983), we conducted a hierarchical multiple regression/correlation procedure on Time 2 EDI-Bulimia scores to test our predictions. Where appropriate, skewed variables were square root transformed (i.e., Time 1 EDI-Perfectionism, Time 1 and Time 2 EDI-Bulimia; for similar operations see Joiner et al., 1997 and Vohs et al., 1999), following procedures suggested by Cohen and Cohen (1983). The two- and three-way interaction terms were calculated by multiplying Time 1 scores on a given measure with Time 1 scores on a second measure (or the multiplication of scores on three Time 1 measures, as in the case of the three-way interaction of Time 1 scores of perfectionism, body dissatisfaction, and self-esteem) to yield one variable that represents the combination of two or more variables.

Our primary regression analysis centered on Time 2 EDI-Bulimia scores as predicted by Time 1 assessments of perfectionism, body dissatisfaction, and self-esteem while controlling for Time 1 EDI-Bulimia scores, as well as Time 1 and Time 2 BDI and BAI scores. This method of analysis assesses the predictability of perfectionism, body dissatisfaction, and self-esteem on bulimic symptom development independent of depression and anxiety symptoms.

For the first step, Time 1 EDI-Bulimia scores were entered into the regression equation with Time 2 EDI-Bulimia scores as the dependent measure. This step created a residual change score of bulimic symptoms. Next, we simultaneously entered Time 1 and Time 2 BDI and BAI scores to statistically control for the effects of depression and anxiety symptoms on EDI-Bulimia scores. At Step 3, we simultaneously entered Time 1 EDI-Perfectionism, EDI-Body Dissatisfaction, and RSE scores to assess the simple effects of the predictor variables. At the next step, Step 4, we simultaneously entered Time 1 two-way interactions of EDI-Perfectionism × EDI-Body Dissatisfaction, EDI-Perfectionism × RSE, and EDI-Body Dissatisfaction × RSE as a set. Lastly, in Step 5, we entered the three-way interaction of EDI-Perfectionism × EDI-Body Dissatisfaction × RSE at Time 1. The three-way interaction is the critical test of our prediction that perfectionism, body dissatisfaction, and self-esteem interact to predict changes in bulimic symptoms independent of depression and anxiety symptoms. Table 2 displays the steps detailed above and the results.

As seen in Table 2, the regression analysis revealed support for our hypothesis that perfectionism, body dissatisfaction, and self-esteem interact to predict bulimic symptoms. The only significant predictors of Time 2 EDI-Bulimia scores are Time 1 EDI-Bulimia scores, $pr = .66$, $p<.0001$,

Table 2. Perfectionism, Body Dissatisfaction, Self-Esteem and Their Three-Way Interaction Predicting Time 2 EDI-Bulimia Scores

Order of entry of set	Predictors in set	*F* for set	*t* for within set predictors	*df*	Partial correlation	Model R^2 (ΔR^2)
1.	Time 1 EDI-Bulimia	51.63	7.19***	1, 68	.66	.66 (.66)
2.	BDI, BAI covariates	1.33		4, 64	.31	.69 (.03)
	Time 1 BDI		.38		.05	
	Time 2 BDI		-.09		-.01	
	Time 1 BAI		.32		.04	
	Time 2 BAI		1.16		.14	
3.	Main effects	.37		3, 61	.15	.69 (.00)
	EDI-Perfectionism		-.57		-.07	
	EDI-BD		.71		.09	
	RSE		-.62		-.08	
4.	Two-way interactions	.37		3, 58	.15	.70 (.01)
	Perfectionism × EDI-BD		.79		.10	
	Perfectionism × RSE		-.48		-.05	
	EDI-BD × RSE		.28		.04	
5.	Three-way interaction	4.38*		1, 57	.27	.73 (.03)
	Perfectionism × EDI-BD × RSE		2.09*		.27	

Note. Perfectionism, body dissatisfaction, and self-esteem refer to Time 1 assessments. RSE stands for Rosenberg Self-Esteem Scale (Rosenberg, 1965); higher scores represent higher self-esteem levels. EDI stands for Eating Disorder Inventory (Garner, Olmstead, & Polivy, 1983). EDI-BD stands for the Body Dissatisfaction subscale of the EDI; lower scores indicate greater body dissatisfaction. Perfectionism represents scores on the EDI-Perfectionism scale; higher scores indicate greater perfectionism. BDI stands for Beck Depression Inventory (Beck et al., 1979). BAI stands for Beck Anxiety Inventory (Beck & Steer, 1993). ΔR^2 = change in R^2 with the addition of each step in the regression. Partial correlation = *PR/pr*, where *PR* = multiple partial correlations for a set of predictors and *pr* = partial correlation for within set predictors. *$p < .05$; ***$p < .001$.

and the three-way interaction, $pr = .27$, $p = .04$; no simple effects or higher-order interactions significantly predicted Time 2 EDI-Bulimia scores. Thus, even after statistically controlling for the effects of depression and anxiety[1], the interaction of perfectionism, body dissatisfaction, and self-esteem was a unique predictor of change in bulimic symptoms.

To reveal the nature of the interaction, residual change scores for EDI-Bulimia were computed following procedures outlined by Cohen and Cohen (1983, pp. 323, 419). Residual change scores were computed by entering values representing "high" and "low" scores for the predictor variables of perfectionism, body dissatisfaction, and self-esteem (using 1.5 standard deviations above and below the mean for "high" and "low" scores, respectively) into the regression equation presented in Table 2. Mean scores were entered for the co-variates, Time 1 EDI-Bulimia, and Time 1 and Time 2 BDI and BAI scores. As can be seen in Figure 1, the greatest increase in EDI-Bulimia scores from Time 1 to Time 2 occurred in perfectionistic women who are dissatisfied with their bodies and who have low self-esteem (i.e., women with high EDI-Perfectionism scores, low EDI-Body Dissatisfaction scores, and low RSE scores). EDI-Bulimia residual change scores were much lower for all other combinations of variables. Consistent with the findings of Vohs et al. (1999), the interactive model of perfectionism × body dissatisfaction × self-esteem predicted development of bulimic symptoms.

Specificity to Bulimic Symptoms. To assess the symptom specificity component of the model, we conducted hierarchical multiple regression/correlation procedures to predict change in BDI and BAI scores (see Cohen & Cohen, 1983). If the interactive model of perfectionism × body dissatisfaction × self-esteem is specific to bulimic symptom development, attempts to predict depression and anxiety symptom change should be non-significant.

For Step 1, we created a residual BDI change variable by entering Time 1 BDI scores into the regression equation with Time 2 BDI scores as the dependent measure. For Step 2, we simultaneously entered Time 1 and Time 2 BAI and EDI-Bulimia scores. This step allows us to statistically control for the effects of anxiety and bulimic symptoms. Next, we simultaneously entered Time 1 EDI-Perfectionism, EDI-Body Dissatisfaction, and RSE scores to assess the effects of the predictor variables on change in BDI

1. Body mass index (BMI) data were also available for 55 of our participants ($M = 23.4$, $SD = 4.46$), which we used as a co-variate in our model. Entering BMI (which is calculated by dividing weight in kilograms by height in meters squared) as a co-variate in the hierarchical regression analysis predicting change in EDI-Bulimia scores yielded results similar in direction, magnitude, and significance to those obtained without BMI scores (for comparable findings, see Vohs et al., 1999).

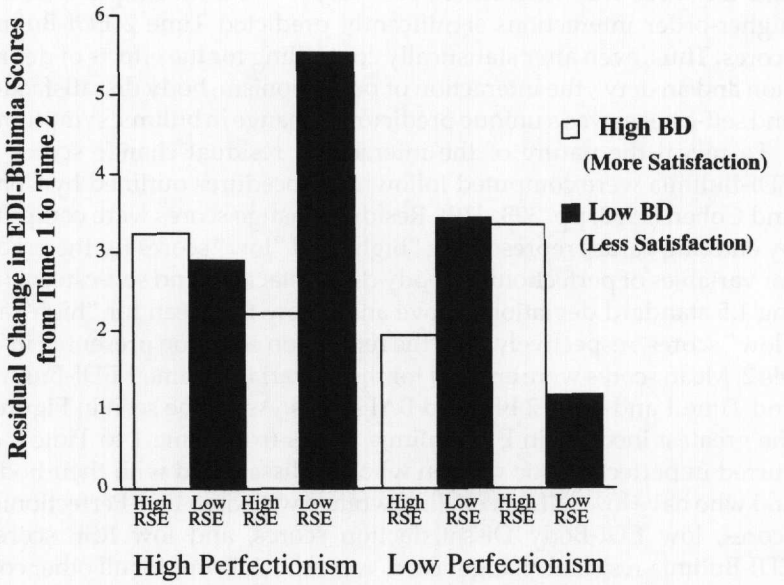

FIGURE 1. Perfectionism, body dissatisfaction, and self-esteem refer to Time 1 assessments. *EDI* stands for Eating Disorder Inventory (Garner, Olmstead, & Polivy, 1983). *RSE* stands for Rosenberg Self-Esteem Scale (Rosenberg, 1965); higher scores represent higher self-esteem levels. *BD* stands for the Body Dissatisfaction subscale of the EDI; lower scores indicate greater body dissatisfaction. *Perfectionism* represents scores on the EDI-Perfectionism scale; higher scores indicate greater perfectionism. Individuals predicted to show the greatest increase in bulimic symptoms from Time 1 to Time 2 is represented by the high perfectionism, low BD, low RSE group (i.e., perfectionistic women who are dissatisfied with their bodies and who have low self-esteem).

scores. At Step 4, we simultaneously entered Time 1 two-way interactions of EDI-Perfectionism × EDI-Body Dissatisfaction, EDI-Perfectionism × RSE, and EDI-Body Dissatisfaction × RSE as a set. In Step 5, we entered the Time 1 three-way interaction of EDI-Perfectionism × EDI-Body Dissatisfaction × RSE. The three-way interaction is the crucial test of the model's specificity. Table 3 displays the steps detailed above and the results.

As can be seen in Table 3, the three-way interaction of perfectionism, body dissatisfaction, and self-esteem also predicts change in BDI scores, $pr = .36$, $p < .05$. To properly understand the interaction effects, we again computed BDI residual change using "high" and "low" combinations of each predictor variable by entering values of 1.5 standard deviations above and below the mean (Cohen & Cohen, 1983, pp. 323, 419). Mean values were entered in place of the co-variates of Time 1 BDI scores, and Time 1 and Time 2 BAI and EDI-Bulimia scores. These computations re-

Table 3. Perfectionism, Body Dissatisfaction, Self-Esteem and Their Three-Way Interaction Predicting Time 2 BDI Scores

Order of entry of set	Predictors in set	*F* for set	*t* for within set predictors	*df*	Partial correlation	Model R^2 (ΔR^2)
1.	Time 1 BDI	35.02	5.92***	1, 68	.58	.58 (.58)
2.	BAI, EDI-Bul covariates	8.32***		4, 64	.64	.75 (.17)
	Time 1 BAI		-1.82		-.22	
	Time 2 BAI		5.53***		.57	
	Time 1 EDI-Bul		-.70		-.09	
	Time 2 EDI-Bul		-.09		-.01	
3.	Main effects	.38		3, 61	.15	.76 (.01)
	EDI-Perfectionism		-.92		-.12	
	EDI-BD		-.16		-.02	
	RSE		.03		.00	
4.	Two-way interactions	3.36*		3, 58	.41	.80 (.04)
	Perfectionism × EDI-BD		2.29*		.29	
	Perfectionism × RSE		-1.19		-.15	
	EDI-BD × RSE		-2.25*		-.28	
5.	Three-way interaction	7.74*		1, 57	.36	.82 (.02)
	Perfectionism × EDI-BD × RSE		2.78*		.36	

Note. Perfectionism, body dissatisfaction, and self-esteem refer to Time 1 assessments. RSE stands for Rosenberg Self-Esteem Scale (Rosenberg, 1965); higher scores represent higher self-esteem levels. EDI stands for Eating Disorder Inventory (Garner, Olmstead, & Polivy, 1983). EDI-BD stands for the Body Dissatisfaction subscale of the EDI; lower scores indicate greater body dissatisfaction. Perfectionism represents scores on the EDI-Perfectionism scale; higher scores indicate greater perfectionism. EDI-Bul stands for the Bulimia subscale of the EDI; higher scores indicate more severe bulimic symptoms. BDI stands for Beck Depression Inventory (Beck et al., 1979). BAI stands for Beck Anxiety Inventory (Beck & Steer, 1993). ΔR^2 = change in R^2 with the addition of each step in the regression. Partial correlation = PR/pr, where PR = multiple partial correlations for a set of predictors and pr = partial correlation for within set predictors. *p <.05; **p < .01; ***p < .001.

Table 4. Perfectionism, Body Dissatisfaction, Self-Esteem and Their Three-Way Interaction Predicting Time 2 BAI Scores

Order of entry of set	Predictors in set	*F* for set	*t* for within set predictors	*df*	Partial correlation	Model R^2 (ΔR^2)
1.	Time 1 BAI	31.98	5.66***	1, 68	.57	.57 (.57)
2.	BDI, EDI-Bul covariates	14.98***		4, 64	.74	.81 (.24)
	Time 1 BDI		.97		.12	
	Time 2 BDI		5.53***		.57	
	Time 1 EDI-Bul		-.41		-.05	
	Time 2 EDI-Bul		1.16		.14	
3.	Main effects	.09		3, 61	.07	.81 (.00)
	EDI-Perfectionism		-.10		-.02	
	EDI-BD		-.21		-.03	
	RSE		.46		.06	
4.	Two-way interactions	1.85		3, 58	.31	.83 (.02)
	Perfectionism × EDI-BD		-1.80		-.23	
	Perfectionism × RSE		1.41		.18	
	EDI-BD × RSE		-.04		-.01	
5.	Three-way interaction	.22		1, 57	.07	.83 (.00)
	Perfectionism × EDI-BD × RSE		-.47		-.07	

Note. Perfectionism, body dissatisfaction, and self-esteem refer to Time 1 assessments. RSE stands for Rosenberg Self-Esteem Scale (Rosenberg, 1965); higher scores represent higher self-esteem levels. EDI stands for Eating Disorder Inventory (Garner, Olmstead, & Polivy, 1983). EDI-BD stands for the Body Dissatisfaction subscale of the EDI; lower scores indicate greater body dissatisfaction. Perfectionism represents scores on the EDI-Perfectionism scale; higher scores indicate greater perfectionism. EDI-Bul stands for the Bulimia subscale of the EDI; higher scores indicate more severe bulimic symptoms. BDI stands for Beck Depression Inventory (Beck et al., 1979). BAI stands for Beck Anxiety Inventory (Beck & Steer, 1993). ΔR^2 = change in R^2 with the addition of each step in the regression. Partial correlation = PR/pr, where PR = multiple partial correlations for a set of predictors and pr = partial correlation for within set predictors. ***$p < .001$.

vealed that the form of the interaction is similar to that shown in Figure 1. Specifically, depressive symptoms increased the most among perfectionistic women who were dissatisfied with their bodies and had low self-esteem (i.e., women who exhibited high EDI-Perfectionism scores, low EDI-Body Dissatisfaction scores, and low RSE scores).

Predicting change in BAI scores. Using the same regression/correlation procedures to predict change in BDI scores, we examined change in BAI scores as predicted by the interactive model. For Step 1, we regressed Time 1 BAI scores onto Time 2 BAI scores to create a residual change variable. For Step 2, we simultaneously entered Time 1 and Time 2 BDI and EDI-Bulimia scores as co-variates to statistically control for the influence of depression and bulimic symptoms. For Step 3, we simultaneously entered Time 1 EDI-Perfectionism, EDI-Body Dissatisfaction, and RSE scores to assess their simple effects on change in BAI scores. Next, we simultaneously entered Time 1 two-way interactions of EDI-Perfectionism × EDI-Body Dissatisfaction, EDI-Perfectionism × RSE, and EDI-Body Dissatisfaction × RSE as a set. Finally, we entered the Time 1 three-way interaction of EDI-Perfectionism × EDI-Body Dissatisfaction × RSE to test the ability of our model to predict change in anxiety symptoms. Table 4 displays the steps detailed above and the results.

As seen in Table 4, the EDI-Perfectionism × EDI-Body Dissatisfaction × RSE interaction did not predict change in BAI scores from Time 1 to Time 2, $pr = -.07$, p = ns. Thus, the model achieves specificity with respect to predicting the development of anxiety, but not depressive, symptoms.

DISCUSSION

We tested a model of bulimic symptom development that had previously been shown to predict change in bulimic symptoms among a large sample of women attending a private, Northeastern college (Vohs et al., 1999). This three-way model grew from a vulnerability-stress model of bulimic symptoms (Joiner et al., 1997) that proposed that perceiving oneself as overweight is a stressor that may lead to bulimic symptoms in perfectionistic women. Vohs et al. extended this reasoning to include self-esteem as a moderator of the perfectionism × perceived weight status interaction. They posited that because low self-esteem embodies both low expectations and negative feelings about the self (Heatherton & Vohs, 2001), women who have low self-esteem would be more likely to display counterproductive behavior, such as binge eating, in the presence of weight-related stressors. In support of such reasoning, Vohs et al. found that the perfectionism × perceived weight status interaction pre-

dicts development of bulimic symptoms only among low self-esteem women.

The present study corroborated and extended the findings of Vohs et al. (1999) using new measures and operationalizations of predictor variables, a different time period between assessments, and a sample of women at a large Southern university. The current study found that change in EDI-Bulimia scores were predicted by the three-way interaction of EDI-Perfectionism scores, EDI-Body Dissatisfaction scores, and RSE scores. As predicted, this interaction revealed that the combination of perfectionistic attitudes and body dissatisfaction are related to increased bulimic symptoms, but only among low self-esteem women. These supportive findings bolster the previous findings of Vohs et al. (1999) and Joiner et al. (1997) by demonstrating the robustness of the model. Together, the findings of three independent investigations attest to the model's ability to predict bulimic symptom development.

It is interesting to note that the current study found negative correlations among EDI-Perfectionism scores and EDI-Bulimia scores as Time 1 and Time 2 (such that higher perfectionism was related to somewhat lower bulimic symptoms), whereas Vohs et al. (1999) found positive associations among these same measures. These discrepant findings support our contention that on its own, perfectionism is a poor predictor of bulimic symptoms and is most predictive of bulimic symptoms in a higher-order manner.

In addition to predicting the development of bulimic symptoms, the current study tested the model's symptom specificity with respect to development of anxiety and depressive symptoms. After statistically controlling for the presence of related symptoms (such as baseline anxiety and bulimic symptoms when predicting change in depressive symptoms), we found that the interactive model does not predict change in anxiety symptoms. Interestingly, we found that the three-way interaction of perfectionism, body dissatisfaction, and self-esteem does predict development of depressive symptoms; our results suggest that the combination of these variables may affect not only weight-related responses, such as bulimic cognitions and behaviors, but also depressive symptomatology.

Psychopathology researchers, clinicians, and neuroscientists have long noted the relationship between depression and bulimia (Fava, Copeland, Schweiger, & Herzog, 1989; Hewitt & Flett, 1991; Lee, Rush, & Mitchell, 1985). Particularly germane to the present findings is research that reports relationships between variables in the interactive model and depressive symptoms. For instance, Joiner, Wonderlich, Metalsky, and Schimdt (1995) found that both depressive and bulimic, but not anxious, symptoms were related to body dissatisfaction. Moreover, in a sample of

bulimic women and controls, Joiner et al. (1995) found that body dissatisfaction was related to depressive symptoms but not to group status (i.e., bulimic versus control). Similarly, Fava and colleagues (Fava et al., 1997) found that among outpatients with major depressive disorder, antidepressant medication brought about a significant decrease in depressive symptoms that, in turn, was related to a significant decrease in scores on the EDI-Perfectionism and EDI-Bulimia subscales.

The relationship between bulimic symptoms and depressed affect has also been examined from a social psychological perspective. Higgins, Strauman, and colleagues (Strauman, Vookles, Berenstein, Chaiken, & Higgins, 1991) have applied Higgins's (1987) self-discrepancy theory to eating disorder symptomatology. Self-discrepancy theory focuses on the gaps between current and desired states and, is therefore consistent with the conceptualization of the body dissatisfaction variable in the current study. In support of our findings, Strauman et al. (1991) have shown that actual:ideal discrepancies, which have been associated with dissatisfaction with the self and depressive symptomatology (Strauman & Higgins, 1988), are specifically related to bulimic behavior.

An interesting possibility is that any stressor, including but not limited to body dissatisfaction, may impinge upon perfectionism and low self-esteem to eventuate in depressive symptoms, whereas only body dissatisfaction (and related experiences) impinges on perfectionism and low self-esteem to result in bulimic symptoms. If so, this would explain patterns of co-morbidity between depressive and bulimic symptoms—that is, bulimia is virtually always accompanied by depression (perhaps because the stressor that eventuates in bulimic symptoms also results in depressive symptoms)—whereas depression may or may not be accompanied by bulimic symptoms (because the stressor that eventuates in depressive symptoms may not be relevant to bulimic symptoms). Evaluation of this possibility represents an interesting area for future research.

It is necessary to note that diagnoses of bulimia include both a binge aspect and a purge aspect. Although it could be said that women who do not display the critical combination of high perfectionism, body dissatisfaction, and low self-esteem may simply "buckle down" (i.e., show greater compensatory behaviors) in response to perceived weight- or body-related stressors, the repeated ability of the interactive model to predict change in general bulimic symptoms should allay such arguments. Moreover, previous research indicates that binge and purge symptoms are not distinct aspects of a global bulimia factor in women (Joiner, Vohs, & Heatherton, 1999).

There are limitations to the present study. One drawback is that the data were obtained using self-report measures, a method that has been

criticized on several grounds (e.g., self-presentational biases; Fairburn & Beglin, 1994). Despite these concerns, the convergent findings between the current study and those of Vohs et al. (1999) and of Joiner et al. (1997) strongly support the model's validity and generalizability. Second, our measures of body dissatisfaction and perfectionism deserve comment. The EDI-Body Dissatisfaction subscale emphasizes satisfaction with size and shape of body parts, but not body weight or other aspects of body perception. However, we note that the findings of the current study, which replaced perceived weight status with body dissatisfaction as the "stressor" variable, conceptually replicate the findings of our previous work (Vohs et al., 1999), and therefore diminish this limitation. With respect to the EDI-Perfectionism scale, we note that it is comprised of only six items and assesses global perfectionism, which renders it unable to address the role of specific dimensions of perfectionism. Finally, although power was not a problem in the current study (sample sizes needed to detect a medium-to-large correlational effect with power = .80 and $\alpha = .05$ range from 28 to 85 (Cohen, 1992, p. 158), we note that a larger sample size would have been desirable. Again, this caution is tempered by the current study's ability to replicate the findings of Vohs et al. (1999).

Regarding treatment implications, interventions that center on either perfectionistic standards, body-image concerns, or self-depreciating attitudes would, by the logic of our model, hold promise in alleviating bulimic symptoms. Indeed, there is empirical support for this argument with regard to cognitive-behavior therapy (Brouwers & Wiggum, 1993; Fairburn, Marcus, & Wilson, 1993; Grant & Cash, 1995), which has been identified as a promising approach with respect to our model (see Bardone, Vohs, Abramson, Heatherton, & Joiner, 1999). Moreover, addressing bulimic symptoms may also have the related effect of lessening depressive symptoms, a finding seen in research on psychopharmacological treatments for both depression and bulimia (see Fava et al., 1989).

In summary, our findings revealed that development of bulimic symptoms over five weeks was predicted by the interaction of perfectionism, body dissatisfaction, and self-esteem. Moreover, tests of symptom specificity found that the model is specific with respect to anxiety symptoms but not to depressive symptoms. Our findings reveal that change in bulimic and depressive symptoms was greatest for low self-esteem women who held perfectionistic attitudes and who were dissatisfied with their bodies. These findings further elucidate the complex role of susceptibility, stressors, and individual differences in producing bulimic symptoms and concomitant conditions.

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