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Journal

International Journal of Eating Disorders, 56(12)

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Publication Date

2023-12-01

DOI

10.1002/eat.24077

Peer reviewed

HHS Public Access

Author manuscript

Int J Eat Disord. Author manuscript; available in PMC 2024 December 01.

Published in final edited form as:

Int J Eat Disord. 2023 December ; 56(12): 2328–2335. doi:10.1002/eat.24077.

Examining Trait-like Factors as Predictors of State-level Responses to Food Intake in Women with Bulimia Nervosa, Purging Disorder, and Controls

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Abstract

Objective: Theories suggest that elevated negative affect and weight/shape concerns explain both who is affected by bulimic symptoms as well as when bulimic symptoms occur, suggesting that individual differences predict within-subject differences. However, few studies have tested this theoretical premise.

Method: In the present study, participants (*N*=119) diagnosed with bulimia nervosa (*N*=57), purging disorder (*N*=31), and non-eating disorder controls (*N*=31) completed measures of negative affect and weight/shape concerns and later made momentary affect and weight/shape concerns ratings before and after an *ad lib* meal.

Results: State negative affect and weight/shape concerns increased post-meal. No moderating effect of trait negative affect was observed for state affect. In contrast, between-subject differences in weight/shape concerns moderated within-subject increases in state weight/shape concerns. Diagnostic group did not account for this effect.

Discussion: Findings point to viable treatment targets for disordered eating. Targeting elevated weight/shape concerns early in interventions could facilitate reductions in purging after food intake for bulimia nervosa and purging disorder.

Keywords

bulimia nervosa; purging disorder; affect; weight concerns

Established risk factors for disordered eating include over-valuation of shape and weight as well as elevated trait negative affect, defined as the stable, enduring tendency of an individual to experience negative emotions across various situations and over time (Knowles & Olatunji 2020; Stice &Van Ryzin, 2019). Several theories posit that individual differences

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CRediT: Elizabeth Fitzgerald—Conceptualization, Writing-Original Draft, Writing-Review & Editing
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Keanan Joyner—Formal Analysis, Writing-Original Draft, Writing-Review & Editing

Conflict of Interest: The authors have no conflict to declare.

that predict who will develop an eating disorder also explain when disordered eating will occur (Fairburn, Cooper, & Shafran, 2003; Heatherton & Baumeister, 1992; Stice, 1998). For example, Stice (1998) wrote, "Theoretically, women experiencing negative affect binge and purge in an effort to regulate their aversive mood. [. . .] According to this theory, binge eating [or purging] could be used to provide relief from both chronic negative affect and more transient bouts of negative mood" (pp. 244–245). Similarly, Fairburn et al. (2003) theorized that factors that maintain eating disorders are also relevant to eating disorder development. Specifically, the theory underlying CBT-BN argues that over-valuation of shape and weight both drives who develops eating disorders and maintains the central features of eating disorders, including purging, within those who have eating disorders. The theory also posits that binge eating is both an outcome of and contributor to negative mood. Collectively, these theories posit that a person who has higher negative affect and weight/shape concerns responds differently to food intake compared to a person with lower negative affect and weight/shape concerns, and that eating can exacerbate negative affect. Thus, individual differences in negative affect and weight/shape concerns may play important roles in maintaining purging as a means to reduce momentary elevations in negative affect or weight/shape concerns following food intake.

While these models hold intuitive appeal, they potentially conflate two kinds of difference – a *between*-subjects difference that represents one person's level on a factor compared to another person's level, and a *within*-subjects difference that represents how a person's level on a factor changes, such as a change in response to food intake. Further, empirical tests of the link relating between-subject constructs to within-subject responses are limited. In the present study, we examined how between-subject differences in negative affect and weight/shape concerns predicted respective within-subject differences in related factors following food intake. This question is important because while it is known that elevated trait negative affect and weight/shape concerns predict eating disorder risk, it is unknown whether these trait factors impact maintenance of core eating disorder symptomatology. Thus, it is unknown whether trait-like factors constitute viable treatment targets. Identifying a link between traits and related states could add to the arsenal of treatment strategies to eliminate bulimic symptoms, such as purging.

Considerable research has focused on within-subject changes in negative affect in relation to food intake and how this might contribute to purging behavior using ecological momentary assessment (EMA) (for reviews, see Berg et al., 2017; Haedt-Matt & Keel, 2011; Shaefer, Engel, & Wonderlich, 2020). However, to our knowledge, only limited research has tested whether between-subject differences are linked to within-subject changes on related constructs, and only one study examined how traits predicted changes in states following food intake. In a small sample (N=17) of women with eating disorders, Fischer et al. (2018) found that higher trait negative urgency predicted greater stability in state negative affect after binge eating. Importantly, negative urgency represents a related but distinct construct from negative affect. In a somewhat larger sample (N=40) of women with primarily binge eating, Smith et al. (2021) found that trait level rumination facets were correlated with momentary facets of rumination using EMA. However, this study did not examine whether between-subject differences moderated within-subject changes. Moreover, neither Fischer et al. (2018) nor others have examined how between-subject differences in negative affect or

weight/shape concerns might translate into within-subject *fluctuations* in analogous factors following food intake.

Additionally, a recent review of EMA studies (Fuller-Tyszkiewicz, 2019) examined how trait body dissatisfaction may moderate related state constructs in clinical and nonclinical samples. The review concluded that "the moderating influence of trait body image on state-based relationships remain unclear" and that null findings may reflect restriction in range of trait variables in nonclinical samples (Fuller-Tyszkiewicz, 2019). Including participants with eating disorders in studies of state-trait relationships may be critical given the review's finding that "studies that compared individuals with an eating disorder against non-eating disordered control groups more consistently reported moderation effects" (Fuller-Tyszkiewicz, 2019). Thus, the review provides rationale for empirically testing moderation of trait-like weight/shape on state-level concerns in a sample that includes individuals with and without diagnosed eating disorders.

Although EMA studies provide valuable insights into states before and following self-reported food intake in the natural environment, the timing of assessments in relation to food intake can vary and introduces error when measuring changes in response to food intake. The *ad lib* test meal design provides an alternative and complementary approach that permits measurement of states immediately before and immediately following food intake in a laboratory setting, with participants choosing how much food they consume (Sysko et al., 2018). To our knowledge, no prior study has tested whether between-subject differences on psychological factors predict within-subject responses of analogous psychological factors to food intake in laboratory-based meal assessments.

The present study involved secondary analyses of data from women with bulimia nervosa, purging disorder, and controls to examine how individual differences on negative affect and weight/shape concerns predicted within-person changes on momentary ratings of these variables in response to an *ad lib* meal consumed in a laboratory setting. In addition to greater temporal precision, our study has the unique benefit of ensuring that we are capturing the window immediately after food intake (versus after a potential inappropriate compensatory behavior). Examining momentary responses following eating is critical given that these responses may serve as immediate triggers for inappropriate compensatory behaviors that characterize both bulimia nervosa and purging disorder.

Prior analyses of our dataset (Keel et al., 2018b) have established that women with eating disorders experienced increases in emotional (sad, anxious, tense) and cognitive distress (preoccupation with weight/shape) from pre- to post-consumption of an *ad lib* meal not observed in controls. However, it is unknown whether these within-subject changes are predicted by between-subject differences or whether between-subject differences, measured dimensionally, will account for variance previously explained by diagnostic group.

Based on prior research (e.g., Fischer et al., 2018) supporting that trait factors moderate changes in related state factors in eating disorders, and on prior comparisons between controls and women with EDs (Keel et al., 2018b), we hypothesized that, following food intake 1) participants with higher negative affect would experience greater increases in

negative affect and 2) participants with higher weight/shape concerns would experience greater increases in weight/shape concerns. Finally, we predicted that between-subject effects would remain significant while controlling for diagnostic group, consistent with theories that posit that these between subject differences account for both who has an eating disorder and when triggers for symptoms will emerge.

Method

Participants

Women (*N*=119, age 18–45 years) were recruited from the community to participate in a series of studies on psychological and biological factors uniquely linked to binge-eating versus purging behaviors. Participants included non-eating disorder controls (*N*=31), women who met research criteria for PD (*N*=31; Keel & Striegel-Moore, 2009), and women who met DSM-5 criteria for BN (*N*=57; 58% purging). Inclusion criteria required body mass index (BMI) between 18.5 and 26.5 kg/m^2. Participants abstained from psychotropic medications for at least 8 weeks and were free of medical conditions or treatments influencing weight or appetite. Controls were free of past or present ED symptoms and of current dietary restriction for the purpose of weight loss. Participants in the PD group could not have a history of DSM-IV anorexia nervosa (AN), BN, binge-eating disorder (BED), or recurrent objective binge-eating episodes, and participants in the BN group could not have a history of DSM-IV AN. Across groups, participants did not differ significantly on age, BMI, or ethnic/racial background. Ethnic/racial distribution was 76.5% white, non-Hispanic, 10.9% African American, 6.7% Hispanic, and 5.9% Asian. Participants' demographic information was obtained through the overview of the Structured Clinical Interview for DSM-5 (SCID), which includes questions assessing age, date of birth, and gender. We added an additional interview question to collect information on race/ethnicity. For more participant details, see Keel et al. (2018a; 2018b).

Procedures and Measures

During Study Visit 1, participants completed a medical assessment and structured diagnostic interviews to confirm eligibility. Participants also completed self-report questionnaires that captured individual differences in negative affect and weight/shape concerns. We measured negative affect by focusing on levels of depression and anxiety, consistent with prior research (Stice, 1998). Similarly, we focused on weight/shape concerns, which includes thoughts related to dissatisfaction, importance, and preoccupation with weight and shape (Rosen,et al., 1996).

The Beck Depression Inventory (BDI) is a 21-item reliable and valid measure assessing the presence and severity of depression symptoms. The BDI shows excellent internal consistency (.93) (Beck, Ward, & Mendelson, 1961), validity in differentiating depressed from nondepressed participants, and good sensitivity to change (Richter et al., 1997). In the present sample, internal consistency was high at α=.91.

The State-Trait Anxiety Inventory (STAI) is a 40-item questionnaire assessing both state and trait anxiety levels. Supporting the validity of these distinct factors, the state scale

demonstrated reactivity to anxiety-producing versus relaxing situations, while the trait scale demonstrated lack of reactivity to such situations (Metzger, 1976). Further, test-retest reliability has been much higher for the trait (.97) than the state scale (.45) (Metzger, 1976). The Trait subscale was used in analyses. In the current study, Cronbach's alpha was high for the Trait (.95) scale.

The Body Shape Questionnaire (BSQ) is a 34-item measure that assesses weight/shape concerns over the past 4 weeks. The BSQ demonstrates good test-retest reliability at .88 and differentiated individuals with and without eating pathology (Rosen et al., 1996). Internal consistency for the present study was high at α=.99.

On the morning of Study Visit 2, participants consumed a standardized breakfast and were instructed not to eat additional food or engage in inappropriate compensatory behaviors prior to their afternoon visit. At the afternoon visit, all participants were asked a series of questions to confirm adherence to instructions prior to commencing the *ad lib* test meal. Participants were then provided with a single-item *ad lib* test meal: A one-quart (946 ml) serving of vanilla frozen yogurt (approximately 1.5 kcal/g) served in a bowl at an individual place-setting, matching methods previously used in a BN sample (Wolfe, Metzger, & Jimerson, 2002). To ensure standardization, participants received printed instructions telling them to play a recorded message. The recording said, "Please eat until you feel full," and these instructions were printed on paper as well (Keel et al., 2018b). Participants consumed a mean (SD) of 270 (149) grams (approximately 405 (223.5) calories) of frozen yogurt. The average time that elapsed between breakfast consumption in the morning visit and frozen yogurt consumption in the afternoon visit was 6 hours 43 minutes (Keel et al., 2018b).

Both immediately prior to and after the test meal, participants followed printed instructions to make ratings on a 100 mm Visual Analogue Scale (VAS) scale anchored from "Not at all/No" to "Extreme/Extremely." Participants rated the degree to which they felt "full," "hungry," "urge to binge," "urge to vomit," "nausea," "stomach discomfort," "sad," "tense," "anxious," "preoccupation with weight," and "preoccupation with shape." Responses made in this manner have differentiated BN, PD, and control subjects (Dossat et al., 2015; Wolfe et al., 2007; Keel et al., 2018b) and shown sensitivity in revealing both group differences and temporal changes in several different studies (Devlin et al., 1997; Kissileff et al., 1996; Rolls et al., 1992).

Missing Data

In total, 124 participants completed the between-subjects measures from visit 1. Of those, 119 participants completed the *ad lib* meal procedure in visit 2. There were no significant differences between participants who did and did not complete the *ad lib* meal on visit 1 variables: BMI (*Completers M* = 22.62 [± 1.99], *Non-completers M* = 22.79 [± 2.29], $t(122) = -.19$, $p = .85$), Diagnostic Group ($\chi^2(3) = 1.69$, $p = .64$), BDI (*Completers M* = 9.18 [± 8.37], *Non-completers M* = 5.00 [± 6.56], $t(122) = 1.10$, $p = .27$), BSQ (*Completers M* = 112.64 [± 51.30], *Non-completers M* = 101.80 [± 59.91], $t(122) = .46$, $p = .65$), and STAI Trait (*Completers M* = 40.76 [± 13.26], *Non-completers M* = 34.60 [± 12.90], $t(121) = 1.02$, $p = .31$).

Data Analyses

Multilevel structural equation modeling (MSEM) in Mplus v.8.1 was used to model latent factors at the within- and between-subject levels of negative affect and weight/shape concerns for the *ad lib* meal using the VAS ratings for anxiety, tenseness, and sadness, and preoccupation with weight and shape, respectively. Relevant between-subjects-level predictors (BSQ total score and a between-subjects latent negative affect factor, with indicators of BDI and STAI-Trait scores) were added as predictors of the between-subject levels of the dependent variables derived from VAS ratings and as moderators of the within-subject random slopes derived from VAS ratings. Eating disorder status, coded as Control, BN, or PD, was included as a covariate to ensure that effects were independent of previously reported group-level differences.

First, a two-factor multilevel confirmatory factor analysis (MCFA) was examined with latent factors of negative affect and weight/shape concerns to evaluate model fit. The between-subject level of the model was first saturated (i.e., correlations among all observed variables) to examine the model fit of the within-subject portion of the model, and then the within-subject level of the model was saturated to examine the model fit of the between-subject portion of the model. Model fit was evaluated using absolute fit indices of Chi-Square (χ^2), Root Mean Square Error of Approximation (RMSEA), and relative fit indices of the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR). Of note, an overall model fit can also be produced for a MCFA model, and the SRMR produces an estimate of fit separately for the between- and within-subject portions of a model.

Following this, we added the linear effects of change in pre-post food consumption ratings ("time", modeled as a binary (pre [0] vs. post [1]) variable) as within-subject predictors of all dependent variables. Random slopes were specified for each of the dependent variables (latent negative affect and weight/shape concerns) for the linear effect of time, and the correlation among these random effects were estimated at the between-subjects level.

Then we added BSQ total score and the latent negative affect factor derived from BDI and STAI-Trait scores as predictors of the between-subject dependent variables (VAS levels) and as moderators of the within-subject random slopes (time). A significant interaction between between-subjects factors and time would support that individual differences on a between-subjects variable moderated changes in the corresponding state variable following food consumption. Finally, models for each key cross-level interaction controlled for diagnostic group to determine whether diagnostic group better accounted for within-subject changes in states. All analyses utilized maximum likelihood with robust standard errors (MLR) as the estimator, and missing data were addressed using the full-information maximum likelihood procedure in Mplus.

Results

Model Fit and Correlations of Factors Derived from VAS Ratings

A multilevel CFA was fit to the *ad lib* meal data. A two-factor MCFA with latent factors of negative affect and weight/shape concerns evidenced excellent overall model fit: CFI

= .98, TLI = .94, $\chi^2(8) = 16.97$ ($p = .03$), RMSEA = .07, $SRMR_{within}/SRMR_{between}$ = .08/.02. Within-subject level specific fit was evaluated by saturating the between-subjects portion of the model; the fit of the within-subject level of the model was acceptable: CFI = .98, TLI = .89, $\chi^2(4) = 11.83$ ($p = .84$), RMSEA = .09, $SRMR_{within}/SRMR_{between}$ = .08/.01. When saturating the within-subject level to evaluate between-subject level specific fit, the fit of the between-subject level was near-perfect: CFI = 1.0, TLI = 1.0, $\chi^2(4)$ = 2.83 ($p = .59$), RMSEA = .00, $SRMR_{within}/SRMR_{between}$ = .01/.02. At the within-subject level, standardized loadings onto the negative affect factor (anxiety: $\lambda = .67$, tenseness: $\lambda = .79$, sadness: $\lambda = .57$) and weight/shape concerns (preoccupation with weight: $\lambda = .84$, preoccupation with shape: $\lambda = .88$) were strong. The latent correlation between negative affect and weight/shape concerns at the within-level was moderate, $\varphi = .35$, $p = .03$. The standardized loadings were even stronger at the between-subjects level for both the negative affect factor (anxiety: $\lambda = .98$, tenseness: $\lambda = 1.0$, sadness: $\lambda = .67$) and weight/shape concerns factor (preoccupation with weight: $\lambda = 1.01$, preoccupation with shape: $\lambda = .93$). The latent correlation between negative affect and weight/shape concerns at the between-level was much stronger than at the within-level, $\varphi = .76$, $p < .001$. Correlations between variables at the within- and between-subject levels can be found in Table 1. Notably, correlations were all stronger at the between- than within-subject levels.

Modeling Levels and Slopes of VAS Ratings

Next, an MSEM was fit evaluating the linear effect of time on latent negative affect and latent weight/shape concerns. There was a significant linear effect of time on latent negative affect (unstandardized $b = .31$, $SE = .10$, $z = 3.22$, $p = .001$) and latent weight/shape concerns (unstandardized $b = .36$, $SE = .05$, $z = 7.50$, $p < .001$). Both demonstrated increases after food consumption. Of note, at the between-subjects level, the random slopes of time since meal consumption did not significantly correlate with one another (unstandardized $\varphi = .41$, $p = .22$), suggesting changes in VAS ratings of negative affect and weight/shape concerns as a function of meal consumption were relatively independent of one another.

Effect of Between-Subjects Negative Affect and Weight/Shape Concerns on Within-Subject Changes on VAS Ratings

Lastly, an MSEM was fit specifying cross-level interactions for between-subject factors with the linear effect of time to test hypothesis one (that participants with higher trait-like negative affect would experience greater increases in state negative affect) and hypothesis two (that participants with higher trait-like weight/shape concerns would experience greater increases in state weight/shape concerns). See Figure 1 for the models described in this section. A trait negative affect latent factor was specified at the between-subject level with indicators of BDI score (unstandardized $\lambda = 7.77$, $SE = .65$, $z = 12.04$, $p < .001$) and STAI-Trait score (unstandardized $\lambda = 12.24$, $SE = .80$, $z = 15.27$, $p < .001$). Latent negative affect did *not* significantly moderate the linear effect of time on latent state negative affect (unstandardized $b = .73$, $SE = .65$, $z = 1.12$, $p = .26$), but was significantly associated with the random intercept (e.g., in the between-subjects level) of latent state negative affect (unstandardized $b = .50$, $SE = .22$, $z = 2.23$, $p = .03$). In contrast, BSQ scores *did* significantly moderate the linear effect of time on latent state weight/shape concerns (unstandardized $b = .013$, $SE = .003$, $z = 3.96$, $p < .001$), and BSQ scores were also

significantly associated with the random intercept of latent state weight/shape concerns (unstandardized $b = 42.84$, $SE = 3.53$, $z = 12.15$, $p < .001$). Specifically, those scoring high (+1 SD above the mean) on the BSQ exhibited greater increases in weight/shape concerns after food intake (unstandardized $b = 1.53$, $p < .001$), whereas those scoring low (−1 SD) below the mean) on the BSQ exhibited no significant change in weight/shape concerns after food intake (unstandardized $b = .20$, $p = .12$).

Finally, we tested the hypothesis that between-subject effects would remain significant while accounting for the influence of diagnostic group. Supporting this hypothesis, covarying for diagnostic group, with PD, BN, and controls considered as separate groups, did not meaningfully change the magnitude of the moderation effect for weight/shape concerns. Specifically, covarying for diagnostic group did not meaningfully change the magnitude of the moderation effect for BSQ on the linear effect of time on latent state weight/shape concerns (unstandardized $b = .016$, $SE = .006$, $z = 2.83$, $p = .005$). No model was required for negative affect because this did not demonstrate significant moderation of changes in VAS ratings.

Discussion

The current study examined how psychological constructs that predict who develops bulimic symptoms predicted changes in corresponding state-level constructs following food consumption. Supporting hypotheses from cognitive behavioral theory, higher weight/shape concerns predicted greater increases in state shape/weight preoccupation following food intake during an *ad lib* meal. Diagnostic group did not account for the moderating effect of weight/shape concerns, supporting a focus on this specific feature of eating pathology.

Current results did not support our hypothesis that individual differences in negative affect would produce differential responses to eating. The absence of findings may reflect that individuals with high trait negative affect have chronically elevated momentary negative mood. Supporting this, research has shown that trait-level psychological factors correlated highly with analogous state-level responses in eating disorder (Smith et al., 2021) and non-eating disorder samples (Edmondson et al., 2013). Thus, in the current study, lack of interaction between trait-like negative affect and food consumption to produce changes in state negative affect may reflect the strong direct association between the trait and state variables. While between-subjects negative affect did not predict subsequent changes in state negative affect, the *ad lib* meal paradigm did successfully produce emotional change. Across participants, food consumption was associated with a significant increase in negative affect (mean VAS increase of 6.45), with a standard deviation of 16.52, suggesting that there was considerable variability in individual responses. This variability supports our use of moderation analyses to determine whether between-subject differences in NA accounted for variance in how much NA changed within subjects.

As to why weight/shape concerns *did* interact with time, the study task and sample—namely, food consumption among participants who differed in presence versus absence of an eating disorder—may have provoked momentary changes in weight/shape concerns that exacerbated trait level differences. Evidence that changes in negative affect were largely

independent of changes in weight/shape concerns support this interpretation. In addition, this independence supports some, but not all aspects of Stice's Dual Pathway Model (1998).

Findings have implications for theories of risk for developing bulimic eating disorders, as well as theories of eating disorder maintenance. In Fairburn's Cognitive Behavioral Theory, weight and shape concerns represent a central maintaining factor of eating pathology. Specifically, in individuals with EDs, self-esteem is theorized to primarily rest on evaluations of weight, shape, and eating behavior; such over-valuation then prompts engagement in pathological efforts to control weight and shape (Fairburn et al., 2003). Alternately, in Stice's Dual Pathway Model, drive for thinness and negative affect proximally predict bulimic behaviors and mediate the influence of other predictors, including weight/shape concerns (Stice & Shaw, 2002; Stice, Shaw, & Nemeroff, 1998). Our findings support that individual differences in weight and shape concerns may translate into different cognitive responses to food intake, consistent with Fairburn's Cognitive Behavioral Theory (Fairburn et al., 2003). They do not support a direct link between individual differences in negative affect and different emotional responses to eating.

The current study had several strengths. The study examined the previously untested premise that individual differences in emotional and cognitive factors predict real-time responses to food intake in a sample of women with BN, PD, and non-eating disorder controls. The use of reliable and valid measures and creation of latent variables to overcome limitations of single-item measures constitutes another strength. Finally, the study's sophisticated analytic approach was well-suited to examine temporal changes and models demonstrated good fit indices.

The present study also had notable limitations. First, the laboratory setting reduces ecological validity and should be seen as a complement to EMA designs. EMA designs that include trait-like measures in intake assessments could examine whether results generalize to more naturalistic settings. Further, it is unknown whether our results generalize to binge episodes. However, increasing emotional and cognitive distress following food intake hold great relevance to purging and may also explain how some eating episodes transition to binge-eating episodes. Further, we did not ask if participants experienced a sense of loss of control during eating, which precluded an examination of how perceived loss of control might interact with between-subjects constructs to influence state change. Additionally, while our within-subjects factor of preoccupation with shape/weight is related to our between-subjects factor of weight/shape concern, it is important to note that these are not interchangeable constructs. By definition, trait-level body image concerns are enduring and difficult to target (Junne, 2019). Importantly, exposure exercises such Mirror Exposure Therapy have demonstrated effectiveness in reducing body image concerns in eating disorder patients, and current findings underscore value of continuing to develop and employ these interventions (Alleva et al., 2015; Naumann et al., 2022). Finally, present results may not generalize to men and may not reflect patterns present prior to the onset of an ED. Findings could reflect consequences of an ED on emotional and cognitive responses to food intake. Nevertheless, such responses represent valuable targets for transdiagnostic eating disorder interventions.

In conclusion, the current study refines understanding of how individual differences on psychological factors predict state-level changes in response to eating that might contribute to inappropriate compensatory behaviors. Present results support the Cognitive Behavioral Theory model linking development to maintenance of bulimic disorders (Fairburn et al., 2003). Moreover, results suggest that targeting trait-levels of risk factors may benefit patients by helping them achieve lower levels of weight/shape concerns, in general, and, specifically, before they eat. Current findings suggest this reduction could translate to less volatility in weight/shape concerns following food intake, which could reduce likelihood of purging. This may be particularly beneficial in the exploration of interventions for PD, for which Cognitive Behavioral Therapy developed for BN may demonstrate somewhat less impact (Waller, Gray, Hinrichsen, Mountford, Lawson, & Patient, 2014). Future research should continue to examine how relevant between-subjects factors may be viable treatment targets to reduce disordered eating.

Funding:

This work was supported by grant from the National Institute of Mental Health (R01MH061836, PI: Keel).

Research ethics committee approval:

The study, “Binge eating: Clinical Patterns & Biological Correlates” was approved by Institutional Review Boards where data were collected.

Data Availability:

Data from the present study are available upon reasonable request.

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Public Significance Statement:

In the present study, individual differences in weight/shape concerns at baseline predicted greater increases in state weight/shape concerns following eating. These effects were maintained when considering possible differences related to presence and type of eating disorder. Results suggest that targeting weight/shape concerns earlier in treatment may be important for reducing maladaptive responses to eating across eating disorders.

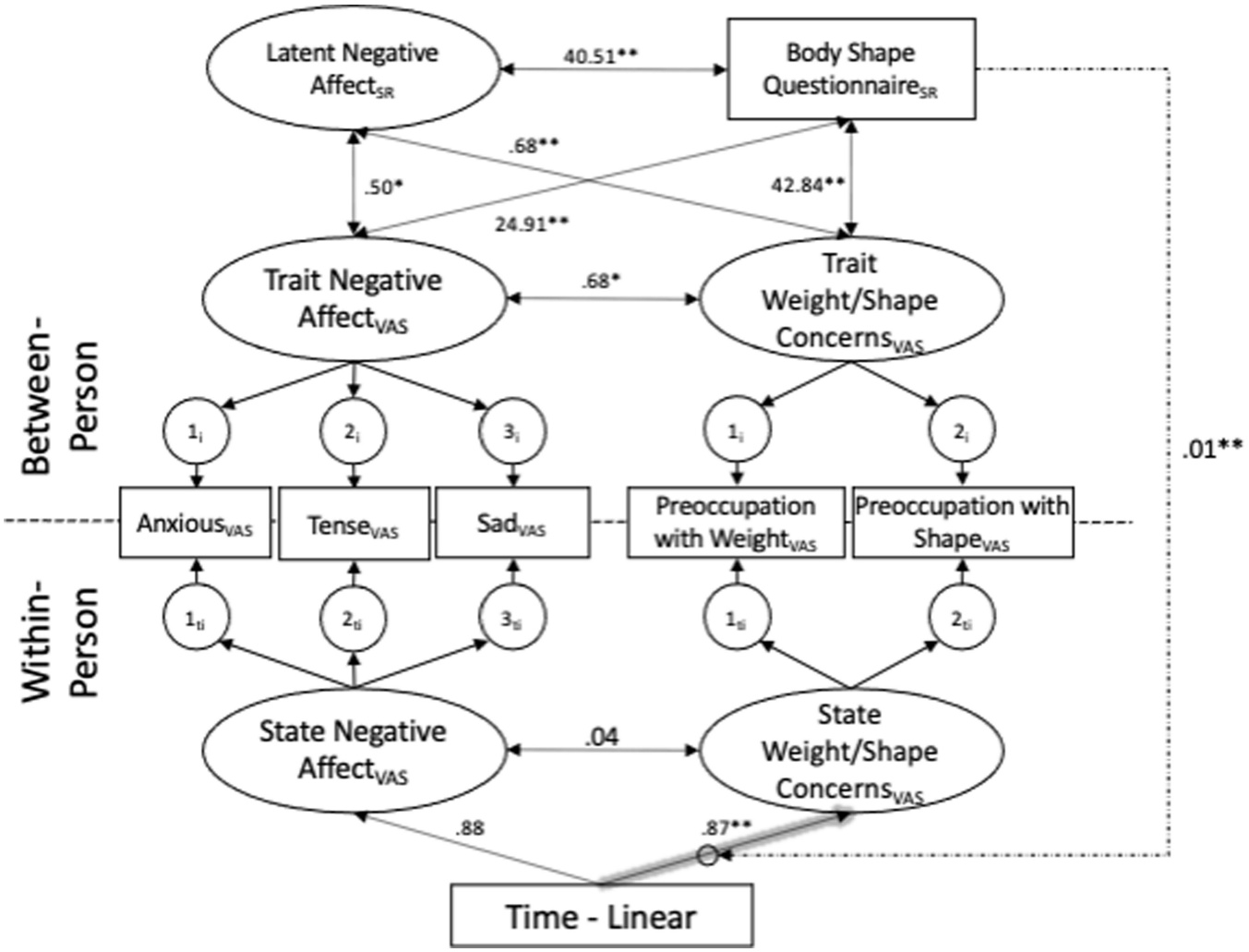

FIGURE 1.
Ad lib meal model.

Table 1

Multilevel Correlation Table during the Ad Lib Meal

	Sad	Anxious	Tense	Weight Preoccupation	Shape Preoccupation
	γ (SE)	**γ (SE)**	**γ (SE)**	**γ (SE)**	**γ (SE)**
Sad	--	.36 (.12)**	.42 (.13)***	.37 (.08)***	.36 (.07)***
Anxious	.63 (.08)***	--	.54 (.09)***	.19 (.09)*	.13 (.10)
Tense	.69 (.09)***	0.97 (.03)***	--	.16 (.09)	.21 (.08)**
Weight Preoccupation	.56 (.07)***	.76 (.06)***	.75 (.07)***	--	.74 (.08)***
Shape Preoccupation	.52 (.08)***	.70 (.06)***	.68 (.08)***	.94 (.03)***	--

Note.

* $p < .05$

** $p < .01$

*** $p < .001$. γ = multilevel correlation coefficient. Between-level correlations shown below the diagonal (and thus, no correlations with the self-report between-subject variables are computed), within-level correlations shown above the diagonal.