

# An Evaluation of the Enhanced Cognitive-Behavioral Model of Bulimia Nervosa in Iranian Student Women

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# Abstract

**Background:** The original and enhanced cognitive-behavioral model of bulimia nervosa model has yet to be evaluated among women of Eastern societies. Thus, the current study aimed to investigate the validity of original and enhanced version of CB-BN model in a sample of Iranian student women.

**Methods:** Five hundred sixteen student women completed a battery of questionnaires.

**Results:** Fit indices indicated that both the original and enhanced models provided a good fit to the data. In the original model, overvaluation of shape and weight and associated with dietary restraint and Binge Eating. Binge eating and dietary restraint correlated with purging. In the enhanced model, significant path was observed between self-esteem and overvaluation of shape and weight; clinical perfectionism and overvaluation of shape and weight; Overvaluation of shape and weight and dietary restraint; Overvaluation of shape and weight and binge eating; binge eating and purging; dietary restraint and purging; and interpersonal problems and binge eating.

**Discussion:** Although, the present study verifies some aspects of CB-BN models in Iranian women students, some key relationships in the model were not confirmed, including the relationship between dietary restraint and binge eating.

## 1. Introduction

Two decade researches demonstrated increasing prevalence of Eating Disorders (EDs) among women of Eastern societies (1-5) Thus, investigating the etiological and maintenance models of EDs in these cultures is an important research and clinical issue.

Fairburn (6) proposed a Cognitive Behavioral model for Bulimia Nervosa (CB-BN). The original version of the model explains how overvaluation of shape and weight and their control results in dietary restraint and thereby binge eating and purging behaviors. According to the theory, patients with Bulimia Nervosa (BN) put their self-worth exclusively or largely on their weight and shape. This overvaluation of shape and weight is the core psychopathology of the BN. Therefore, the patients with BN engaged in dietary restraint or other weight control behaviors. However, perfect obey of these inflexible dietary restraint rules is not possible and lead to binge eating episodes. The binge eating episodes, in turn, increases the concerns about weight and shape and thereby play a role in maintenance of dietary rules. Finally, concerns about weight and shape evokes compensatory behaviors after binge eating.

Fairburn et al., (7, 8) extended the original CB-BN model in order to more fully speculate the factors involved in development and maintenance of EDs. The enhanced version of the model illustrates how low self-esteem, clinical perfectionism, interpersonal problems, and mood intolerance interact with the core psychopathology of EDs. In essence, low self-esteem and clinical perfectionism encourage person to duplicate her/his efforts to achieve expected goals about weight and shape. On the other hand, clinical perfectionism and low self-esteem lead to self-criticism after perceived failure. The enhanced version of

the model outlines that in a subgroup of patients with EDs interpersonal problems may intensify self-esteem concerns and overvaluation of weight and shape, and elicit binge eating behaviors. Finally, the model proposed that some patients with EDs utilized binge eating and purging as a way of coping with overwhelming aversive mood state.

Consistent with the theory, prospective studies consistently demonstrated that appearance overvaluation and/or body dissatisfaction predict dietary restraint, eating disorder cognitions (9), EDs symptoms (10-13), and binge eating behaviors (14). Also, dietary restraint has been indicated prospectively anticipate binge eating behaviors among women (15), adolescents (16), and children (17). One of these studies reported the predictive role of low self-esteem, and lower level of social support on eating symptomatology (14). Also, a number of path analytic studies tried to evaluate the original and enhanced version of CB- BN model.

Studies using structural equation modelling or path analysis showed that original (18-20) and enhanced version of CB model of EDs fit with the data. (18), (20) and (21) found that low self esteem predicted drive for thinness and/or body dissatisfaction which, in tern, anticipated dietary restraint. Dietary restraint predicted binge eating and binge eating predicted purging behaviors. Four studies (19, 22, 23) evaluated the enhanced version of CB-BN model and found that low self esteem and clinical perfectionism associated with overvaluation of shape and weight which, in tern, prognosticate dietary restraint. Dietary restraint corelated with binge eating and benge eating predicted purging behaviors. Finaly, interpersonal problems anticipated dietary restraint and mood intolerance associated with binge eating and purging (19, 22).

However, to our konwledge, the CB-BN model has yet to be evaluated among women of Eastern socities. Thus, the current study aimed to investigate the validity of original and enhanced version of CB-BN model in a sample of Iranian student women. We tried to answer two questions:

- 1) Whether the original model of CB-BN model offer a valid representation of association btween overvaluation of shape and weight, dietary restraint, binge eating and purging among Iranian student women?
- 2) Dose the enhanced version of CB-BN model provide a good account of the relationship of low self esteem, clinical perfectionism, interpersonal problems, and mood intolerance with overvaluation of shape and weight, dietary restraint, binge eating and purging among Iranian student women?

## **2. Material And Methods**

### **2.1 Participants**

The sample consisted of 600 women students of .... Of the participants, 46 (7.6%) did not agree to take part and 38 (6.33%) had missing values on more than 10% of items on questionnaires and were excluded from the analyses. Thus, the data of 516 participants were analyzed. The mean age of women was 23.71

(SD 3.14; range 18-42). The mean BMI was 21.17 (SD 3.29; range 14.88- 35.91). One hundred ninety-eight participants (38/40%) identified themselves as Pars, 250 (48/50%) as Turkish, 10 (1/9%) as Lor, 17 (3/3%) as Kord, 3 (0.6%) as Turkaman, and 35 (6.8%) as other. Three participants did not mention their ethnicity.

## 2.2. Instruments

*2.2.1. Eating Disorder Examination Questionnaire (EDE-Q 6.0)* is a self report measure that assesses cognitive and behavioral aspects of EDs focusing on the last 28 days. The EDE-Q provides a global score and four subscales including restraint, shape concern, weight concern, and eating concern. The frequency of pathological eating behaviors (such as binge eating, laxative misuse) is evaluated through seven items. These items focus on the number of episodes that the behaviors occurred during the past 28 days. Psychometric properties of the Persian version of the EDE-Q have been demonstrated (24).

*2.2.2. Binge Eating Scale (BES) (25)* is 16 items self report measure and developed to assess the severity of binge eating in obese patients. Satisfactory sensitivity, specificity, and internal consistency of the Persian version of the BES was approved (24).

*2.2.3. Clinical Perfectionism Questionnaire (CPQ) (8)* is a 12-item scale designed to measure cognitive, behavioral and emotional components of clinical perfectionism in a time frame of one month. The reliability and validity of English (26, 27) and Persian (28) versions of the CPQ has been approved.

*2.2.4. Distress Tolerance Scale (DTS) (29)* is a 15 item self -report questionnaire that measures the degree to which persons experience psychological distress as intolerable. The instrument utilizes a 5 point Likert scale (from 1 = strongly agree to 5 = strongly Disagree) and lower scores indicate that individual experiences negative emotions as unacceptable. Validity and reliability of the Persian version of the DTS was established (29, 30).

*2.2.5. Inventory of interpersonal problems- 32 (IIP-32)* is a self- report questionnaire that measures eight different domains of interpersonal behaviors. A number of studies reported satisfactory validity and reliability for IIP-32 (31, 32). A study employing regression analysis showed two subscales from the IIP-32 (Hard to be Sociable and Too Dependent) accounted for unique variance in eating disorder symptoms (33). We used these two subscales in the current study as measures of interpersonal problems. The Hard to be Sociable subscale assesses difficulty engaging in social relationships. The Too Dependent subscale reflects dependency on others for approval.

*2.2.6. Rosenberg Self-esteem Scale (RSES)* is a 10-item self-report instrument that assesses self-esteem on a four-point scale (1 = strongly disagree to 4 = strongly agree). The Persian version of the RSES has shown satisfactory reliability and validity (34, 35). In the current study, the RSES demonstrated satisfactory internal consistency (0.86).

## 2.3. Procedure

Research assistants referred to the relevant classes at the universities and invited female students to participate in a study on eating behaviors among women. The research assistants provide information about the purpose and procedure of the study. Those who signed a written consent were asked to complete a battery of questionnaires. Ethical Committee of Tehran University of Medical Science approved the study procedure.

## 2.4. Statistical analysis

Descriptive statistics were used to report demographic information of the participants. We applied path analysis using AMOS 23. A preliminary analysis was performed to examine the validity of the measurement model using Confirmatory Factor Analysis (CFA). Following CFA analysis, the associations between variables were provided using Pearson correlation coefficient. After that, we tested both original and enhanced version of CB-BN model of EDs using path analysis on both goodness-of-fit and parsimony to the data. We used  $\chi^2/df$ , goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), incremental fit index (IFI) and comparative fit index (CFI) with values  $\geq 0.90$ , and the root mean square error of approximation (RMSEA) with values  $\leq 0.08$  as goodness-of-fit indices. We also used the Akaike Information Criteria (AIC)(36) and Browne– Cudeck Criterion (BCC)(37), as measures of parsimony with lower values preferred.

## 3. Results

### 3.1. Measurement Model

The independent CFA was performed to examine the measurement model of overvaluation of shape and weight, restraint eating, binge eating, purging, distress tolerance, self esteem, and clinical perfectionism (Table 1). Interpersonal problems were measured using two subscales (hard to be social and too dependent) and hence were not included in the CFA. For models that showed a poor fit, modification indices were inspected and error covariance were freed if it was theoretically defensible (e.g., items were overlapped in the content). The factor loadings of the models were significant and ranged from 0.47 to 0.95.

**Table 1** Mesurment model of the variables

<b>variables</b>	<b>Mean</b>	<b>SD</b>	<b>Factor loading</b>	<b>Fit indices</b>	<b>Alph coefficient</b>
Overvaluation of shape and weight				<i>GFI</i> = .99 <i>AGFI</i> = .97 <i>IFI</i> = .99 <i>CFI</i> = .99 <i>RMSEA</i> = .04	.85
Shape concern	2.53	1.29	0.86		
Weight concern	1.64	1.48	0.81		
Eating Concern	1.03	1.08	0.78		
Restraint eating				<i>GFI</i> = .99 <i>AGFI</i> = .92 <i>IFI</i> = .99 <i>CFI</i> = .99 <i>RMSEA</i> = .08	.77
EDEQ- Item 1	1.87	2.22	0.67		
EDEQ- Item 2	0.72	1.47	0.51		
EDEQ- Item 3	1.11	1.78	0.71		
EDEQ- Item 4	1.49	1.98	0.61		
EDEQ- Item 5	0.88	1.58	0.66		
Binge eating				<i>GFI</i> = .99 <i>AGFI</i> = .97 <i>IFI</i> = .99 <i>CFI</i> = .99 <i>RMSEA</i> = .04	.71
Attitude towards binge eating	2.91	2.76	0.44		
Binge eating behaviors	4.83	4.36	0.49		
EDEQ- Item 13	1.03	1.31	0.55		

variables	Mean	SD	Factor loading	Fit indices	Alph coefficient
EDEQ- Item 14	1.11	1.31	0.81		
EDEQ- Item 15	1.16	1.33	0.82		
purging				<i>GFI</i> = .92 <i>AGFI</i> = .87 <i>IFI</i> = .99 <i>CFI</i> = .99 <i>RMSEA</i> = .04	.70
EDEQ- Item 16	0.18	0.71	0.66		
EDEQ- Item 17	0.23	0.59	0.61		
EDEQ- Item 18	0.76	1.26	0.36		
Distress tolerance					.82
Tolerance	7.15	2.55	0.76		
Appresial	16.38	4.32	0.84		
Absorption	5.10	1.95	0.72		
Regulation	8.12	2.21	0.75		
Self esteem				<i>GFI</i> = .93 <i>AGFI</i> = .89 <i>IFI</i> = .90 <i>CFI</i> = .90 <i>RMSEA</i> = .08	.77
Item 1	2.43	0.98	0.54		
Item 2	2.15	1.12	0.42		
Item 3	1.90	1.16	0.44		
Item 4	1.87	1.20	0.59		
Item 5	1.92	0.98	0.59		
Item 6	2.73	1.18	0.55		
Item 7	2.45	1.41	0.53		

variables	Mean	SD	Factor loading	Fit indices	Alph coefficient
Item 9	2.05	1.18	0.57		
Item 10	1.98	1.12	0.53		
Clinical perfectionism				<i>GFI</i> = .95 <i>AGFI</i> = .91 <i>IFI</i> = .92 <i>CFI</i> = .92 <i>RMSEA</i> = .07	0.78
Item 1	1.33	0.87	0.49		
Item 3	0.96	1.05	0.58		
Item4	1.30	0.94	0.57		
Item 5	1.21	0.87	0.53		
Item 6	1.05	0.92	0.57		
Item7	1.38	0.92	0.56		
Item 9	1.47	0.87	0.38		
Item 10	1.05	0.93	0.63		
Item 11	1.12	0.94	0.66		
Item 12	0.88	0.88	0.71		

### 3.2. Correlation between variables

Table 2 presents correlation coefficients between measured variables. Clinical perfectionism, interpersonal problems, overvaluation of shape and weight, and restraint eating significantly associated with binge eating. Interpersonal problems, overvaluation of shape and weight, restraint eating, and binge eating significantly correlated with purging behavior. Lower level of distress tolerance associated with higher level of interpersonal problems, self-esteem, overvaluation of shape and weight, binge eating and purging behaviors. There were positive significant relationships between clinical perfectionism and interpersonal problem, self-esteem, overvaluation of shape and weight, and restraint eating. Interpersonal problems significantly associated with overvaluation of shape and weight and restraint eating. Finally, there was a significant correlation between overvaluation of shape and weight and restraint eating.

Table 2  
*Correlations among independent and dependent variables in the model.*

	1	2	3	4	5	6	7
1 Clinical perfectionism	1						
2 Interpersonal problems	.15*	1					
3 Self esteem	.12*	.13*	1				
4 Distress tolerance	.05	-.26*	-.20*	1			
5 Overvaluation of shape and weight	.11*	.11*	.05	-.16*	1		
6 Restraint eating	.13*	.05	-.05	.1	.51*	1	
7 Binge eating	.14*	.20*	.07	-.20*	.63*	.29*	1
8 Purging	.05	.15*	.09	-.11*	.29*	.25*	.24*

*Correlations among independent and dependent variables in the model*

### 3.3. Path analysis of the original CB-BN

The model included one exogenous variable (overevaluation of shape and weight) and three endogenous variables (dietary restraint, binge eating, and purging). The goodness-of-fit indices confirmed that the original CB-BN model indicated good fit with the data of Iranian female students ( $\chi^2 / df = 4.37$ ,  $GFI = .99$ ,  $AGFI = .95$ ,  $NFI = .98$ ,  $IFI = .99$ ,  $CFI = .99$ ,  $RMSEA = .06$ , 90% CI [.02, .07]),  $SRMR = .02$ ) after two modifications (Fig. 1). The modifications were the direct path of overvaluation of shape and weight to binge eating and direct path of dietary restraint to purging. These paths were added to the model since they were theoretically plausible. Significant paths were observed between overvaluation of shape and weight and dietary restraint and binge eating, between binge eating and purging, and between dietary restraint and purging. However, there was a weak, non-significant negative path between Dietary Restraint and Binge Eating.

### 3.4. Path analysis of the enhanced CB-BN model

The enhanced CB-BN model was composed of four exogenous variables (self-esteem, clinical perfectionism, interpersonal problems, distress tolerance) and four endogenous variables (overvaluation of shape and weight, dietary restraint, binge eating, and purging). The results of path analysis indicated that the enhanced CB-BN model did not provide a good fit with the data ( $\chi^2 / df = 17.48$ ,  $GFI = .90$ ,  $AGFI = .69$ ,  $NFI = .58$ ,  $IFI = .60$ ,  $CFI = .58$ ,  $RMSEA = .20$ , 90% CI [0.18, 0.23]),  $SRMR = .10$ ). The modification indices suggested two paths that similar with the suggested paths to the original model. In other words, the direct path of overvaluation of shape and weight to binge eating and direct path of dietary restraint to purging were added to the model. After these modifications, the enhanced CB-BN model

showed good fit with data ( $\chi^2 / df = 2.90$ ,  $GFI = .98$ ,  $AGFI = .94$ ,  $NFI = .95$ ,  $IFI = .96$ ,  $CFI = .96$ ,  $RMSEA = .06$ , 90% CI [0.04, 0.07]),  $SRMR = .06$ ) (Fig. 2).

Consistent with the theory, significant path was observed between self-esteem and overvaluation of shape and weight; clinical perfectionism and overvaluation of shape and weight; Overvaluation of shape and weight and dietary restraint; overvaluation of shape and weight and binge eating; binge eating and purging; dietary restraint and purging; and interpersonal problems and binge eating. However, clinical perfectionism was not significantly associated with dietary restraint. Distress tolerance did not significantly correlate with binge eating and purging. Interpersonal problems were not associated with dietary restraint and purging. Finally, as found for the original model, dietary restraint did not correlate with binge eating.

## 4. Discussion

The primary aim of this study was to evaluate the original and enhanced CB-BN models in a sample of Iranian university student women. The results of path analysis indicated that both original and enhanced CB-BN models fit with data.

Several paths of the original and enhanced CB-BN model were confirmed in the present study. Lower level of self-esteem and higher level of perfectionism associated with greater overvaluation of shape and shape. Overvaluation of shape and weight predicted increasing of dietary restraint. Clinical perfectionism significantly explained the variance of dietary restraint. Binge eating predicted episodes of purging. Interpersonal problems associated with binge eating, and as expected binge eating predicted episodes of purging. These results are in line with conceptual model of Fairburn and colleagues (6) as well as prospective (38, 39) and cross-sectional studies (22, 40) which reported original and enhanced version of CB-BN model for eating disorders fit with data of different populations.

Two paths showed significant relationship which had not been directly mentioned in the original and enhanced CB-BN model. That is, overvaluation of shape and weight significantly explained binge eating periods. What can be concluded from these results might be that overvaluation of shape and weight might directly correlate with binge eating behaviors in women student sample. In other words, the student women experience some concerns about their shape and weight, but they do not or cannot restrict their eating. They might interpret their normal eating as binge eating. In addition, there were significant relationship between dietary restraint and purging behaviors in both models. It implied that some women might use purging behaviors just because they think they must eat as less as possible. Therefore, they engage in purging behaviors after subjective binge eating, not objective binge eating.

However, some hypothesized relationships in the original and enhanced models were not supported. First and most important, there was no significant relationship between dietary restraint and binge eating in both models. The dietary Restraint- binge eating relationship is a central component of the cognitive behavioral model of EDs and yet not verified in the current study. Previous researches indicated mixed

Findings. For example, prospective (41-43) and cross-sectional studies (20, 44) showed dietary restraint anticipates binge eating behaviors. However, the relationship was not supported in other structural equation modeling studies (22, 44, 45). These mixed results implied that the nature of the relationship between dietary restraint and binge eating remains unclear (22).

Second, the enhanced model proposed that mood intolerance associate with binge eating and purging behaviors, but the expected association between these variables were not observed in the current study. Lower levels of distress tolerance was not associated with purging (22). Also reported no relationship between mood intolerance and binge eating and purging. This is unexpected finding, and further research is needed to understand the implications of this result. However, it is possible that the non-clinical nature of the present sample has led to the lack of correlation between these variables.

## 5. Conclusion

In summary, the findings of the present study provide preliminary evidence for cross-cultural validity of the original and enhanced CB- BN models in Iranian population. It implies that this model can be used as a basis for further understanding of eating problems in Iranian women and their treatment. However, the findings must be interpreted considering its limitations. The cross-sectional and correlational nature of the present study makes it impossible to infer the causal relationship between variables. Thus, future research could utilize longitudinal or experimental design to evaluate validity of the model in Iranian women. Second, student and nonclinical nature of our sample render us to generalize findings to clinical sample. Therefore, repeating this study on Iranian women with eating disorders would be logical next step.

## List Of Abbreviations

Eating Disorders

EDs

Cognitive Behavioral model for Bulimia Nervosa

CB-BN

Bulimia Nervosa

BN

*Eating Disorder Examination Questionnaire*

EDE-Q 6.0

*Clinical Perfectionism Questionnaire*

CPQ

*Distress Tolerance Scale*

DTS

*Inventory of interpersonal problems- 32*

IIP-32

*Rosenberg Self-esteem Scale*

*RSES*

Confirmatory Factor Analysis

CFA

Goodness-of-Fit Index

GFI

Adjusted Goodness-of-Fit Index

AGFI

Incremental Fit Index

IFI

Comparative Fit Index

CFI

Root Mean Square Error of Approximation

RMSEA

Aikaike Information Criteria

AIC

Browne–Cudeck Criterion

BCC

## **Declarations**

### **Ethics approval and consent to participate**

All methods were carried out in accordance with the Declaration of Helsinki, with appropriate ethics approval and participant consent. Ethics approval was received from Tehran University of Medical Sciences & Health Services (20805-161-03-91). Informed consent was obtained from all participants prior to participation.

### **Consent for publication**

Identifiable demographic information has been removed from this manuscript to ensure anonymity. Thus, the consent to publish is not applicable.

### **Availability of the data**

Tehran University of Medical Sciences which approved and supported the study has given permission that only researches of the manuscript will have access to the dataset, so the data used in this study is not available for public view. Requests should be written to the university.

### **Competing Interest**

The authors have no actual or potential conflicts of interest including any financial, personal or other relationships with other people or organizations within three years of beginning the work submitted that could inappropriately influence their work.

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## Authors' Contribution

M.M, and RM designed and supervised the research. Other authors conducted the study. RM, and M.B analyzed the data and wrote the manuscript. All authors have read and approved the manuscript.

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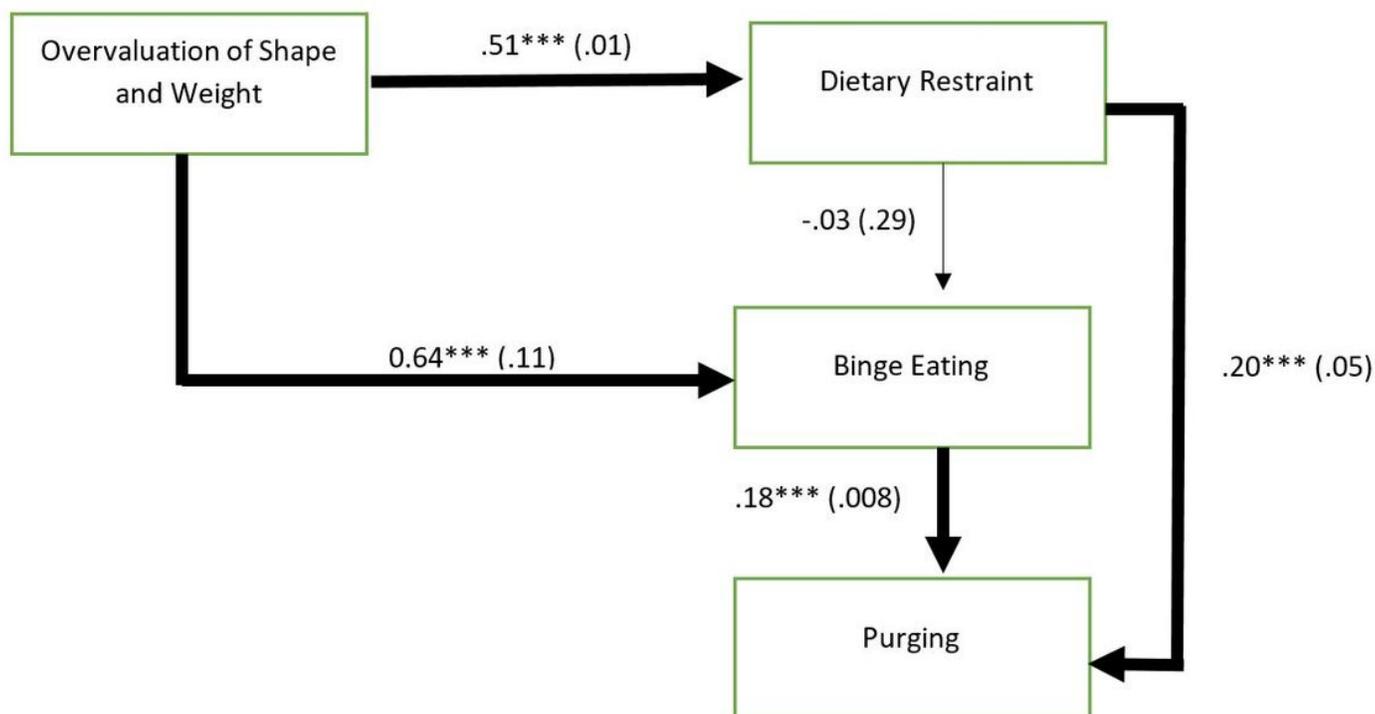
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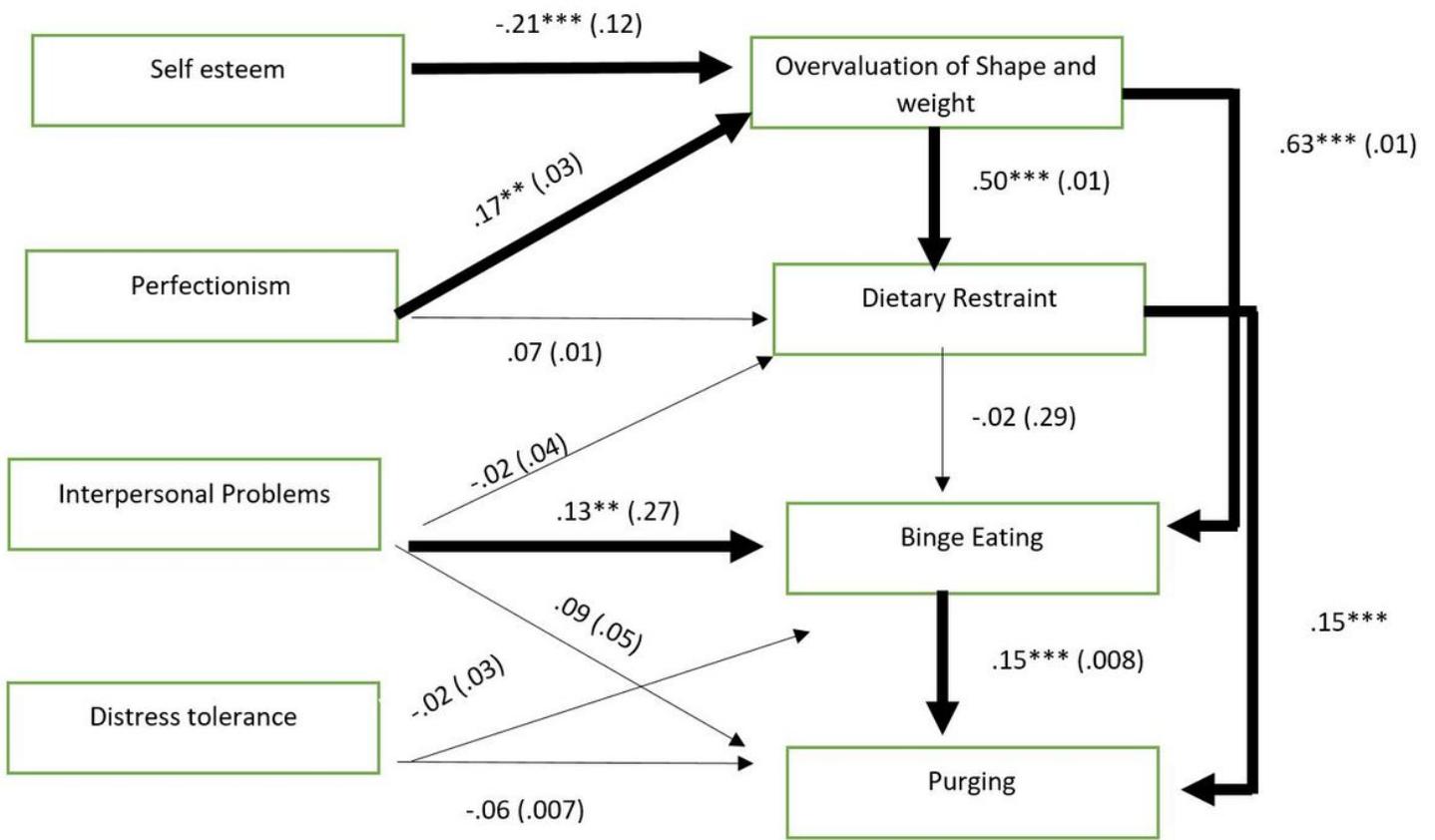
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## Figures



**Figure 1**

Path analysis for the original cognitive-behavioral model of EDs (standardized coefficients reported; standard errors in parenthesis;  $***p < .001$ ).



**Figure 2**

Path analysis for the enhanced cognitive-behavioral model of EDs (standardized coefficients reported; standard errors in parenthesis; \*\*\* $p < .001$ )