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Factor structure and clinical correlates of the Food Thought Suppression Inventory within treatment seeking obese women with binge eating disorder

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Abstract

Prior research on the relations among eating behaviors and thought suppression is limited to a measure of general thought suppression, the White Bear Suppression Inventory. To address this limitation, researchers recently validated the Food Thought Suppression Inventory (FTSI). Analyses using this measure suggest that food thought suppression is distinct from and is more predictive of eating disorder psychopathology than is general thought suppression. The FTSI, however, has not yet been validated in clinical samples. The purpose of the current study is to examine the factor structure and clinical correlates of the FTSI within treatment seeking obese women with binge eating disorder (BED; $N = 128$). Analyses revealed a valid and reliable one-factor measure of food thought suppression that was related to higher levels of eating and general psychopathology. The findings provide evidence for the use of the FTSI with obese women with BED. Future research should examine the psychometric properties of the FTSI within larger and more diverse samples.

Keywords

Obesity; Binge eating; Thought suppression; Food; Eating; Measure

1. Introduction

The Ironic Processes Theory suggests that thought suppression, or purposely trying to avoid certain thoughts, may have unwanted consequences such as increases in priming of the target thoughts (hyperaccessibility; Wegner & Erber, 1992), increases in target thoughts immediately once an individual tries to suppress specific thoughts, and increases in target thoughts following cessation of suppression attempts (the rebound effect; Wegner, 1994;

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Contributors

All authors were responsible for the protocol and recruiting participants. The first, second, and third authors were responsible for writing the first draft of the manuscript and conducted statistical analyses. All authors contributed to and have approved the final manuscript.

Conflict of interest

Both authors declare that they have no conflicts of interest.

Wegner & Erber, 1992). Rumination may, therefore, be a likely outcome of thought suppression attempts. Research indicates general thought suppression is related to higher levels of psychiatric symptoms, such as depression (Wenzlaff & Wegner, 2000). Thought suppression also has been investigated in the context of specific themes, including food and eating-related constructs. The little existing research examining the association between thought suppression and eating behaviors has resulted in mixed findings. The consequences of thought suppression, such as hyperaccessibility and rebound, have been found to result from attempting to suppress food-related thoughts in some studies (Dejonckheere, Braet, & Soetens, 2003; Smart & Wegner, 1999; Soetens & Braet, 2006; Soetens, Braet, Dejonckheere, & Roets, 2006; Soetens, Braet, & Moen, 2008) but not all (May, Andrade, Batey, Berry, & Kavanagh, 2010; Soetens & Braet, 2007; Soetens, Braet, & Bosmans, 2008). Of note is that May et al. (2010) did not consider dieting status or weight in their analyses, both of which may influence thought suppression (e.g., Erskine & Georgiou, 2010; Kemps, Tiggemann, & Christianson, 2008; O'Connell, Larkin, Mizes, & Fremouw, 2005; Pop, Miclea, & Hancu, 2004; Soetens et al., 2006).

Initial studies of thought suppression and eating behaviors (e.g. Soetens et al., 2006) were limited to the White Bear Suppression Inventory (WBSI), a self-report measure of *general* thought suppression. To address the limitation that eating-related studies were restricted to a general measure of thought suppression, rather than one specific to eating, researchers recently created the Food Thought Suppression Inventory (FTSI), which was validated with non-clinical samples of women (Barnes, Fisak, & Tantleff-Dunn, 2010) and men (Barnes & White, 2010). The items are based on the WBSI, for example: "There are things I prefer not to think about" from the WBSI was changed to "There are foods I prefer not to think about" for the FTSI. The measure includes a single, reliable, and valid factor of food thought suppression, and higher scores on the FTSI have been shown to be associated with higher BMI (Barnes & White, 2010; Barnes et al., 2010). The FTSI is moderately related to the WBSI and more strongly associated with important eating-related constructs than is the WBSI (Barnes & White, 2010; Barnes et al., 2010), suggesting that food thought suppression is distinct from, albeit related to, general thought suppression.

Psychometric evaluations of the FTSI, however, have been limited to non-clinical samples. Existing research indicates that food thought suppression may evidence even greater clinical significance for obese persons with disordered eating such as those with binge eating disorder (BED; i.e., feeling loss of control while eating unusually large quantities of food without inappropriate compensatory behaviors). While Ward, Bulik, and Johnston (1996) posited a relationship between binge eating and thought suppression over 15 years ago, their theory only recently received empirical attention in non-clinical (Barnes & Tantleff-Dunn, 2010; Barnes & White, 2010) and clinical samples (Barnes, Masheb, & Grilo, 2011). The latter study, which compared matched samples of obese persons with versus without BED, reported significantly higher levels of food thought suppression in the BED group (Barnes, Masheb & Grilo, 2011). Barnes, Masheb and Grilo (2011) also reported a positive association between food thought suppression and binge eating frequency among women with BED, a finding that was previously reported in a non-clinical sample of women (Barnes & Tantleff-Dunn, 2010). Unexpectedly, a negative correlation was observed between food thought suppression and binge eating frequency among men with BED, a finding that conflicts with previous reports with male non-clinical samples (Barnes & Tantleff-Dunn, 2010; Barnes & White, 2010).

In summary, preliminary data suggest there may be an association between food thought suppression and various aspects of disordered eating patterns and this relationship may differ between obese individuals with versus without BED. Further investigation of such differences seems indicated, particularly given other well-established differences between

obese persons with and without BED on a range of eating and psychological variables (Grilo, Masheb, & White, 2010; Grilo & White, 2011; Grilo et al., 2008). A key step, however, is to confirm the factor structure and validity of the FTSI in clinical samples. The current study, therefore, examined the factor structure and clinical correlates of the FTSI in a consecutive series of obese women with BED. We hypothesized that the factor analysis would result in a valid, one-factor measure of food thought suppression and that FTSI score would be significantly and positively associated with general and specific eating disorder psychopathology.

2. Materials and methods

2.1. Participants

Participants were a consecutive series of 128 treatment-seeking obese (body mass index (BMI) ≥ 30) women who met full DSM-IV-TR (American Psychiatric Association, 2000) research criteria for BED based on the Eating Disorder Examination (Fairburn & Cooper, 1993) interview (described below). Overall, participants had a mean age of 47.44 ($SD = 9.04$, range = 21 to 65) years and a mean BMI of 39.03 kg/m² ($SD = 6.14$, range = 29.52 to 54.67). Ethnicity was as follows: 82.8% ($n = 106$) Caucasian, 14.8% ($n = 19$) African-American, 0.8% ($n = 1$) Asian, and 1.6% ($n = 2$) considered themselves “other.”

2.2. Procedures

Patients were recruited via advertisements seeking overweight persons who wanted to “stop binge eating and lose weight” for treatment research studies. Exclusion criteria included certain specific serious psychiatric diagnoses requiring alternative interventions (e.g., bipolar disorder, schizophrenia), uncontrolled hypertension, cardiac issues broadly defined, significant neurological history, regular use of purging or restrictive behaviors, and current use of psychoactive medications such as SSRI antidepressants. Patients were interviewed by experienced and trained doctoral-level research-clinicians, completed self-report questionnaires, and were measured for height/weight. Study procedures were IRB approved and all participants provided written informed consent.

2.3. Measures

2.3.1. Food Thought Suppression Inventory—Food Thought Suppression Inventory (FTSI; Barnes et al., 2010; Barnes & White, 2010) is a 15-item self-report measure of the tendency to avoid food-related thoughts. Higher scores indicate higher levels of food thought suppression. The FTSI has a unidimensional factor structure and demonstrated validity within nonclinical samples. Scores can range from 15 to 75, with higher scores reflecting higher levels of food thought suppression. The average scores have been reported as 27.8 ($SD = 13.4$) for non-clinical community women and 45.0 ($SD = 13.0$) for treatment seeking women with BED (Barnes, Masheb, & Grilo, 2011). Cronbach's alpha with the current sample was .92.

2.3.2. The Eating Disorder Examination (EDE)—The Eating Disorder Examination (EDE) (Fairburn & Cooper, 1993) is a semi-structured investigator-based interview that assesses eating disorder psychopathology. The EDE focuses on the previous 28 days, except for the diagnostic items that are rated per the durations stipulated in the DSM-IV-TR (American Psychiatric Association, 2000). The EDE assesses the frequency of *objective bulimic episodes* (OBEs, defined as unusually large quantities of food with a sense of loss of control). The EDE also comprises four subscales (Cronbach's alphas are for current sample): Dietary Restraint ($\alpha = .55$), Eating Concern ($\alpha = .55$), Weight Concern ($\alpha = .60$), and Shape Concern ($\alpha = .71$), and an overall Global score ($\alpha = .82$). The items for the four EDE subscales are rated on a seven point forced-choice format (0–6), with higher scores

reflecting greater severity or frequency. The EDE is a widely-used interview method used with BED (Grilo, Masheb, & Wilson, 2001a, 2001b) and has demonstrated good inter-rater and test–retest reliability in diverse patient groups, including BED (Grilo, Lozano, & Elder, 2005; Grilo, Masheb, Lozano-Blanco, & Barry, 2004).

2.3.3. The Beck Depression Inventory (BDI)—The Beck Depression Inventory (BDI) (Beck & Steer, 1987) is a 21-item self-report questionnaire that assesses current depression level and symptoms of depression. It is a widely used and well-established measure with excellent reliability and validity (Beck, Steer, & Garbin, 1988). Higher scores reflect higher levels of depression and, more broadly, negative affect and are an efficient marker for broad psychopathology (Grilo, Masheb, & Wilson, 2001c). Cronbach's alpha with the current sample was .88.

2.3.4. Ruminative Response Scale (RSS)—Ruminative Response Scale (RSS) (Treynor, Gonzalez, & Nolen-Hoeksema, 2003) is a well-established 10-item questionnaire that includes two factors: Brooding ($\alpha = .80$) and Reflection ($\alpha = .76$) Rumination. The Brooding subscale (e.g., “Think about how sad you feel”) measures “moody pondering” (Treynor et al., 2003, p. 251) and the Reflection subscale (e.g., “Go someplace alone to think about your feelings”) assesses neutral contemplation as a means to cope with or attempt to overcome struggles. Participants respond to statements with a four-point forced-choice response (1–4, almost never to almost always). This measure of rumination is unconfounded by depression content, since items assessing depressive features were omitted from this version of the RSS (Treynor et al., 2003). Both subscales also have test–retest reliability (Treynor et al., 2003) and Cronbach's alpha for the current sample were $\alpha = .80$, Brooding, and $\alpha = .76$, Reflection.

3. Results

3.1. Factor structure and internal consistency

The original 15-item FTSI, requiring a minimum sample size of 75 (15 items $\times$ 5 participants per item; Bryant & Yarnold, 1994) was subjected to analysis. The current sample of $N = 128$ yielded 8.5 participants per item. We conducted an exploratory factor analysis with SPSS version 19 statistical package, using a maximum likelihood method, as our data demonstrated multivariate normality according to the Omnibus test of multivariate normality ($p < .0001$). We specified a varimax rotation. The Kaiser–Meyer–Olkin measure of sampling adequacy and the Bartlett's test of sphericity were calculated to assess the appropriateness of the data for factor analysis. The Kaiser–Meyer–Olkin index was 0.89 and the Bartlett's test was significant ($p < .0001$), indicating that the data were appropriate for analysis. Based on the scree plot and eigenvalue test, a one-factor solution was retained. Items were retained if they had a factor loading of 0.45 or greater. This procedure eliminated four items. The items, “There are foods I prefer not to think about,” “I always try to put eating problems out of my mind,” “I often do things to distract myself from my thoughts of food,” and “I have thoughts about food that I try to avoid,” failed to have factor loadings of .45 or above.

Table 1 summarizes the resulting one-factor solution, which accounted for 56.1% of the total variance, along with item loadings which ranged from .52 to .91. The final 11-item FTSI yields a range of possible scores of 11 to 55 with higher scores indicating a higher degree of food thought suppression. Internal consistency (reliability) of the revised scale was good as evidenced by Cronbach's alpha of 0.92.

3.2. Convergent validity

As measures of convergent validity, associations between the FTSI and indicators of eating pathology were examined. Table 2 summarizes the means, standard deviations, and Pearson *r* correlations. As predicted, the FTSI was significantly and positively associated with EDE Global scores and subscales of the EDE, namely Eating Concern, Shape Concern, and Weight Concern. However, the FTSI was not significantly associated with the Restraint subscale. Furthermore, the FTSI was not significantly associated with the number of objective bulimic episodes. Table 2 also summarizes associations between the FTSI and indicators of general psychopathology. As predicted, the FTSI was significantly and positively associated with depression and rumination.

3.3. Incremental validity

Table 3 summarizes a series of hierarchical regression analyses performed to assess the incremental validity of the FTSI. Specifically, it was expected that the FTSI would predict variance in eating psychopathology, as measured by the EDE, after controlling for the variance accounted for by BDI scores. The BDI was entered in the first step of the regression equation, and the FTSI was entered in the second step of the equation. Output was examined to ensure that the residuals were normally distributed. Cook's Distance score was used to exclude outlier points with a threshold of 4/n, resulting in five to a maximum of ten participants excluded per hierarchical regression analysis. The addition of the FTSI in the second step of the regression equation led to significant improvement in the model predicting EDE Global scores. Further, a comparison of the standardized beta coefficients in the final model indicated that the FTSI is nearly as robust a predictor of EDE Global scores as the BDI. Follow-up analyses indicated that the FTSI exhibits incremental validity in relation to the Restraint, Eating Concern, and Weight Concern subscales of the EDE, but not the Shape Concern subscale.

4. Discussion

In this clinical study group of treatment-seeking obese women with BED, the FTSI was found to be a reliable, one-factor measure of thought suppression specific to food-related thoughts. Unlike the 15-item and 14-item factor structures observed with non-clinical samples of women and men, respectively, our current factor analysis with a clinical sample suggested that the one factor was improved by removing four items, resulting in an 11-item scale. The factor analysis indicated that the factor item loadings and reliability coefficient were strong. The FTSI also demonstrated convergent and incremental validity.

The original factor analysis of the WBSI, the measure of general thought suppression, included a one factor (Wegner & Zanakos, 1994). However, a follow-up factor analysis of the WBSI resulted in three factors named: Unwanted Intrusive Thoughts, Thought Suppression, and Self-Distraction (Blumberg, 2000). Blumberg's Thought Suppression subscale included four items. Three of the four corresponding items from the FTSI were excluded from the measure in the current factor analysis. Perhaps the excluded variables in the current factor analyses form a second factor that is not being captured due to the limited sample size. The Unwanted Intrusive Thoughts subscale included eight items and all of the corresponding FTSI items were retained in the current one-factor solution. The current factor structure may be assessing a construct similar to food rumination. This is the first study, however, to examine the FTSI with a clinical sample. Previous factor analyses with nonclinical samples did not exclude this many items. While the current factor analysis is a first step towards assessing this measure in a clinical sample, further examination of the factor structure with larger samples is important.

The positive correlations between the FTSI and eating disorder psychopathology suggest that the FTSI has convergent validity for women with BED. We did not observe a significant association between food thought suppression and binge-eating frequency in this clinical group which is at odds with previous reports of positive associations between binge-eating and FTSI scores from smaller studies of similar groups of BED (Barnes, Masheb, & Grilo, 2011; Barnes, Masheb, White, et al., 2011) and non-clinical women (Barnes & Tantleff-Dunn, 2010). The previous research examining binge eating and the FTSI relied on the Eating Disorders Examination-Questionnaire, the self-report version of the EDE interview used here. Studies comparing these two assessment methods for identifying binge-eating have generally found that the EDE interview yields higher estimates of binge-eating but lower scale scores reflecting eating psychopathology than the EDE-Questionnaire (Barnes, Masheb, White, & Grilo, 2011; Grilo et al., 2001a). Therefore, there are two possible reasons for such differing results. First, perhaps the differences between the results of self-report (EDE-Q) versus interview (EDE) assessment methods. Second may be the restricted range of the current sample, there likely was less variation in binge-eating frequency as all participants were required to meet full-threshold BED. Regardless, the mixed findings –which could also reflect treatment-seeking confounds or greater distress in the present study group – highlight the need for further studies before any firm conclusions can be drawn.

The Food Thought Suppression Inventory's incremental validity was most notable for eating concerns. Conceptually, this makes sense since the Eating Concerns subscale includes items assessing preoccupation with food, fear of losing control over eating, and guilt about eating. While no causal conclusions can be made, the results do suggest a relationship between attempting to suppress thoughts of food and negative emotions related to eating. It may be that attempts to suppress thoughts of food are a result of these negative views of one's eating, which unfortunately is likely to have the unwanted effect of increases in unwanted thoughts.

Further studies seem warranted in light of preliminary promising studies utilizing so-called “third wave” treatments, such as Dialectical Behavior Therapy (DBT) that teaches patients tools such as mindfulness or meditation to cope with preoccupying cognitions or unwanted thoughts rather than relying on harsh judgments or thought suppression. Participation in such interventions has been found to decrease loss of control over eating and preoccupation with food (Alberts, Mulken, Smeets, & Thewissen, 2010) and reduce binge eating (Kristeller & Hallett, 1999; Telch, 1997; Wiser & Telch, 1999). Moreover, food thought suppression was associated with eating, shape, and weight concerns, which are key features of eating disorder psychopathology. While OBEs were not significantly related to food thought suppression in the current study, previous studies suggest a possible relationship between these variables (Barnes, Masheb, & Grilo, 2011; Barnes & Tantleff-Dunn, 2010). These findings, paired with previous literature, suggest that continued investigation of the utility of “new-wave” treatments (e.g., DBT, Acceptance and Commitment Therapy, mindfulness) for BED.

In addition to eating-related variables, the FTSI was also related to depression and rumination. Depression is related to the tendency to rely on thought suppression in general (Dagleish & Yiend, 2006; Rosenthal, Cheavens, Compton, Thorp, & Lynch, 2005), and to BED psychopathology (Grilo et al., 2008, 2010, 2001c), so it is not surprising that depressive symptoms are also related to the use of specific food thought suppression, a distinct but likely overlapping construct with general thought suppression.

The positive correlations between FTSI and rumination support the Ironic Processes Theory that thought suppression results in increases of the very thoughts one is trying to suppress

(Wegner & Erber, 1992). Authors of the rumination questionnaire aimed to create a measure specific to rumination without the confound of depressive symptoms (Treynor et al., 2003). Thus, food thought suppression may be separately and distinctly associated with both depression *and* rumination. It must be noted, however, that some items of the FTSI may assess rumination about food versus suppression of food thoughts, which may partially account for the significant correlations. The somewhat weak correlations between food thought suppression and these variables also suggest that suppression is measuring a construct related to eating disorder psychopathology that is unique from depression or general rumination.

We note several strengths and limitations of the present study. Strengths include a rigorously assessed clinical sample of obese women with BED. Limitations include a relatively small sample size of primarily Caucasian women seeking treatment, which suggests that our results may not generalize to more diverse groups of individuals with BED, to community samples of non-treatment-seekers, or to men. We also did not examine other psychometric aspects of the FTSI, including possible clinical level cut-off scores and test-retest reliability. Lastly, the correlational analyses preclude any speculations about causality.

5. Conclusions

Future research should replicate the current findings within larger, more diverse samples and examine the significance of food thought suppression on the maintenance of BED psychopathology and its relation to BED treatment response. Since the goals of most treatments for BED include both binge eating cessation and weight loss (e.g., Grilo, Masheb, Wilson, Gueorguieva, & White, 2011; Wilson, Grilo, & Vitousek, 2007), the significance of food thought suppression should be examined in relation to both outcomes and whether it serves as a negative prognostic indicator. The current study investigated the factor structure of the FTSI for women with BED, replicated previous examinations of the convergent validity of the FTSI by showing significant associations with eating disorder psychopathology, and provided new findings regarding its associations with general psychopathology.

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Table 1

Factor loadings for Food Thought Suppression Inventory based on exploratory factor analysis.

Item number	Mean (SD)	Factor loadings	Item-total correlations
1 Sometimes I wonder why I have the thoughts about food that I do.	3.7 (1.3)	.77	.71
2 I have thoughts about food that I cannot stop.	3.4 (1.4)	.91	.84
3 There are images about food that come to mind that I cannot erase.	3.0 (1.5)	.77	.74
4 My thoughts frequently return to one idea about food.	3.1 (1.3)	.76	.72
5 I wish I could stop thinking of certain foods.	3.6 (1.4)	.80	.75
6 Sometimes my mind races so fast about food I wish I could stop it.	2.5 (1.3)	.62	.61
7 There are thoughts about food that keep jumping into my head.	3.2 (1.4)	.80	.75
8 Sometimes I stay busy just to keep thoughts of food from intruding on my mind.	2.8 (1.4)	.52	.53
9 There are foods that I try not to think about.	3.0 (1.5)	.57	.58
10 Sometimes I really wish I could stop thinking about food.	3.8 (1.4)	.76	.73
11 There are many thoughts about food that I have that I don't tell anyone.	2.9 (1.5)	.54	.55

Table 2

Variable descriptives and correlations between the Food Thought Suppression Inventory and measures of eating disorder psychopathology, depression, and rumination.

Measure	Mean (SD)	Correlation with FTSI
Food Thought Suppression Inventory	34.98 (11.29)	–
Eating Disorders Examination		
Global score	2.92 (0.91)	.35 ***
Dietary restraint	1.79 (1.23)	.12
Eating concern	2.57 (1.32)	.46 ***
Shape concern	3.86 (1.17)	.21 *
Weight concern	3.44 (1.12)	.26 **
OBEs ^a	3.99 (3.27)	.07
Beck Depression Inventory	16.54 (9.12)	.26 **
Response styles questionnaire		
Brooding rumination	11.52 (3.77)	.29 **
Reflection rumination	9.65 (3.35)	.26 **

Note.

^a Average number of objective bulimic episodes per week in the past 6 months.

* $p < .05$.

** $p < .01$.

*** $p < .0005$.

Table 3

Hierarchical regressions examining the incremental validity of the Food Thought Suppression Inventory to predict eating disorder psychopathology after accounting for current depression levels.

Dependent variable	Step	R ² adjusted	F change	b (SE)	β
EDE					
Global score	1: BDI	.24	37.70***	.04 (.01)	.42***
	2: FTSI	.29	9.40**	.02 (.01)	.25**
Dietary restraint	1: BDI	-.01	.35	.00 (.01)	.01
	2: FTSI	.02	3.88 [†]	.02 (.01)	.19 [†]
Eating concern	1: BDI	.23	35.68***	.05 (.01)	.37***
	2: FTSI	.39	32.61***	.05 (.01)	.43***
Weight concern	1: BDI	.23	36.14***	.05 (.01)	.44***
	2: FTSI	.26	4.22*	.02 (.01)	.17*
Shape concern	1: BDI	.27	41.87***	.06 (.01)	.45***
	2: FTSI	.27	2.21	.01 (.01)	.12

Note. BDI = Beck Depression Inventory. EDE = Eating Disorder Examination. FTSI = Food Thought Suppression Inventory.

[†] $p = .051$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.