

Clinical Validation of the Trait and State Versions of the Food Craving Questionnaire

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This is the first study to evaluate the psychometric properties of the Food Craving Questionnaire-Trait (FCQ-T), and Food Craving Questionnaire-State (FCQ-S) measures using a clinically heterogeneous sample of eating disorder patients (N = 177) recruited from seven different outpatient eating disorder treatment centers in Spain. Confirmatory factor analyses (CFAs) corroborated the factor structures of the FCQ-T and FCQ-S. The measures' scores and their factor-derived scale-scores yielded internal consistency reliability indexes that ranged from adequate to excellent. The measures were predictive of eating disorder symptoms. As expected, the FCQ-T was more strongly associated with eating disorder psychopathology than the FCQ-S. The results replicated the psychometric properties of the FCQ-T and FCQ-S in eating disorder populations and could become useful tools in clinical and research settings.

Keywords: food cravings; eating disorders; assessment

Cravings have been defined as strong desires that, arising from either physiological or psychological underlying states, promote drug and food consumption (e.g., Baker, Morse, & Sherman, 1986). Drug-addiction researchers typically give cravings a highly influential role in the maintenance of addictive behaviors and blame cravings for the high rates of relapse following drug-cessation treatments (see Tiffany, 1990, 1994). Similarly, food cravings have been linked to binge eating in bulimic women

(van der Ster Wallin, Norring, & Holmgren, 1994), increased food consumption in restrained eaters (Fedoroff, Polivy, & Herman, 1997), early dropout from weight-loss treatments (e.g., Sitton, 1991), overeating in obese individuals (Bjoervell, Roennberg, & Roessner, 1985), and lifetime prevalence rates of bulimia nervosa (Gendall, Sullivan, Joyce, & Bulik, 1997).

A pervasive hypothesis in the appetite and eating-behavior literature is that cravings arise from the need to

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repair physiological deficiencies (e.g., energy depletion) or physiologically mediated mood disturbances (see review by Weingarten & Elston, 1990). This assumption appears to originate from the observation that cravings are often confined to unique types of food (e.g., chocolate; Rozin, Levine, & Stoess, 1991) and that the ingestion of craved foods may restore nutrient deficiencies. For instance, eating sweets reestablishes glucose levels (Blouin et al., 1993), and carbohydrate consumption may decrease symptoms of depression by elevating brain serotonin levels (Bancroft, Williamson, Warner, Rennie, & Smith, 1993). The connection between cravings and physiological states has been reinforced by numerous studies linking cravings to menstrual-related changes (e.g., Dye, Warner, & Bancroft, 1995), endogenous opioid peptide activity (e.g., Mercer & Holder, 1997; Zimmerman et al., 1997), and depression (e.g., Buffenstein, Poppitt, McDevitt, & Prentice, 1995).

Although cravings are expected to be particularly intense in those individuals who binge eat (e.g., Gendall, Joyce, & Sullivan, 1997), food cravings are not a rare experience among the general population, that is, food cravings are not necessarily pathological. Many researchers have asserted that most individuals experience cravings and describe food cravings as a yearning, desire, or longing for a specific type of food (e.g., Michener & Rozin, 1994; Rodin, Mancuso, Granger, & Nelbach, 1991; Schlundt, Virts, Sbrocco, Pope-Cordle, & Hill, 1993; Weingarten & Elston, 1990, 1991). Nonetheless, researchers have postulated that food cravings play an instrumental role in the development and maintenance of binge-eating behavior (e.g., Cooper, 1997; Fairburn & Cooper, 1989; Heatherton & Polivy, 1992; Vitousek, 1996). For example, the starvation/dietary restraint model explains that dietary restraint practices produce strong food cravings that provoke a loss of control over eating (i.e., binge eating; Fairburn & Cooper, 1989), that is, cravings have been conceptualized as the link that connects a self-fueling cycle, starting with dietary restraint and ending with binge eating. In this model, caloric restrictive diets lead to homeostatic imbalances that cause intense cravings and drive individuals to binge eat (Booth, Lewis, & Blair, 1990; Cepeda-Benito & Gleaves, 2001; Fairburn & Cooper, 1982).

However, Weingarten and Elston (1990) noted that although it is possible that foods that are craved may serve to repair homeostatic disturbances, there are many foods or substances that are not craved but are effective in restoring specific physiological deficiencies. Weingarten and Elston suggested that food cravings could be conceptualized as cue-elicited expectations for the pleasurable sensations that accompany the consumption of the desired substance. For instance, Rozin et al. (1991) indicated that chocolate is a highly craved substance because of its sweetness, texture, and aroma. Similarly, Hill, Weaver, and Blundell

(1991) reported that eating the foods that are craved leads to mood improvement. Many other investigators have also downplayed the role of biological influences on craving phenomena and have assigned the origin of cravings to psychological processes (e.g., Cepeda-Benito & Gleaves, 2001; Dye et al., 1995; Gendall, Joyce, et al., 1997; Hill & Heaton-Brown, 1994; Michener & Rozin, 1994; Rodin et al., 1991; Weingarten & Elston, 1991). For instance, food cravings have been linked to negative affect (Dye et al., 1995), guilt and stress (e.g., Benton, Greenfield, & Morgan, 1998), and food cues that include sensory (e.g., smells), environmental (e.g., time and place), and cognitive (e.g., thoughts) stimuli (e.g., Fedoroff et al., 1997; Hill et al., 1991).

How to best conceptualize cravings is a highly debated subject (see Cepeda-Benito & Gleaves, 2001; Franken, 2003; Tiffany & Carter, 1998; Weingarten & Elston, 1990), with some authors defending the idea that cravings are unidimensional (e.g., Kozlowski, Pilliteri, Sweeney, Whitfield, & Graham, 1996) and others positing that a multidimensional conceptualization of cravings is more congruent with current theory and research (e.g., Tiffany, 1990). Researchers who favor a unidimensional definition argue that a craving is just a strong desire to consume a substance (e.g., Kozlowski et al., 1996; Kozlowski, Mann, Wilkinson, & Poulos, 1989). Authors who favor a multidimensional perspective prefer to differentiate between cravings according to their underlying motivational origins, including affective and environmental triggers and substance-use outcome expectancies (see Cepeda-Benito & Gleaves, 2001, for a more detailed review).

Investigators have often expressed dissatisfaction with the unscientific and imprecise measurement of food cravings in research (e.g., Booth, Conner, & Gibson, 1989; Michener & Rozin, 1994; Weingarten & Elston, 1990), that is, numerous studies have assessed the intensity of cravings with single item instruments although the definition of craving has varied considerably across these studies (e.g., desire, intense desire, uncontrollable desire, craving, urge, etc.; for a review, see Cepeda-Benito & Gleaves, 2001). In response to expressed dissatisfaction with the "unscientific" and "imprecise" definition and measurement of food cravings, Cepeda-Benito and colleagues (Cepeda-Benito, Gleaves, Fernandez, Vila, & Reynoso, 2000; Cepeda-Benito, Gleaves, Williams, & Erath, 2000) developed two multifactorial, food craving instruments: the Food Craving Questionnaire-Trait (FCQ-T) and the Food Craving Questionnaire-State (FCQ-S). These instruments were created consistent with the theory that food cravings can arise from and be expressed through a wide variety of psychological processes (Weingarten & Elston, 1990).

Cepeda-Benito, Gleaves, Williams, et al. (2000) developed two different instruments to assess cravings as a

psychological trait, or as cravings are typically manifested in any given individual or within an identified population (e.g., obese patients), as well as a psychological state in response to specific situations (e.g., stressful events, after food deprivation). Some of the questionnaires' items were generated mirroring those found in psychometrically sound, multidimensional questionnaires of drug cravings (i.e., Singleton, Tiffany, & Henningfield, 1994; Tiffany & Drobles, 1991; Tiffany, Singleton, Haertzen, & Henningfield, 1993). The rest of the items were developed to capture conceptualizations of food cravings found in the appetite and eating disorder literature (e.g., Harvey, Wing, & Mullen, 1993; Macdiarmid & Hetherington, 1995; Michener & Rozin, 1994; Overduin & Jansen, 1996; Rodin et al., 1991; Schlundt et al., 1993; Sitton, 1991; Weingarten & Elston, 1991). Using CFA, the two instruments yielded excellent fit indices for nine- and five- factor solutions for the FCQ-T and FCQ-S, respectively (Cepeda-Benito, Gleaves, Williams, et al., 2000).

The FCQ-T and FCQ-S, arguably among the most extensively validated multidimensional measures of craving, are available in Dutch (Franken & Muris, 2005), English (Cepeda-Benito, Gleaves, Williams, et al., 2000), Spanish (Cepeda-Benito, Gleaves, Fernandez, et al., 2000), and Swedish (Elfhag, 2006). Research has consistently shown that the scores of the FCQ-T and FCQ-S have been reliable and have passed many construct validity tests (Cepeda-Benito, Fernandez, Moreno, 2003; Cepeda-Benito, Gleaves, Fernandez, et al., 2000; Cepeda-Benito, Gleaves, Williams, et al., 2000; Elfhag, 2006).

Theorists have proposed that cravings are more prevalent among eating disorder than normal populations (e.g., Gendall, Sullivan, et al., 1997). However, the investigation of food craving phenomena among eating disorder samples has yet to include the assessment of craving using a multidimensional, psychometrically validated measure. Given that the factor structures and construct validity of the multilingual versions of the FCQ-T and FCQ-S have been tested and cross-validated numerous times using samples of college students, we considered that the psychometric evaluation of these instruments in a sample of eating-disordered patients would fill an important gap in the research literature.

The aim of this study was to use CFA to evaluate the factor structures of the FCQ-T and the FCQ-S in a clinical sample. We do not anticipate observing a different factor structure in women seeking treatment for eating disorders than in women attending college, that is, the theoretical and empirical literature, as reviewed above, suggest that cravings are not necessarily pathological and that their differential expression in individuals with and without eating disorders are a matter of frequency and intensity rather than quality (see Gendall, Sullivan, et al., 1997). However,

factor–structure invariability across different populations cannot be assumed and needs to be tested (Bollen, 1989).

To test the construct validity of the measures, we examined the extent to which their scores were associated with level of eating disorder symptoms. Given the prediction that cravings lead to binge eating (e.g., van der Ster Wallin et al., 1994), it was expected that cravings would correlate more strongly with binge-related symptoms than with body dissatisfaction scores. Moreover, given that the FCQ-T was developed to assess characteristic or typical craving patterns, whereas the FCQ-S is intended to measure state-dependent cravings, we predicted that eating disorder psychopathology would be more strongly correlated with trait than state cravings.

METHOD

Participants and Procedures

The participants were 177 women in treatment at seven outpatient eating disorder clinics located in different cities and regions across Spain (Albacete, Ciudad Real, Granada, Malaga, Madrid, Seville, and Valencia) in the year 2001. Ages ranged from 12 to 44 ($M = 20.4$; $SD = 5.2$). Descriptive statistics of the characteristics of the sample are reported in Table 1.

We sought the help of various eating disorder clinics to recruit volunteer participants from patients in treatment. Administration procedures for the measures used in the study were explained in detail to the personnel within each center that volunteered to recruit participants and administer the questionnaires. All eating disorder patients from each clinic who were available during data collection days were asked whether they wanted to volunteer to complete a battery of questionnaires for research purposes. They were told that their answers would be kept confidential and that they would not receive any compensation in exchange for their participation. The voluntary nature of their participation was emphasized and they were assured that neither their therapist nor the clinic would keep track of who had and who had not participated (although no formal records were kept on participation rates, recruiters estimated that more than 90% of those asked to participate volunteered for the study). Participants were alerted that information from their clinical records would be added to their questionnaire, including their *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) diagnosis and their most recent height and weight measurements.

The protocols to produce *DSM-IV* diagnoses differed slightly across settings and were taken at face value after we ascertained that the diagnostic procedures used were systematic and clinically valid, that is, we sought help only

TABLE 1
Means and Standard Deviations for Variables Descriptive of the Sample

	DSM-IV Diagnoses (N)				
	ANR (32)	ANBP (28)	BNNP (30)	BNP (45)	EDNOS (42)
Age	18.1 (4.4)	18.2 (3.7)	22.1 (6.8)	22.9 (5.1)	19.5 (4.0)
BMI	17.3 (1.2)	17.5 (1.4)	22.9 (3.2)	22.4 (4.0)	22.7 (8.5)
BSQ	117.5 (37.4)	137.1 (44.2)	133.0 (33.5)	155.7 (34.1)	136.9 (52.4)
BITE-symptom	8.0 (3.4)	15.4 (4.8)	14.7 (5.5)	21.8 (2.7)	11.5 (6.1)

NOTE: BMI = Body Mass Index; BSQ = Body Shape Questionnaire; BITE = Symptom and Severity Indices of the Bulimia Investigatory Test, Edinburg; ANR = anorexia nervosa–restrictive; ANBP = anorexia nervosa–binging and purging; BNNP = bulimia nervosa–non-purging; bulimia nervosa–purging; EDNOS = eating disorder not otherwise specified.

from clinics where eating disorder diagnoses were corroborated by a licensed psychiatrist on the basis of an interview and scores from standardized eating disorder measures (not necessarily the same measures used in this study). Participants completed the measures within the clinic site during a single administration session. Completion of the measures was usually accomplished within a 30-minute period. The order of administration of the measures was always the same. The FCQ-S and FCQ-T, in that order, were followed by the other measures in the order listed below. The FCQ-S was administered first because the construct it purports to measure is by definition sensitive to environmental and/or affect-related changes.

Measures

Food craving measures. The Spanish versions of the FCQ-T and the FCQ-S (Cepeda-Benito, Gleaves, Fernandez, et al., 2000) measure the intensity of nine trait and five state dimensions of food cravings (see Tables 2 and 3, respectively). The instructions of the FCQ-T ask participants how frequently each statement “would be true for you in general” using a 6-point scale that ranged from 1 (*never or not applicable*) to 6 (*always*). For the FCQ-S, participants were asked to indicate the extent to which they agreed with each statement “right now, at this very moment” using a 5-point Likert-type scale that ranged from 1 (*strongly agree*) to 5 (*strongly disagree*). The nine scales of the FCQ-T measure cravings experienced as or associated with (a) Positive Reinforcement, (b) Negative Reinforcement, (c) Cue-Dependent Eating, (d) Feelings of Hunger, (e) Preoccupation With Food, (f) Intentions to Eat, (g) Lack of Control, (h) Negative-Affect, and (i) Guilty Feelings. The five factors or scales of the FCQ-S include (a) An Intense Desire to Eat; (b) Anticipation of Positive Reinforcement, (c) Anticipation of Relief From Negative States and Feelings, (d) Preoccupation With Food and Lack of Control Over Eating; and (e) Feelings of Hunger.

Full-scale and factor-scale totals can be calculated by simply adding the corresponding item scores.

The FCQ-T and FCQ-S were developed in English and Spanish and have been tested in five separate samples of American and Spanish undergraduates (Cepeda-Benito et al., 2003; Cepeda-Benito, Gleaves, Fernandez, et al., 2000; Cepeda-Benito, Gleaves, Williams, et al., 2000). Both instruments have shown factor structure invariance across American and Spanish samples, as well as excellent internal consistency with the FCQ-T scores also showing good 3-week test–retest reliability. The FCQ-S scores had lower test–retest reliability than the FCQ-T scores, but this finding was congruent with the expectation that psychological states change as a function of time and circumstances (Cepeda-Benito, Gleaves, Williams, et al., 2000). Researchers have found support for the construct validity of the two instruments with the FCQ-T scores being consistently correlated with eating disorder symptoms and, more specifically, with bulimic symptoms and with the FCQ-S being sensitive to dietary restraint manipulations (Cepeda-Benito, Gleaves, Williams, et al., 2000).

In the present sample, the alpha for the FCQ-T total scores was .96, and factor scales provided respectable alphas for eight of the scales (.76–.95), with the scores for one of the scales (Negative Reinforcement) showing poorer reliability, $\alpha = .67$. The overall alpha for the FCQ-S was .83, and factor-scale alphas ranged from .69 to .92 (for a complete list of reliability coefficients, see Tables 2 and 3).

The Bulimic Investigatory Test, Edinburg (BITE). The BITE (Henderson & Freeman, 1987) is a 33-item self-report questionnaire that yields two indexes, severity and symptoms. Three items yield the severity index by measuring the presence and frequency of symptoms associated with dieting, losing control over eating, and engaging in various compensatory behaviors for eating (e.g., use of laxatives). Each of the three severity items is composed of various questions scored on different scales to indicate the frequency with which the person engages in

dieting, purging, and bingeing. In this study, we used the 30 true–false items that assess the presence of eating disorder symptoms related to binge eating. Threshold scores for clinical significance are a symptom score of 20 or more (Henderson & Freeman, 1987). The BITE has been translated into Spanish, and its scores have shown appropriate internal consistency and test–retest reliability with a Spanish sample composed of a group of asymptomatic individuals and a group of eating disorder patients diagnosed as having either bulimia nervosa or “subclinical” bulimia nervosa (Vaz Leal & Penas Lledo, 1999). These authors also found that the BITE discriminated between participants with bulimia nervosa and “subclinical” bulimia nervosa. Within the present sample, the internal consistency for the BITE-symptom scores was good, $\alpha = .90$.

The Body Satisfaction Questionnaire (BSQ). The BSQ (Cooper, Taylor, Cooper, & Fairburn, 1987) contains 34 items that are scored on a 6-point Likert-type scale, ranging from *never* (a) to *always* (b). Total scores can range from 34 to 204, with scores above 104 being in the eating disorder clinical range. The BSQ mainly assesses preoccupation with body shape and size and fears of becoming or feeling fat. The measure has been shown to yield good reliability indices, to discriminate between eating disorder samples and controls, and to be sensitive to treatment gains (Cooper et al., 1987; Zabinski et al., 2001). For the Spanish version of the BSQ, several investigators have reported adequate reliability and validity for the measure’s scores (e.g., Merino Madrid, Pombo, & Godas Otero, 2001; Raich, Torras, & Figueras, 1996; Rodriguez Ramirez, 1997). In the present investigation, internal consistency for the BSQ scores was excellent, $\alpha = .92$.

Statistical Methods

Factor structure cross-validation. Following the same methodology used for the development of the measures (see Cepeda-Benito, Gleaves, Fernandez, et al., 2000; Cepeda-Benito, Gleaves, Williams, et al., 2000), the CFA were performed with the generalized least squares method and using LISREL 8 (Jöreskog & Sörbom, 1993), a nine- and a five-factor model for the FCQ-T and FCQ-S, respectively, were specified. Each item was specified to load on its respective latent factor as was done in previous examinations of the FCQ-T and FCQ-S. Model fit was evaluated using the Normed-Fit Index (NFI; Bentler & Bonett, 1980), the Tucker-Lewis Index (TLI; see Marsh, Balla, & McDonald, 1988), the Comparative Fit Index (CFI; Bentler, 1990), and the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990). For the NFI, TLI, and CFI, values of approximately .90 or greater reflect an adequate fit (e.g., Byrne,

1989; Mulaik et al., 1989). The TLI and CFI have been found to be unaffected by sample size (Bentler, 1990; Marsh et al., 1988). Browne and Cudeck (1993) suggested that values of the RMSEA of .05 or less indicate a close fit, values between .05 and .08 indicate adequate fit, and values greater than .10 indicate need for improvement in the model.

Association between food craving scales, binge eating symptoms, and body dissatisfaction. To further examine the structural validity between the scales of each of the questionnaires, as well as the construct validity of the measures, we examined the extent to which the different scales of each of the two food craving measures predicted different types of eating disorder symptoms. Given that cravings are thought to be precursors of binge eating (e.g., Gendall, Sullivan, et al., 1997), we hypothesized that craving scores would be better predictors of binge eating (BITE-symptom scores) than of body image dissatisfaction (BSQ scores). Thus, for each FCQ scale, we examined whether the correlations between craving-scale scores and BITE scores were stronger than the correlations between craving and BSQ scores. These analyses were carried out following Meng, Rosenthal, and Rubin (1992) recommendations for comparing nonindependent correlations. The methods are extensions of Dunn and Clark’s (1969) work using the Fisher z -transformation and include the calculation of confidence intervals for comparing two correlations.

We also expected that the models using the FCQ-T set of scales, which should measure trait or stable characteristics of craving within any given individual, would explain a substantially greater amount of variance of eating disorder symptoms than the model using the FCQ-S scales, which purports to measure food craving states that change across circumstances. This is the same rationale one would use to hypothesize that, in a neutral or uncontrolled setting, an anxiety trait measure would predict anxiety disorder symptoms better than an anxiety state measure. We conducted four separate multiple regression analyses using the BITE-symptoms and BSQ as the predicted variables and the scales of the FCQ-S and FCQ-T as two separate sets of independent variables. To compare the predictability across models, we calculated 95% CI around the squared multiple correlation coefficients using Fouladi and Steiger’s (1993) recommendations (see also Smithson, 2001).

RESULTS

Factor Structure Cross-Validation

CFA analyses supported the validity of the nine-factor and five-factor structures of the FCQ-T and the FCQ-S, respectively. For the FCQ-T, all fit indices suggested an

TABLE 2
Factors (Scale α 's), Items, and Item-Factor Loadings
(Standardized Loadings From the LAMBDA X Matrix) for Food Cravings Questionnaire-Trait

Anticipation of positive reinforcement from eating (.77)		
9	Como para sentirme mejor. (I eat to feel better.)	.86
10	Algunas veces, mi vida parece perfecta cuando como lo que me apetece. (Sometimes, eating makes things seem just perfect.)	.68
15	Cuando como lo que deseo me siento mejor. (Eating what I crave makes me feel better.)	.76
24	Comer lo que me apetece mucho me sienta estupendamente. (When I eat what I crave I feel great.)	.64
37	Comer me alivia. (When I eat food, I feel comforted.)	.91
Anticipation of relief from negative states and feelings from eating (.67)		
16	Cuando como lo que deseo me siento menos deprimido. (When I satisfy a craving I feel less depressed.)	.79
19	El comer me tranquiliza. (Eating calms me down.)	.90
21	Despues de comer no tengo tantas ansiedades. (I feel less anxious after I eat.)	.64
Having intentions and plans to consume food (.76)		
5	Sin duda alguna, las ganas de comer me hacen pensar en como voy a conseguir lo que quiero comer. (Food cravings invariably make me think of ways to get what I want to eat.)	.86
18	Cada vez que deseo comer algo en particular me pongo a hacer planes para comer. (Whenever I have cravings, I find myself making plans to eat.)	.86
23	Cuando se me antoja una comida, normalmente intento comerla tan pronto como pueda. (When I crave certain foods, I usually try to eat them as soon as I can.)	.92
Cues that may trigger food cravings (.87)		
1	Cuando estoy con alguien que esta comiendo me entra hambre. (Being with someone who is eating often makes me hungry.)	.81
34	Cada vez que voy a un banquete termino comiendo más de lo que necesito. (Whenever I go to a buffet I end up eating more than what I needed.)	.79
35	Para mi es difícil resistir la tentación de tomar comidas apetecibles que están a mi alcance. (It is hard for me to resist the temptation to eat appetizing foods that are within reach.)	.93
36	Cuando estoy con alguien que se pasa comiendo, yo también me paso. (When I am with someone who is overeating, I usually overeat too.)	.86
Thoughts or preoccupation with food (.87)		
6	No hago mas que pensar en la comida. (I feel like I have food on my mind all the time.)	.70
8	A veces me encuentro pensativo preocupado con comida. (I find myself preoccupied with food.)	.46
27	Por mucho que lo intento, no puedo parar de pensar en comer. (I can't stop thinking about eating no matter how hard I try.)	.91
28	Gasto demasiado tiempo pensando en lo próximo que voy a comer. (I spend a lot of time thinking about whatever it is I will eat next.)	.73
30	A veces me doy cuenta de que estoy soñando despierto y estoy soñando en comer. (I daydream about food.)	.64
31	Cada vez que se me antoja una comida sigo pensando en comer hasta que como lo que se me antojó. (Whenever I have a food craving, I keep on thinking about eating until I actually eat the food.)	.95
32	Cuando tengo muchas ganas de comer algo estoy obsesionado con comer lo que deseo. (If I am craving something, thoughts of eating it consume me.)	.93
Craving as hunger (.82)		
11	Se me hace la boca agua cuando pienso en mis comidas favoritas. (Thinking about my favorite foods makes my mouth water.)	.77
12	Siento deseos intensos de comer cuando my estómago está vacío. (I crave foods when my stomach is empty.)	.83
13	Siento como que mi cuerpo me pidiera ciertas comidas. (I feel as if my body asks me for certain foods.)	.82
14	Me entra tanto hambre que mi estómago se siente com un pozo sin fondo. (I get so hungry that my stomach seems like a bottomless pit.)	.89

(continued)

TABLE 2
(continued)

Lack of control over eating (.94)		
2	Cuando tengo deseos intensos de comer, una vez que me pongo a comer no puedo parar de comer. (When I crave something, I know I won't be able to stop eating once I start.)	.98
3	A veces, cuando como lo que se me antoja, pierdo control y como demasiado. (If I eat what I am craving, I often lose control and eat too much.)	.98
22	Si tengo la comida que deseo, no puedo resistir la tentación de comerla. (If I get what I am craving I cannot stop myself from eating it.)	.90
25	No tengo la fuerza de voluntad de resistir mis deseos de comer las comidas que se me antojan. (I have no will power to resist my food crave.)	.88
26	Una vez que me pongo a comer tengo problemas en dejar de comer. (Once I start eating, I have trouble stopping.)	.97
29	Si me dejo llevar por la tentación de comer pierdo todo mi control. (If I give in to a food craving, all control is lost.)	.95
Emotions that may be experienced before or during food cravings or eating (.95)		
20	Siento deseos de comer cuando estoy aburrida, enfadada, o triste. (I crave foods when I feel bored, angry, or sad.)	.96
33	A menudo deseo comer cuando siento emociones fuertes. (My emotions often make me want to eat.)	.94
38	Cuando estoy muy estresada me entran deseos fuertes de comer. (When I'm stressed out, I crave food.)	.95
39	Me entran deseos fuertes de comer cuando estoy disgustada. (I crave foods when I'm upset.)	.96
Guilt from cravings and/or for giving into them (.76)		
4	Detesto no poder resistir la tentación de comer. (I hate it when I give into cravings.)	.88
7	A menudo me siento culpable cuando deseo ciertas comidas. (I often feel guilty for craving certain foods.)	.54
17	Cuando como algo que deseo con intensidad me siento culpable. (When I eat what I am craving I feel guilty about myself.)	.59

excellent fit: NFI = .98; TLI = .98; CFI = .99; and RMSEA = .05. Item-factor loadings ranged from .46 to .98 (see Table 2). However, many interfactor correlations (Phi Matrix) for the FCQ-T were very high, ranging from .94 to .43 (see Table 4). We further examined the structural validity of the nine-factor model using the confidence interval test (Anderson & Gerbing, 1988). The discriminant validity between two factors can be assessed by calculating a confidence interval of plus or minus 2 standard errors around the correlation between the factors. If this interval does not include 1.0, discriminant validity is demonstrated (Anderson & Gerbing, 1988). None of these confidence intervals around the factor correlations contained 1.0, a finding that supports the structural validity of the model (see values above the diagonal in Table 4). For comparison purposes, correlations between the scale-derived raw scores are presented below the diagonal in Table 4.

Given the high interfactor correlations, we further tested the structural validity of the model following the recommendations of Bagozzi and Yi (1988), that is, we fixed, one at a time, the two highest correlations in the

model (the $r = .94$ between Lack of Control Over Eating and Hunger; and the $r = .94$ between Lack of Control Over Eating and Preoccupation With Food) to 1.0, and then compared the fit of these models with the unconstrained model using a χ^2 difference test. Constraining the correlations to 1.0 is an alternative way of testing whether the obtained correlations between the factors were different from 1.0. Constraining the correlation between Lack of Control Over Eating and Hunger to 1.0 led to a significant loss in fit, $\Delta\chi^2(1, N = 177) = 7.02, p < .01$, as did the constraint for the correlation between Lack of Control Over Eating and Preoccupation With Food, $\Delta\chi^2(1, N = 177) = 4.96, p < .05$. Thus, this additional test also supported the structural validity of the model.

Although the first-order factor model fit the data well, the high correlations found between the factors suggested the presence of a second-order (higher) factor. Thus, we performed also a second-order factor analysis using the methodology described by Jöreskog and Sörbom (1993). We specified that there was one exogenous second-order latent variable, with the various dimensions of the instruments being endogenous latent variables. The fit indexes

TABLE 3
Factors (Scale α 's), Items, and Item-Factor Loadings
(Standardized Loadings From the LAMBDA X Matrix) for Food Cravings Questionnaire-State

An intense desire to eat (.92)		
1	Ahora mismo, tengo un deseo intenso de comer una o varias comidas en particular. (I have an intense desire to eat one or more specific foods.)	.90
2	Ahora mismo tengo un antojo por una o varias comidas en particular. (I'm craving one or more specific foods.)	.90
3	Ahora mismo me urge comer una o varias comidas en particular. (I have an urge for one or more specific foods.)	.91
Anticipation of positive reinforcement that may result from eating (.81)		
4	Si pudiera comer una o varias comidas en particular me sentiría perfectamente. (Eating one or more specific foods would make things seem just perfect.)	.58
5	Estoy seguro de que si comiera lo que deseo, mi humor mejoraría. (If I were to eat what I am craving, I am sure my mood would improve.)	.84
6	Comer una o varias comidas en particular me haría sentir maravillosamente. (Eating one or more specific foods would make me feel wonderful.)	.90
Anticipation of relief from negative states and feelings as a result of eating (.85)		
7	Si comiera algo no me sentiría tan débil y aletargada (If I ate something I wouldn't feel so sluggish and lethargic.)	.69
8	Me sentiría menos antipática e irritable si pudiera satisfacer mis deseos de comer. (Satisfying my craving would make me feel less grouchy and irritable.)	.89
9	Me sentiría más alerta si pudiera satisfacer mis deseos de comer. (I would feel more alert if I could satisfy my craving.)	.84
Lack of control over eating (.75)		
10	Si tomara una o varias comidas en particular no podría parar de comerlas. (If I have one or more specific foods, I cannot stop eating it.)	.77
11	Mi deseo de comer una o varias comidas en particular puede más que yo. (My desire to eat [one or more specific foods] seems overpowering.)	.93
12	Ahora mismo, se que voy a seguir pensando en lo que me apetece hasta que lo consiga. (I know I'm going to keep on thinking about one or more specific foods until I actually have it.)	.47
Craving as hunger (.69)		
13	Tengo hambre. (I am hungry.)	.43
14	Si pudiera comer algo ahora mismo, mi estómago no se sentiría tan vacío. (If I eat right now, my stomach wouldn't feel as empty.)	.82
15	Me siento débil por no comer. (I feel weak because of not eating.)	.71

obtained for the second-order factor were highly similar to those obtained for the first-order CFA. All second-order fit index values were within a ± 0.02 range of their corresponding first-order fit index values. Loadings of the original factors on the second-order factor ranged from .35 for Negative Reinforcement to .60 for Planning. Overall, the results of the first-order and second-order factor analyses were highly comparable to the first- and second-order factor analyses conducted by Cepeda-Benito, Gleaves, Williams, et al. (2000) for the development of the FCQ-T.

Overall, the fit indices for the FCQ-S suggested an adequate fit, with three indices indicating an adequate fit (TLI = .91; CFI = .93; RMSEA = .08) and one falling short of being adequate (NFI = .88). Item-factor loadings ranged from .43 to .91. None of the confidence intervals around the factor correlations contained 1.0, and the interfactor

correlations for the FCQ-S were considerably lower than those obtained for the FCQ-T (see Table 5). The relatively low interfactor correlations supported the structural validity of the model and made it unnecessary to test for the presence of a higher order factor.

Association Between Food Craving Scales, Binge Eating Symptoms, and Body Dissatisfaction

Correlation comparisons. Given that cravings are thought to be precursors of binge eating (e.g., Gendall, Sullivan, et al., 1997), we hypothesized that craving scores would be more strongly associated with binge eating (BITE-symptom scores) than with body image dissatisfaction (BSQ scores). We used Meng et al. (1992) method to statistically compare two nonindependent correlations that

TABLE 4
Interfactor Correlations, or PHI Matrix (Above the Diagonal) for the FCQ-T
and Correlations Between Scale Scores of the FCQ-T, BITE, and BSQ

<i>Food Craving Dimensions</i>	1	2	3	4	5	6	7	8	9
1. Positive reinforcement	—	.82	.73	.70	.80	.73	.75	.76	.43
2. Negative reinforcement	.69	—	.57	.58	.69	.60	.64	.62	.44
3. Cue-dependent eating	.63	.41	—	.85	.93	.79	.92	.91	.74
4. Preoccupation with food	.49	.28	.65	—	.89	.91	.94	.91	.79
5. Feelings of hunger	.66	.42	.75	.68	—	.88	.94	.89	.80
6. Intentions to eat	.62	.38	.65	.70	.69	—	.91	.86	.80
7. Lack of control	.64	.45	.79	.73	.73	.80	—	.92	.88
8. Negative-affect	.65	.42	.76	.42	.67	.75	.83	—	.80
9. Guilty feelings	.10	.04	.41	.66	.45	.50	.59	.51	—
BITE-symptoms	.26	.32	.61	.78	.61	.66	.81	.75	.69
BSQ	-.13	-.02	.15	.49	.14	.16	.24	.18	.59

NOTE: FCQ-T = Food Craving Questionnaire–Trait; BSQ = Body Shape Questionnaire; BITE = Bulimia Investigatory Test.

TABLE 5
Interfactor Correlations, or PHI Matrix
(Above the Diagonal) for the FCQ-S
and Correlations Between Scale Scores
of the FCQ-S, BITE, and BSQ

<i>Food Craving Dimensions</i>	1	2	3	4	5
1. Intense desire to eat	—	.16	.39	.56	.54
2. Positive reinforcement	.13	—	.61	.35	.18
3. Negative reinforcement	.33	.49	—	.61	.43
4. Feelings of hunger	.52	.27	.49	—	.34
5. Lack of control	.48	.11	.28	.26	—
BULIT-symptoms	.33	.10	.25	.21	.72
BSQ	.07	.01	.15	.17	.34

NOTE: FCQ-S = Food Craving Questionnaire–State; BSQ = Body Shape Questionnaire; BITE = Bulimia Investigatory Test.

have one common or overlapping variable. Visual inspection of Tables 4 and 5 shows that the correlations between FCQ scale scores and BITE scores were higher than their overlapping FCQ-BSQ correlations. For the FCQ-T, we found that eight of nine correlation comparisons were statistically significant, that is, all but the comparison having the *Guilty Feelings scale* of the FCQ-T as the overlapping variable. For the FCQ-S, two of five correlation comparisons yielded statistically significant differences: those that had the *Intentions to Eat* and the *Lack of Control* scale of the FCQ-S as the overlapping variable (see Table 5). These findings support the construct validity of the FCQ measures because craving scores were more strongly associated to binge eating than to body dissatisfaction. Moreover, as expected, this effect was observed more clearly when cravings were measured as a trait than as a state.

Multiple regression analyses. We predicted that FCQ-T scales, which should measure trait or stable characteristics of craving, should be better predictors of eating disorder symptomatology than FCQ-S scales, which purport to measure food craving states that change across time and circumstances. The two multiple regression models using the FCQ-T scales to predict binge-related or BITE-symptom scores (adjusted $R^2 = .78$ [95% CI = .73 – .85]; $F[9, 167] = 65.2, p < .0001$) and body shape dissatisfaction or BSQ scores (adjusted $R^2 = .42$ [95% CI = .32 – .52]; $F[9, 167] = 13.4, p < .0001$) were statistically significant (see Table 6). Four of the nine FCQ-T scales were unique predictors of BITE-symptoms, Preoccupation With Food ($\beta = .32$), Lack of Control ($\beta = .43$), Negative-Affect ($\beta = .22$), and Guilty Feelings ($\beta = .22$). Three of the nine FCQ-T scales were unique predictors of BSQ scores, Intentions and Plans to Eat ($\beta = -.20$), Preoccupation With Food ($\beta = .44$), and Guilty Feelings ($\beta = .52$). It is noteworthy that, when entered simultaneously into the regression equation and despite their very high interfactor correlations (see Table 3), four scales emerged as significant predictors of BITE scores. This finding can be used to argue for incremental validity for each of the two highly correlated scales even when entered simultaneously within the same model.

The two multiple regression models using the FCQ-S scales to predict bulimic symptoms (adjusted $R^2 = .51$ [95% CI = .41 – .61]; $F[5, 172] = 35.5, p < .0001$) and body shape dissatisfaction (adjusted $R^2 = .12$ [95% CI = .03 – .21]; $F[5, 172] = 5.41, p < .001$) were statistically significant (see Table 7). One of the five FCQ-S scales was a unique predictor of BITE-symptoms (Lack of Control Over Eating [$\beta = .71$]). Two of the five FCQ-S scales

TABLE 6
Multiple Regression Results for the Prediction of Binge-Related (BITE-Symptom)
and Body Dissatisfaction-Related (BSQ) Symptoms from Trait Cravings (FCQ-T)

FCQ-T Scales	Predicted Model							
	BITE-Symptom				BSQ			
	b	SE	β	p	b	SE	β	p
Intentions to eat	-0.157	0.106	-.102	.140	-1.888	1.125	-.194	.095
Positive reinforcement	-0.021	0.073	-.019	.775	-0.004	0.771	-.001	.996
Negative reinforcement	-0.023	0.104	-.013	.822	-0.002	1.123	.000	.998
Lack of control	0.321	0.069	.466	<.001	-0.020	0.736	-.004	.979
Preoccupation with food	0.262	0.048	.330	<.001	2.202	0.510	.430	<.001
Feelings of hunger	0.006	0.082	.005	.944	-1.108	0.859	-.139	.199
Negative-affect	0.174	0.072	.193	.017	-0.447	0.768	-.077	.562
Cue-dependent eating	-0.117	0.083	-.098	.163	-0.124	0.897	-.016	.890
Guilty feelings	0.306	0.085	.205	<.001	4.930	0.940	.507	<.001

NOTE: FCQ-T = Food Craving Questionnaire-Trait; BITE = Bulimia Investigatory Test; BSQ = Body Shape Questionnaire; BITE predicted (adjusted $R^2 = .78$; $F[9, 167] = 65.2$, $p < .0001$); BSQ predicted (adjusted $R^2 = .42$; $F[9, 167] = 13.4$, $p < .0001$).

TABLE 7
Multiple Regression Results for the Prediction of Binge-Related (BITE-Symptom)
and Body Dissatisfaction-Related (BSQ) Symptoms from State Cravings (FCQ-S)

FCQ-S Scales	Predicted Model							
	BITE-Symptom				BSQ			
	b	SE	β	p	b	SE	β	p
Intense desire to eat	-0.115	0.134	-.058	.392	-2.411	1.200	-.189	.046
Positive reinforcement	-0.114	0.124	-.059	.360	-1.422	1.088	-.115	.193
Negative reinforcement	0.078	0.116	.046	.503	0.905	1.002	.085	.368
Lack of control	1.355	0.118	.747	<.001	4.513	1.033	.393	<.001
Feelings of hunger	0.001	0.077	.001	.997	0.942	0.659	.126	.155

NOTE: FCQ-S = Food Craving Questionnaire-State; BITE = Bulimia Investigatory Test; BSQ = Body Shape Questionnaire; BITE predicted (adjusted $R^2 = .51$; $F[5, 171] = 35.5$, $p < .0001$); BSQ predicted (adjusted $R^2 = .12$; $F[5, 171] = 5.41$, $p < .001$).

were unique predictors of BSQ scores (An Intense Desire to Eat [$\beta = -.21$] and Lack of Control Over Eating [$\beta = .52$]), that is, as predicted, FCQ-S scores predicted BITE and BSQ scores (51% and 12% of variance explained, respectively) but to a substantially lesser extent than FCQ-T scores (71% and 42% of variance explained, respectively). This conclusion was supported statistically because the R^2 CIs for the prediction of BITE scores from FCQ-T (95% CI = .73–.85) and from FCQ-S scores (95% CI = .41–.61) did not overlap, and because the R^2 CIs for the prediction of BSQ scores from FCQ-T (95% CI = .32–.52) and from FCQ-S scores (95% CI = .03–.21) did not overlap.

DISCUSSION

At the theoretical level, the replication of the nine-factor model of the FCQ-T and the five-factor model of FCQ-S

support the conceptualization of cravings as a multidimensional construct that should be measured by appraising the contextual, physiological, cognitive, and emotional states that cause or modulate cravings, as well as the cognitive and affective responses that are generated by the anticipation of satisfying the craving (see Cepeda-Benito & Gleaves, 2001; Franken, 2003; Tiffany & Carter, 1998; Weingarten & Elston, 1990; compare Kozlowski et al., 1996). With the exception of the low internal consistency of the scores yielded by the Negative Reinforcement scale of the FCQ-T and the Hunger scale of the FCQ-S (both slightly below .70), the internal consistency for the scores of the full instruments and their scales were clearly adequate. Evidence of structural validity for the hypothesized nine-factor (FCQ-T) and five-factor (FCQ-S) solutions of the instruments was supported by the good fit-indices and the generally high item loadings obtained.

In congruence with the hypothesized causal relationship between drug cravings and compulsive drug use (e.g., See, 2002), substantiation of construct validity for the measures was obtained by showing that scores from both craving instruments were associated more strongly with binge eating–related symptoms than with body dissatisfaction. Finally, associations with both measures of eating disorder psychopathology were higher for trait than state cravings, a pattern of results that supports the notion that the FCQ-T and the FCQ-S measure trait and state constructs, respectively.

A limitation of the claim of structure validity for the FCQ-T was the finding of its high interfactor correlations. Indeed, a second-order CFA confirmed the presence of a higher order factor (as would be expected given that they are all hypothesized aspects of trait-like cravings). However, for most data-reduction scenarios (simply adding item scores to obtain scale scores), the above limitation is lessened because interscale correlations are lower than interfactor correlations (see Table 4). In comparison to the FCQ-T, the interfactor correlations of the FCQ-S provided clearer evidence of the structural validity of the instrument, that is, interfactor correlations were substantially lower for the FCQ-S and for the FCQ-T (Tables 4 and 5). This pattern of results across the FCQ-T and FCQ-S are highly similar to those found in previous research with nonclinical samples (e.g., Cepeda-Benito et al., 2003).

Regarding construct validity, FCQ-T scale scores were more strongly associated with binge eating than with body dissatisfaction, with shared variance being substantially and significantly greater between cravings and binge eating than between cravings and body dissatisfaction. Regarding structural validity, we found that various scales that were highly correlated with each other emerged as unique predictors of eating disorder symptoms. More specifically, Preoccupation With Food and Guilty Feelings scores were unique predictors of both BITE-symptom and BSQ scores, and Lack of Control and Negative-Affect scores emerged as significant predictors of BITE-symptom scores.

As hypothesized, FCQ-T scores were better predictors of binge eating symptoms and body dissatisfaction symptoms than FCQ-S scores. This pattern of results represents a replication of findings obtained with college student samples (Cepeda-Benito et al., 2003; Cepeda-Benito, Gleaves, Williams, et al., 2000) and is congruent with the notion that the FCQ-T and FCQ-S measure trait and state craving, respectively. Although FCQ-S scores were not as predictive of eating disorder symptoms as FCQ-T scores, the FCQ-S may nonetheless be a useful tool to investigate eating disorders. Whereas the trait version of the FCQ is expected to yield scores that are unresponsive to situational

circumstances (e.g., length of time without eating, in reaction to stress), the state measure could be used to assess differential levels of responsiveness to various manipulations. For example, using the FCQ-S, researchers could test whether a food deprivation manipulation increases cravings more in bulimia nervosa participants than in nonclinical controls.

These results have other important research and applied implications. Treatment outcome studies investigating the effectiveness of food-exposure/response-prevention therapies for bulimia have found that reactivity to food-associated cues does decline after treatment. These studies, without exception, have attempted to reduce or extinguish subjective (e.g., craving report) and physiological reactivity (e.g., salivation) to food cues (e.g., sight, smell, taste) by using cue-exposure/response-prevention methods (i.e., exposure to food and preventing binge eating). However, degree of cue-reactivity reduction has not been associated in a consistent manner to treatment modality nor to positive treatment outcome (Carter, Bulik, McIntosh, & Joyce, 2001, 2002; Carter, McIntosh, Joyce, & Bulik, 2001; Jansen, 2001; Leitenberg, Rosen, Gross, Nudelman, & Vara, 1988; Wilson, Rossiter, Kleifield, & Lindholm, 1986). Given the multidimensional nature of cravings, a potential methodological shortcoming of exposure/prevention interventions could be that these exposure procedures, although effective in reducing overall cue-dependent craving reactivity, do not diminish craving reactivity associated with those dimensions of cravings most strongly associated with eating disorder psychopathology. For example, the multiple regression analysis conducted to predict BITE symptom scores suggested that Lack of Control, Negative-Affect, Intentions and Plans to Eat, and Guilty Feelings are the most relevant craving dimensions for binge eating–related symptoms.

A present limitation and area for future research is the need to investigate the extent to which FCQ-T scores differentiate between diagnostics groups (e.g., anorexic vs. bulimic patients), as well as the extent to which food craving states may change across different situations and types of eating disorder patients. For example, if food cravings are precursors of binge eating, one would expect that individuals diagnosed with anorexia nervosa–restrictive type would report less cravings than individuals diagnosed with bulimia nervosa. Similarly, FCQ-S scores may help us assess whether the propensity to binge eat is positively with craving reactivity to precursors of binge eating (e.g., emotional states, food stimuli). If such is the case, treatment-induced reductions in craving reactivity could be predictive of treatment-outcome success. Likewise, it would be important to determine whether trait cravings change in response to treatment interventions and whether these changes are related to treatment outcomes.

In summary, the present investigation represents the first study to provide evidence of the validity of the FCQ-T and FCQ-S for use with eating disordered populations. The results add to the generalizability of findings previously obtained with nonclinical samples. Given that in theory cravings have a pivotal role on binge eating, the results open the door also to future research on the role of cravings in eating disorder psychopathology and treatment outcome research.

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