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## Motivations to eat: Scale development and validation

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### Abstract

*Objective:* To validate a measure of psychological motivations to eat based on a four-category model of motivations for alcohol use (Cooper, 1994). Motivations specified by this model are: to cope with negative affect, to be social, to comply with others' expectations, and to enhance pleasure.

*Method:* In Study 1, 40 respondents were queried in an open-ended format about their reasons for eating; responses were content-coded to determine if they fit into the four theorized categories. In Study 2, an item pool was generated based on responses from Study 1, and random halves of a sample of 812 college students were used to test and then validate the hypothesized factor structure.

*Results:* As expected, the final inventory yielded the four theorized categories. The factor structure was generally invariant across gender, and the resulting Motivations to Eat subscales uniquely predicted restrictive eating, bingeing, and purging.

*Discussion:* Prior eating research has focused mainly on coping and compliance motivations. The present study identified four distinct motivations to eat that potentially are important for understanding healthy and disordered eating.

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## 1. Introduction

Eating is a physiological requirement, insofar as it provides nutrients for proper growth and functioning of the major systems of the human body (e.g., cardiovascular, immune, and pulmonary). Even beyond physiological requirements for sustenance, *psychological motivations* play an important role in the initiation of both healthy and disordered eating. For example, eating can be motivated by both positive (e.g., happiness) and negative (e.g., anger, depression) emotions (Arnow, Kenardy, & Agras, 1995; Heatherton & Baumeister, 1991; Macht & Simons, 2000; Sherwood, Crowther, Wills, & Ben-Porath, 2000), as well as by a desire to nurture oneself (Leham & Rodin, 1989). Eating can also be motivated by internalized social cues, norms, and expectations about food consumption (Leary, Tchividjian, & Kraxberger, 1994; Roth, Herman, Polivy, & Pliner, 2001) or by cultural practices that strengthen feelings of social connection, such as celebrations and other social functions involving food (Pliner & Chaiken, 1990). Such motivations to initiate eating have been the focus of some discussion and empirical research, but these motivations most often have been discussed in isolation from one another.

Allison (1994) provided an exhaustive review of existing inventories pertaining to eating behaviors and eating disorders; none of the over 100 inventories reviewed was designed to assess a range of psychological motivations to eat. Nevertheless, a few inventories examined one or two aspects of psychological motivations concerning food-related behaviors. For example, the Emotional Eating Scale (Arnow et al., 1995) assesses an important psychological motivation for eating: as a response to negative emotions. Two of the three scales in the Dutch Eating Behavior Questionnaire (van Strien, Frijters, Bergers, & Defares, 1986) tap motivations to eat: Emotional Eating (eating in response to negative emotions) and External Eating (eating in response to external sensory cues, such as the smell and appearance of food). Finally, the Eating Inventory (Stunkard & Messick, 1985; cf. Stunkard & Messick, 1988) has three scales, including one scale (disinhibition of control) that includes some items reflecting psychological reasons to eat. However, the disinhibition of control scale includes items that reflect psychological motivations to eat (e.g., “When I feel lonely, I console myself by eating”) along with other non-motivation items (e.g., “My weight has hardly changed at all in the last ten years”). Thus the scale does not provide a pure measure of motivations, nor was it intended to. Since Allison’s 1994 book, Steptoe, Pollard, and Wardle published a measure of motivations that are associated with eating behavior (1995). However, their measure is designed to assess what motivates food choices, once a person already has decided to eat in the first place. In summary, though there are scales related to psychological motivations to eat, none are theoretically derived for measuring exclusively a range of motivations to initiate eating.

The relative lack of systematic theoretical and empirical attention to psychological motivations in the field of eating disorders is surprising, especially when one examines the literature pertaining to psychological motivations for alcohol use. This literature is particularly relevant considering the relation between eating disorders

and alcohol use. Specifically, both alcohol use and eating disorders can be considered ways of coping with societal, relational, and personal matters in people's lives (Mintz & Wright, 1993; cf. Brumberg, 2000). In this view, alcohol and food are both thought to serve similar functions for an individual (Brisman & Seigel, 1984; cf. Snyder & Cantor, 1998). The psychological structure of motivations in both domains might have common features, even though the behaviors themselves are quite distinct (cf. Cooper, Agocha, & Sheldon, 2000). Whereas the literature about psychological motivations to eat is quite small (Arnow et al., 1995; Stunkard & Messick, 1985; van Strien et al., 1986), there is considerable research on psychological motivations for alcohol use.

Cox and Klinger (1988, 1990) proposed a framework for understanding psychological motivations for alcohol use, and this framework was applied by Cooper and colleagues (Cooper, 1994; Cooper, Frone, Russell, & Mudar, 1995) to develop a four-category model of motivation for alcohol use. As stated by Cooper (1994), in this model, motivations for drinking alcohol

can be meaningfully characterized along two underlying dimensions reflecting the valence (positive or negative) and source (internal or external) of the outcomes an individual hopes to achieve by drinking. Thus, individuals may drink to obtain a positive outcome...or to avoid a negative one... Moreover, drinking may be responsive to internal rewards, such as the manipulation or management of one's own internal emotional state, or to external rewards, such as social acceptance or approval (p. 118).

Further, by crossing these two dimensions, four categories of motivations for alcohol consumption emerge. Specifically, we see a negatively valenced, internally elicited motivation (to cope with negative affect); a positively valenced, externally elicited motivation (to be social); a negatively valenced, externally elicited motivation (to comply with social expectations); and a positively valenced, internally elicited motivation (to enhance pleasure or positive affect).

The four-category model of drinking motivations has clear parallels to the types of eating motivations discussed in the literature to date. For example, research has shown that people regulate their eating behaviors as a way to cope with emotional distress (Gangley, 1988; Heatherton & Baumeister, 1991; Stice & Agras, 1999; Strueman, Vookles, Berenstein, Chaiken, & Higgins, 1991). Whether emotional distress leads to food restriction or intake depends on an interaction of numerous complex factors: psychological, historical, cultural, and sociological (Bordo, 1993; Brumberg, 2000; Wolf, 1991). Both eating for social reasons and compliance reasons are influenced by externally derived norms and expectations, though the motivation to eat to be social is activated only during social occasions. Research suggests a norm of minimal eating in others' company is stronger than the norm of matching the food intake levels of one's peers (Roth et al., 2001). Group norms, however, will shape the baseline that constitutes minimal eating during social gatherings (e.g., in public settings norms for young college women might lead to lesser degrees of food intake than for their male counterparts; cf. Pliner & Chaiken, 1990; Wolf, 1991). The motivation to eat to comply—as activated by a set of internalized expectations which may be chronically primed—can lead to either chronic food intake or restriction (Fredrickson, Roberts, Noll, Quinn, & Twenge, 1998; Heatherton & Baumeister,

1991; Mintz & Betz, 1998; Noll & Fredrickson, 1998; Strauman et al., 1991; Wolf, 1991). Finally, eating for the sensory pleasure of food has been associated with binge-eating. Indeed, sensory cues (e.g., delicious aroma or attractive appearance of foods) have been shown to activate binge-eating episodes (cf. Waters, Hill, & Waller, 2001), suggesting that pleasure motivations for eating might be the more proximal cause of over-eating, mediating cue exposure and bingeing. Hence, although the psychological motivations to eat thus far identified have not been integrated into an overarching theoretical framework, they appear to fit well within this framework (also see Cooper & Shapiro, 1997, and Cooper, Shapiro, & Powers, 1998, for an elaboration of this framework and its application to other health-related behaviors).

In the current set of studies, we therefore develop and validate an inventory to assess psychological motivations to eat based on this four-category model (i.e., coping, social, compliance, and pleasure motivations). In Study 1, possible scale items were generated through an open-ended elicitation of 40 respondents, with additional face valid items generated by the researchers. In Study 2, the factor structure of the inventory was determined, and item content was refined, based on data collected from a separate sample of 812 college students. Given that gender fundamentally shapes eating practices and food consumption (Bordo, 1993; Wolf, 1991), the factor structure was tested for invariance across females and males. As well, measures to determine several types of validity—convergent, discriminant, and concurrent—were included.

Based on theoretical and clinical knowledge of food consumption and of the etiology of eating disorders, we formulated general hypotheses about how each of the motivations would predict three types of eating behaviors: restrictive eating, bingeing, and purging. We hypothesized that (a) coping motivations to eat would positively predict all three types of eating behaviors; (b) social motivations to eat would negatively predict all three types of eating behaviors; (c) compliance motivations to eat would positively predict all three types of eating behaviors; and (d) pleasure motivations to eat would positively predict binge-eating, negatively predict restrictive eating, but show no relation to purging.

## **2. Study 1: Development of the item pool**

In Study 1, we used open-ended elicitation procedures for three purposes: (1) to determine whether the theoretically derived framework fits with people's own ideas about reasons, beyond physiological needs, for eating; (2) to assess whether we might be overlooking an important domain of these motivations; and (3) to obtain preliminary data on gender differences and similarities in these motivations. Eating disorders are far more common among women than men, but are experienced by both genders (Andersen, 1999; Wolf, 1991; cf. Bordo, 1993). By including both males and females in the development of this instrument, we can explore whether the four categories cover the major motivations to eat for both females and males, or if unique domains exist for either gender.

## 2.1. Method

### 2.1.1. Sample and procedure

A convenience sample of 28 female and 12 male university and community volunteers responded in written form to open-ended questions about their motivations to eat, beyond physical hunger. The mean age was approximately 25 years old. The following question was posed: “What kinds of feelings, thoughts, or circumstances typically prompt you (or others) to eat or want to eat (besides simply feeling hungry/being hungry)?”

## 2.2. Results and discussion

Participants generated 203 discrete responses to this question. Narrative responses were independently coded by two raters into one of the four theoretically expected motivations to eat: coping, social, compliance, and pleasure. Written descriptions of each motivation domain were provided in advance to coders to ensure there was a common understanding of each motivation. Responses judged as not fitting these dimensions were assigned to an “other” category. Discrepancies between coders were resolved by discussion until consensus was reached. All psychologically meaningful reasons for eating responses fit in one of the four categories. Of the responses generated, 48% were categorized as Coping motivations (e.g., “stress/depressed”), 13% were categorized as Social motivations (e.g., “as a social event”), 4% were categorized as Compliance motivations (e.g., “someone saying ‘you have to try this’”), and 16% were categorized as Pleasure motivations (e.g., “love the taste of food”). The 19% of responses that were coded as other motivations were not centrally psychological in nature (e.g., “hypoglycemic,” “keeping energy level up”). In sum, the four-category model seemed to fit well with participants’ self-generated understandings about motivations to eat.

Both females and males generated responses consistent with the four-category model. Of all the reasons for eating that females generated, 51% of the responses were Coping motivations; 12% were Social motivations; 5% were Compliance motivations; 16% were Pleasure motivations; and 15% were Other motivations. Of all the reasons for eating that males generated, 48% of the responses were Coping motivations; 15% were Social motivations; 2% were Compliance motivations; 17% were Pleasure motivations; and 29% were Other motivations. The differences by gender for percentage generated in each category were not statistically different,  $\chi^2(4) = 6.00, p > .05$ .

## 3. Study 2: Development, refinement, and validation of the motivation to eat subscales

### 3.1. Method

#### 3.1.1. Sample and procedure

An initial pool of items assessing each of the four theorized domains was generated from two sources. Thirty-three non-redundant responses were taken from Study

1 and edited as needed for clarity. Additional items were drawn from the literature to supplement the Compliance, Social, and Pleasure categories. The resulting pool included 39 items: 17 on the Coping subscale, 7 on the Social subscale, 7 on the Compliance subscale, and 8 on the Pleasure subscale.

Participants for the present study were 812 undergraduates who received credit as part of their introductory psychology course. The mean age of the sample was 18.8 years old, 64% of the sample was female, and 87% was European American.

### 3.1.2. Measures

Items were administered in random order, as part of a larger questionnaire packet. Respondents rated the relative frequency of eating for each of the specified reasons on a scale from 1 (almost never/never) to 5 (almost always/always).

To establish convergent and discriminant validity of the Motivations to Eat subscales, the Emotional Eating Scale (EES; Arnow et al., 1995) and the Dutch Eating Behavior Questionnaire (DEBQ; van Strien et al., 1986) were included in the questionnaire packet. The EES is a 25-item scale that assesses eating in response to negative emotions, and comprises three subscales assessing eating in response to anger/frustration, anxiety, and depression, with 11, 9, and 5 items, respectively. Items begin with the stem “How strong is your desire to eat when you feel. . .”. Responses range from 1 (*no desire to eat*) to 5 (*an overwhelming urge to eat*). In this study, the reliability of each subscale was: Anger/Frustration,  $\alpha = .89$ ; Depression,  $\alpha = .83$ ; Anxiety,  $\alpha = .83$ . These three subscales were expected to converge with the Coping subscale in the Motivations to Eat measure. The DEBQ is a 33-item inventory that has three subscales: Emotional Eating (eating in response to negative emotions), External Eating (eating in response to sensory cues), and Restrained Eating (how much one restrains or limits eating), with 13, 10, and 10 items, respectively. Responses range from 1 (*never*) to 5 (*very often*). In this study, the reliability of each of the subscales was: Emotional Eating,  $\alpha = .94$ ; External Eating,<sup>1</sup>  $\alpha = .71$ ; Restrained Eating,  $\alpha = .91$ . Emotional Eating was expected to converge with the Coping subscale in the Motivations to Eat measure. Though eating can be activated by sensory cues, the pleasure-seeking motivation may be the more proximal cause of eating. As such, External Eating was expected to demonstrate convergent validity with the Pleasure subscale in the Motivations to Eat measure. Restrained Eating was expected to show discriminant validity with each of the four dimensions of the Motivations to Eat measure.

To assess the concurrent validity of the Motivations to Eat subscales, criterion measures of three types of eating behaviors were also included. Respondents answered questions about the presence and the lifetime frequency of eating restraint (i.e., fasting, appetite control pill use, and strict dieting), bingeing, and purging (i.e., vomiting, laxative use, and diuretic use). Presence was measured by a yes/no response indicating whether the respondent had ever engaged in a given behavior. For

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<sup>1</sup> Due to a clerical error, seven items on the external eating subscale were missing from the questionnaire administration.

purging and restraint, which were each assessed by multiple behaviors, a count of yes responses was made across the relevant subset of behaviors. Thus scores could range from 0 (no behaviors endorsed) to 3 (three behaviors endorsed) for both restrained eating and purging. Respondents who had ever engaged in a given behavior were then asked to indicate on a 1 (*1–2 times in your life*) to 6 (*more than 20 times*) scale how often they had ever engaged in this behavior. For restrictive eating and purging, lifetime frequency was determined by taking the average across the specific acts that constituted the behavior.

Finally, to rule out the effects of socially desirable responding, we included the 20-item version of the Marlowe–Crowne Social Desirability Scale (Strahan & Gerbasi, 1972). This scale comprises items that are answered true or false; half of the items are reverse-scored. Sample items include “I’m always willing to admit it when I made a mistake” and “I like to gossip at times” (reverse-scored). In coding this scale, each item was assigned the value of 0 or 1, and responses were then summed; 1 denotes that the participant marked the socially desirable response. In the 1972 article, based on a sample of 500 university students, the mean and standard deviation for this scale are 14.5 and 5.4, respectively; no range was reported. In the current sample,  $M = 12.21$ ,  $SD = 2.14$ , with answers ranging from 5 to 19.

### 3.2. Results and discussion

#### 3.2.1. Overview of analyses

The analyses were conducted in five phases. First, the sample was randomly divided into two subsamples (Group 1,  $n = 404$ ; Group 2,  $n = 408$ ).<sup>2</sup> The measurement model was refined in Group 1, and the refined model was cross-validated in Group 2. Means, standard deviations, and  $\alpha$ s of the resulting subscales were calculated. Second, the final model was tested for invariance in the factor structure across gender, using the pooled sample. Third, analyses were conducted to test for mean gender differences in each of the four Motivations to Eat subscales. Fourth, convergent and discriminant validity with selected established measures were examined. Fifth, multiple regression was used to test the concurrent validity of the Motivations to Eat subscales vis-à-vis three distinctive types of eating behavior: restrictive eating, bingeing, and purging.

#### 3.2.2. Measurement model refinement and cross-validation

*Exploratory factor analyses.* An exploratory factor analysis was conducted to determine whether the four theorized factors would be extracted. Using data from Group 1, we extracted factors through principal-axis factoring followed by oblimin rotation, and examined the pattern matrix. Principal-axis factoring was used because it has been shown to reproduce the initial correlation matrix more reliably than other extraction techniques (Snook & Gorsuch, 1989), whereas oblimin rotation (which

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<sup>2</sup> Group 1 and Group 2 did not differ in gender composition or on mean levels of age, weight, socially desirable responding, or any of the individual motivation to eat items.

allows correlated factors) was used because earlier research suggests that eating motivations are correlated (e.g., van Strien et al., 1986). The resulting solution was evaluated to determine whether items loaded on their intended factors at or above .40, and demonstrated purity (Floyd & Widaman, 1995). In this case, items whose loading on a secondary factor were less than half the value of the loading on its primary or intended factor were considered pure (i.e., non-complex). For example, if an item loaded .60 on its primary factor and .30 or above on another factor, it would be considered factorially complex.

Exploratory factor analysis of the 39 items yielded six factors with eigenvalues greater than one. However, the sixth factor was barely over 1 (1.06), and the scree plot suggested either 4 or 5 factors. Thus, the analysis was re-run constraining the solution to five and four factors, respectively. In the five-factor solution, 18 eat to cope with negative emotion items loaded on the first factor. All items loaded at or above .40, and only two of the items failed to meet criteria for non-complexity. Six of the seven social items loaded on factor two with loadings  $\geq .40$ . However, one of these six social items failed to meet our criterion for non-complexity, thus yielding five social items that met both criteria. The third factor contained the compliance items, all six of which met our dual criteria (i.e., loaded above .40 and showed purity). The fourth factor was defined by four of the eight pleasure motivation items, with loadings  $\geq .40$ . Three pleasure motivation items loaded on factor five, with loadings  $\geq .44$ . One of the three pleasure items loading on factor five cross-loaded on factor four. Finally, one pleasure item loaded below .40 on both the fourth and fifth factors. In general, the items loading on factors four and five were distinguished by the degree to which the wording emphasized use of food as a reward or treat vs. eating in order to experience pleasurable sensations. Constraining the solution to four factors yielded a structure that was consistent with this conceptualization. Specifically, the first three factors in the constrained four-factor solution were identical to those obtained in the five-factor solution (reflecting Coping, Social, and Compliance factors, respectively), whereas the seven items that had loaded on factors 4 and 5 combined to yield one Pleasure motivation factor. Examination of individual item loadings on the four factors showed that all items loaded  $\geq .52$  on their respective factors, and that all but one item met our criteria for purity.

Based on the results of these analyses, a subset of five coping items that met our dual criteria (i.e., loaded  $\geq .40$  on its intended factor and had a 2:1 loading ratio on the primary vs. secondary factors) and reflected a range of emotional states were selected for inclusion in the final item pool. The five social items that met our dual criteria were also retained, as were five of the six compliance items that met these criteria. Finally, six of the seven pleasure items that met our dual criteria in the constrained four-factor solution were retained: three items reflecting motivations to eat related to the pleasurable aspects of food, and three items reflecting the use of food to reward or treat oneself. This ensured the broadest possible coverage of the pleasure motivations construct. Thus, a total of 21 items were retained on the four theoretically predicted factors.

*Confirmatory factor analyses in Group 1.* A correlated four-factor model was specified and tested in Group 1 using confirmatory factor analyses (CFA). The fit of the

model to the data was compared to three alternative models (see Table 1, models 1–4). A one-factor model tested the notion that a single underlying motivation is adequate to account for the pattern of covariation among all of the items. Two alternative, correlated two-factor models were also tested: (a) we specified internal vs. external factors in which Coping and Pleasure items were constrained to load on the internal factor and Compliance and Social items were constrained to load on the external factor; (b) we specified positive vs. negative reinforcement factors in which Social and Pleasure items were constrained to load on the positive reinforcement factor and Compliance and Coping items were constrained to load on the negative reinforcement factor.

All CFAs were performed using the EQS structural equation modeling program (Bentler, 1995). The variance–covariance matrix served as input. Scaling metrics for the latent variables were fixed by setting factor variances to 1.0. Following the recommendation of several authors (Bollen & Long, 1993; Loehlin, 1998), multiple fit indices are reported for each of the analyses, including the  $\chi^2/df$  ratio (Bollen, 1989), the normed fit index (NFI; Bentler & Bonnett, 1980), the comparative fit index (CFI; Bentler, 1995), and the standardized root-mean-square residual (RMR). Given that each fit index has different limitations, consistency across indices is generally regarded as the most reliable indicator of goodness of fit (Mulaik et al., 1989). Although no consensus exists on the exact value of the  $\chi^2/df$  ratio needed to indicate good fit, all recommendations fall in the range of 2:1 to no more than 5:1 (Bollen, 1989; Marsh & Hocevar, 1985). The values for both the NFI and the CFI range from

Table 1  
Development and validation of factor structure across randomly split halves

| Model  | $\chi^2$ | <i>df</i> | $\chi^2/df$ | NFI | CFI | RMR                                  |
|--|----------|-----------|-------------|-----|-----|--------------------------------------|
| 1. Original four-factor model: Group 1                               | 749.51*  | 183       | 4.10        | .88 | .85 | .05                                  |
| 2. Final four-factor model: Group 1                                  | 512.74*  | 164       | 3.13        | .89 | .92 | .05                                  |
| 3. One-factor model: Group 1   | 1958.34* | 170       | 11.52       | .56 | .59 | .09                                  |
| 4. Two-factor model <sup>a</sup><br>(internal vs. external): Group 1 | 1547.47* | 169       | 9.16        | .66 | .68 | .10                                  |
| 5. Two-factor model <sup>b</sup><br>(positive vs. negative): Group 1 | 1380.96* | 169       | 8.17        | .69 | .72 | .09                                  |
| 6. Final four-factor model: Group 2                                  | 354.77*  | 164       | 2.16        | .92 | .95 | .04                                  |
| 7. Factor pattern invariant model:<br>Across groups                  | 1195.56* | 292       | 4.09        | .91 | .93 | .05 <sup>c</sup><br>.04 <sup>d</sup> |
| 8. Factor-loading invariant model:<br>Across groups                  | 898.35*  | 344       | 2.61        | .90 | .94 | .05 <sup>c</sup><br>.04 <sup>d</sup> |

*Note.* NFI, Normed Fit Index; CFI, Comparative Fit Index; RMR, standardized root-mean-square residual. In Group 1,  $n = 404$ , and in Group 2,  $n = 408$  (total  $N = 812$ ).

\*  $p < .001$ .

<sup>a</sup> Compliance and Social items were constrained to load on an external factor; Coping and Pleasure items were constrained to load on an internal factor.

<sup>b</sup> Social and Pleasure items were constrained to load on a positive factor; Compliance and Pleasure items were constrained to load on a negative factor.

<sup>c</sup> Fit of the model to the data in Group 1.

<sup>d</sup> Fit of the model to the data in Group 2.

0 to 1, with values from .90 to .95 as acceptable, and higher values indicating good fit (Bentler & Bonnett, 1980; Bollen & Long, 1993; Hu & Bentler, 1999). The RMR is the standardized average absolute difference between the original and the reproduced matrices (Marsh & Hocevar, 1985). Small values (e.g., .05) indicate minimal discrepancy between the original and the reproduced matrices. RMR values reported here exclude diagonal elements and as such are more conservative.

Goodness-of-fit information for the four alternative models (tested in Group 1) is summarized in Table 1, models 1–4. The original 21-item four-factor model did not fit the data well, as demonstrated by NFI and CFI values of .88 and .85, respectively. Examination of the modification indices (using the LaGrange Multiplier Test; Bentler, 1995) revealed factorial complexity associated with the Pleasure item “because eating is pleasurable and enjoyable.” For example, it appeared that there would be substantial improvement of fit by allowing the error variance of this item to correlate with other error variances. To construct a cleaner scale, and because the Pleasure scale already had six items and the other scales had five, we re-specified the four-factor model by dropping this one item and proceeding with the five remaining items on the Pleasure scale. This modified four-factor model yielded a more acceptable fit: the  $\chi^2/df$  ratio was 3.13, values for the NFI and CFI were .89 and .92, respectively, and the RMR was .05.

As shown by the  $\chi^2$ -difference test, the final correlated four-factor model fit the data significantly better than did the one-factor model (Model 3–Model 2,  $\Delta\chi^2[6] = 1445.60$ ,  $p < .001$ ), or either of the two-factor models (Model 4–Model 2,  $\Delta\chi^2[5] = 1034.73$ ,  $p < .001$  and Model 5–Model 2,  $\Delta\chi^2[5] = 868.22$ ,  $p < .001$ ).

### 3.2.3. Validation in Group 2

To determine whether this modified factor structure was reliable, we specified and tested the invariance of the correlated four-factor structure across the two random samples. As shown in Table 1, line 6, the correlated four-factor model provided an acceptably good fit to the data in the second random half of the sample. The  $\chi^2/df$  ratio was 2.16, values for the NFI and CFI were .92 and .95, respectively, and the RMR was .04. To determine whether the specified model fit equally well across the two groups, two simultaneous, between-group models were specified. First, a model was tested in which a common factor-pattern was specified across Groups 1 and 2, but the magnitude of the factor-loadings was allowed to vary. As shown on line 7 of Table 1, the  $\chi^2/df$  ratio of 4.09, values for the NFI and CFI of .91 and .93, respectively, and acceptable RMR values indicate that the specified four-factor model provided an equally adequate fit to the data across Groups 1 and 2, thus indicating configural invariance across subsamples (Widaman & Reise, 1997).

Next, we tested a factor-loading equivalent model in which the factor-pattern as well as the factor-loadings were constrained to equivalence across Groups 1 and 2 (line 8, Table 1). Examination of the fit indices for this model indicate that the factor-loading equivalent model also provided an acceptably good fit to the data across subsamples. The  $\chi^2/df$  ratio was 2.61, values for the NFI and CFI were .90 and .94, respectively, with acceptable RMR values. However, the  $\chi^2$ -difference test between the factor-pattern only and the factor-pattern with factor-loading equivalent models

was significant,  $\Delta\chi^2(52) = 297.21$ ,  $p < .01$ , indicating that the assumption of complete factor-loading invariance was not supported.

When modification indices (using the LaGrange Multiplier Test) for individual items were examined, results revealed factor-loading invariance for all individual items across Groups 1 and 2 except for two items (one Coping item: “because you feel worthless or inadequate” and one Compliance item: “because you don’t want to stand out or be different from others who are eating”). The unstandardized loading for the Coping item in Group 1 was  $.52 (\pm .041)$ ,  $p < .001$ ; in Group 2, it was  $.64 (\pm .041)$ ,  $p < .001$ . The unstandardized loading for the Compliance item in Group 1 was  $1.00 (\pm .067)$ ,  $p < .001$ ; in Group 2, it was  $.72 (\pm .059)$ ,  $p < .001$ . Despite the lack of complete factor-loading invariance, all items loaded significantly on the Coping motivations factor in both groups ( $t$  values = 12.61–17.64 and 15.35–20.37 for Group 1 and Group 2, respectively,  $p$  values  $< .001$ ), as did all Compliance motivation items in both groups ( $t$  values = 11.55–14.89 and 11.89–14.36 for Group 1 and Group 2, respectively,  $p$  values  $< .001$ ). In fact, all items loaded significantly in both groups for the other two scales as well (Social:  $t$  values = 15.45–20.15 and 12.62–18.71 for Group 1 and Group 2, respectively,  $p$  values  $< .001$ ; Pleasure:  $t$  values = 9.63–10.13 and 9.95–10.85 for Group 1 and Group 2, respectively,  $p$  values  $< .001$ ). Internal consistency was also comparable across groups for all four subscales (Coping  $\alpha = .88$  and  $.89$ ; Compliance  $\alpha = .85$  and  $.84$ ; Social  $\alpha = .89$  and  $.88$ ; Pleasure  $\alpha = .82$  for both). Given strong evidence for configural invariance and evidence of nearly complete factor-loading invariance across the subsamples for the four-factor model, data were pooled for the remaining analyses.

Table 2 presents the standardized and unstandardized (with standard error) factor-loadings, for the correlated four-factor model estimated in the entire sample ( $N = 812$ ). Descriptive statistics and factor intercorrelations for the resulting scales are presented in Table 3. As shown in Table 3, the four subscales possess adequate reliability and show adequate independence among themselves. Interestingly, the rank order of mean levels of endorsement for each motivation subscale is identical to what has been observed in the alcohol motivations literature (Cooper, 1994). Specifically, Social ( $M = 2.72$ ,  $SD = .93$ ) and (Pleasure  $M = 2.31$ ,  $SD = .81$ ) motivations are endorsed as the most common, followed by Coping ( $M = 1.65$ ,  $SD = .78$ ) and Compliance ( $M = 1.58$ ,  $SD = .70$ ).

#### 3.2.4. Invariance across gender

To determine whether the final correlated four-factor model was invariant across females and males, two simultaneous, between-group models were specified. First, a model was tested in which a common factor-pattern was specified across females and males, but the magnitude of the factor-loadings was allowed to vary. As shown on line 3 of Table 4, the  $\chi^2/df$  ratio of 2.78, values for the NFI and CFI of .90 and .93, respectively, and acceptable RMR values indicate that the specified four-factor model provided an equally good fit to the data across females and males, thus indicating configural invariance across subsamples.

Next, a factor-loading equivalent model was tested in which both the factor-pattern and the factor-loadings were constrained to equivalence across females and

Table 2  
Standardized and unstandardized factor loadings and standard errors for the hypothesized four-factor model using the pooled sample ( $N = 812$ )

| Item  | Coping |      |                 | Social |      |                 | Compliance |      |                 | Pleasure |      |                 |
|---|--------|------|-----------------|--------|------|-----------------|------------|------|-----------------|----------|------|-----------------|
|   | SFL    | USFL | SE              | SFL    | USFL | SE              | SFL        | USFL | SE              | SFL      | USFL | SE              |
| 9. Because you're depressed or sad  | .75    | 1.00 | NA <sup>a</sup> |        |      |                 |            |      |                 |          |      |                 |
| 16. Because you feel worthless or inadequate  | .64    | .58  | .030            |        |      |                 |            |      |                 |          |      |                 |
| 21. As a way to help you cope   | .88    | .99  | .037            |        |      |                 |            |      |                 |          |      |                 |
| 22. As a way to comfort yourself  | .82    | .94  | .039            |        |      |                 |            |      |                 |          |      |                 |
| 27. As a way to avoid thinking about something unpleasant or to distract yourself         | .74    | .88  | .041            |        |      |                 |            |      |                 |          |      |                 |
| 7. Because it's a special or traditional part of some social occasion or celebration      |        |      |                 | .70    | .82  | .041            |            |      |                 |          |      |                 |
| 29. As a way to enjoy a social gathering  |        |      |                 | .82    | .91  | .033            |            |      |                 |          |      |                 |
| 31. As a way to celebrate a special occasion with friends, family, or a loved one         |        |      |                 | .84    | 1.00 | NA <sup>a</sup> |            |      |                 |          |      |                 |
| 32. To be sociable  |        |      |                 | .78    | .82  | .032            |            |      |                 |          |      |                 |
| 37. To join in a festive occasion   |        |      |                 | .84    | .95  | .034            |            |      |                 |          |      |                 |
| 34. To keep people from asking questions about why you're not eating                      |        |      |                 |        |      |                 | .74        | 1.00 | NA <sup>a</sup> |          |      |                 |
| 35. Because someone pressures you to eat  |        |      |                 |        |      |                 | .75        | .92  | .046            |          |      |                 |
| 36. Because you feel like you can't say 'no'  |        |      |                 |        |      |                 | .75        | .95  | .048            |          |      |                 |
| 38. Because you <i>don't</i> want to stand out or be different from others who are eating |        |      |                 |        |      |                 | .79        | .86  | .045            |          |      |                 |
| 39. To please your mother or someone else who wants you to eat                            |        |      |                 |        |      |                 | .61        | .91  | .055            |          |      |                 |
| 3. Because you want to treat yourself   |        |      |                 |        |      |                 |            |      |                 | .76      | 1.00 | NA <sup>a</sup> |
| 5. As a reward for having done something that you're proud of or feel good about          |        |      |                 |        |      |                 |            |      |                 | .72      | .87  | .058            |
| 6. Because you like to eat  |        |      |                 |        |      |                 |            |      |                 | .53      | .96  | .045            |
| 10. Because you deserve it  |        |      |                 |        |      |                 |            |      |                 | .79      | .91  | .045            |
| 19. Because you feel good or are in a good mood   |        |      |                 |        |      |                 |            |      |                 | .69      | .83  | .044            |

Note. Items were preceded by the stem "How often do you eat." Item numbers reflect the order in which items were presented to respondents. SFL, standardized factor loading, USFL, unstandardized factor loading. All factor loadings are significant at  $p < .001$ .

<sup>a</sup>NA, Not applicable. For identification purposes, the USFL was set to 1.

Table 3  
Scale statistics and factor correlations

| Scale         | <i>M</i> | <i>SD</i> | $\alpha$ | Factor correlations |     |     |     |
|---------------|----------|-----------|----------|---------------------|-----|-----|-----|
|               |          |           |          | 1                   | 2   | 3   | 4   |
| 1. Coping     | 1.65     | .78       | .88      | –                   | .40 | .48 | .54 |
| 2. Social     | 2.72     | .93       | .88      |                     | –   | .48 | .65 |
| 3. Compliance | 1.58     | .70       | .84      |                     |     | –   | .41 |
| 4. Pleasure   | 2.31     | .81       | .82      |                     |     |     | –   |

*Note.* Data are from total sample ( $N = 812$ ). Possible scale means range from 1 (almost never/never) to 5 (almost always/always), in response to item stems that began “How often do you eat...” Means, standard deviations, and coefficient  $\alpha$ s are based on scale scores derived from manifest variables; inter-correlations are among latent factors.

Table 4  
Examination of factor invariance across gender

| Model                             | $\chi^2$ | <i>df</i> | $\chi^2/df$ | NFI | CFI | RMR                               |
|-----------------------------------|----------|-----------|-------------|-----|-----|-----------------------------------|
| 1. Female ( $n = 520$ )           | 534.66*  | 164       | 3.26        | .91 | .93 | .05                               |
| 2. Male ( $n = 278$ )             | 360.04*  | 164       | 2.20        | .88 | .93 | .05                               |
| 3. Factor pattern invariant model | 911.55*  | 328       | 2.78        | .90 | .93 | .05 <sup>a</sup> .05 <sup>b</sup> |
| 4. Factor-loading invariant model | 913.27*  | 344       | 2.65        | .89 | .93 | .05 <sup>a</sup> .05 <sup>b</sup> |
| 5. $\chi^2$ difference            | 1.77     | 16        | —           | —   | —   | —                                 |

*Note.* NFI, Normed Fit Index; CFI, Comparative Fit Index; RMR, standardized root-mean-square residual. Dashes indicate data not applicable.

\*  $p < .001$ .

<sup>a</sup> Fit of the model to the data among Females.

<sup>b</sup> Fit of the model to the data among Males.

males. Examination of the fit indices for this model indicated that the factor-loading equivalent model provided an acceptable fit to the data across females and males (line 4, Table 4). Values for the NFI and CFI were .89 to .93, respectively, and RMRs were acceptable (.05 for both groups). The  $\chi^2$ -difference test was not significant,  $\Delta\chi^2(16) = 1.77$ ,  $p > .05$ , indicating that the assumption of complete factor-loading invariance was supported. Nevertheless, examination of the modification indices (using the LaGrange multiplier test) showed that relaxing the equality constraint on one Coping item (“as a way to avoid thinking about something unpleasant or to distract yourself”) would significantly improve model fit. The unstandardized loading for this item among females was .87 ( $\pm .052$ ),  $p < .001$ ; among males, it was 1.00 ( $\pm .080$ ),  $p < .001$ . Not surprisingly, given earlier findings (see Table 2), all remaining items loaded significantly on their intended factors among both males and females. As well, internal consistency was comparable across female and male respondents on the Coping motivations subscale ( $\alpha = .88$  and .87, respectively), and on the Social ( $\alpha = .90$  and .86, respectively), Compliance ( $\alpha = .85$  and .83, respectively), and Pleasure ( $\alpha = .82$  and .83, respectively) motivations subscales.

These analyses indicate a largely, but not entirely, homogeneous solution. Social, Compliance, and Pleasure motivations met the strict statistical assumptions of

complete factor-loading invariance for all items across gender groups, whereas all but one Coping motivations item met the strict statistical assumptions of complete factor-loading invariance. In summary, these data indicate factor-pattern invariance for all scales across females and males and complete factor-loading invariance for all but a single item. Given arguments that factor-pattern invariance is crucial, and that more stringent forms of invariance cannot be reasonably expected between non-randomly formed groups (Horn, McArdle, & Mason, 1983), our results suggest that more than adequate similarities exist to permit meaningful cross-group comparisons.

### 3.2.5. Mean differences across gender in motivations to eat

To determine whether the Motivations to Eat subscales varied as a function of gender, we conducted a one-way multivariate analysis of variance (MANOVA). As shown in Table 5, results revealed that there were no gender differences in mean levels of Social motivations ( $F = .81, p > .10$ ), Compliance motivations ( $F = 1.04, p > .10$ ), and Pleasure motivations ( $F = 1.55, p > .10$ ). However, there were significant gender differences in Coping motivations ( $F = 24.60, p < .001$ ). Female respondents were significantly more likely than male respondents to endorse eating to cope with emotional distress. Finally, supplementary analyses showed that this difference was not due to age, weight, or socially desirable responding. Indeed, when age, weight, and socially desirable responding were entered as covariates, the eta-squared for Coping motivations increased, from about 5% of the variance to just over 7%.

### 3.2.6. Convergent and discriminant validity

The data in Table 6 illustrate that the Motivations to Eat subscales correlated in expected ways with the established measures included to assess convergent and discriminant validity. The Coping motivations subscale showed the strongest significant and positive correlations with each of the EES subscales (Anger/Frustration, Anxiety, and Depression) and with the DEBQ Emotional Eating subscale, as expected. Also as expected, Pleasure motivations were more strongly related to the DEBQ External Eating Subscales than to any of the other scales. The modest correlations between Compliance motivations and the included criterion scales, as well as between Social motivations and the criterion scales, indicate that neither Compliance nor Social motivations are well-represented by existing measures. Finally, and as expected,

Table 5  
Unweighted means for four motivations to eat subscales, by gender

| Gender               | Coping   |           | Social   |           | Compliance |           | Pleasure |           |
|----------------------|----------|-----------|----------|-----------|------------|-----------|----------|-----------|
|                      | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>SD</i>  | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Female ( $n = 520$ ) | 1.78     | .82       | 2.74     | .96       | 1.60       | .73       | 2.33     | .79       |
| Male ( $n = 278$ )   | 1.40     | .61       | 2.66     | .89       | 1.54       | .66       | 2.28     | .84       |
| $\eta^2$             | .053*    |           | .002     |           | .001       |           | .001     |           |

Note. Wilks' lambda = .94; multivariate  $F : (4, 807) = 13.81, p < .001$ .

\*  $p < .001$ .

Table 6  
Correlations among motivations to eat subscales and convergent/divergent criterion scales

|                                       | Coping | Social | Compliance | Pleasure |
|---------------------------------------|--------|--------|------------|----------|
| Convergent/Divergent Criterion Scales |        |        |            |          |
| EES, Anger/Frustration Subscale       | 72     | 31     | 32         | 34       |
| EES, Anxiety Subscale                 | 67     | 29     | 34         | 34       |
| EES, Depression Subscale              | 65     | 27     | 30         | 33       |
| DEBQ, Emotional Eating Subscale       | 68     | 22     | 26         | 31       |
| DEBQ, External Eating Subscale        | 34     | 33     | 17         | 47       |
| DEBQ, Restrained Eating Subscale      | 30     | 08     | 21         | 03       |
| M-C Social Desirability               | 08     | 02     | 05         | 12       |
| Demographic variable                  |        |        |            |          |
| Gender (1 = male, 2 = female)         | 23     | 04     | 04         | 00       |

*Note.*  $N = 812$ , except  $n = 810$  for Social Desirability. Except for Gender, all measures are scored so that higher numbers indicate more of the measured construct. Decimals are omitted. All correlations  $\geq .07$  are significant at  $p < .05$ . EES, Emotional Eating Scale. DEBQ, Dutch Eating Behavior Questionnaire. MC, Marlowe–Crowne.

the DEBQ Restrained Eating subscale correlated only modestly ( $r_s < .30$ ) with the Motivations to Eat subscales, showing discriminant validity. Indeed, we would not expect motivations to eat to be the same as motivations not to eat.

Finally, socially desirable responding did not correlate substantially with any of the Motivations to Eat subscales, suggesting that responses to the subscales are more than simply a function of what participants think they ought to say about their reasons for eating. Overall, these data suggest that the eating motivations subscales show both convergent and discriminant validity.

### 3.2.7. Motivations to eat as predictors of eating-related behavior

To establish concurrent validity of the Motivations to Eat subscales and the utility of distinguishing among these motivations, we tested whether the subscales were differentially related to three types of eating behaviors (restrictive eating, bingeing, and purging). A series of six hierarchical multiple regression analyses was conducted. On the first step, gender was entered and on the second step the set of four motivations to eat was entered.<sup>3</sup> For each of the three types of eating behaviors the following two indicators were examined as dependent variables: ever engaged in the behavior, and lifetime frequency among those who ever engaged in the behavior. These indicators were chosen so that we could examine the utility of the eating motivations subscales in predicting both initial engagement and degree of involvement in the eating behavior.

<sup>3</sup> For dependent measures that were continuous, Ordinary Least Squares (OLS) estimation was used. For the dichotomous dependent measure (ever binged), analyses were conducted with both logistic and OLS regression procedures. Although the use of dichotomous dependent variables violates assumptions underlying OLS estimation (see Neter, Kutner, Nachtsheim, & Wasserman, 1996), comparison of results from the two procedures showed no substantive differences. Thus, to simplify reporting and maintain comparability across dependent measures, results are tabled for the OLS regression procedures only.

As shown in Table 7, the four Motivations to Eat subscales accounted for approximately 3 to 13% of the variance across restrictive eating, bingeing, and purging. Examination of the individual beta weights indicated that each of the four motivations was associated with a unique pattern of eating behavior.

*Restrictive eating.* As shown in Table 7, the four Motivations to Eat subscales accounted for about five to six percent of the variance in restrictive eating, after accounting for gender. In general, Coping and Compliance motivations each significantly and positively predicted more restrictive eating for both indices. The exception was that Coping did not predict lifetime frequency of restrictive eating. Also as expected, both Pleasure and Social motivations were significantly and negatively related to more restrictive eating, though Pleasure did not predict lifetime frequency.

*Binge eating.* As shown in Table 7, the four Motivations to Eat subscales accounted for about 13% of variance in the dichotomous binge eating measure, after accounting for gender. Coping, Compliance, and Pleasure motivations were each significantly and positively related to more binge eating. Social motivations were significantly and negatively related to more binge eating. Lifetime frequency of bingeing was not related to any of the Motivations to Eat subscales. This suggests that the motivations are primarily useful in distinguishing between those who ever vs. never engaged in the behavior, and that they, at least in this sample, do not help us further understand the degree of involvement in this behavior.

*Purging.* As shown in Table 7, the Motivations to Eat subscales accounted for about three percent of the variance in the occurrence of purging behaviors, after ac-

Table 7  
Multiple regression analyses predicting eating behaviors from four motivations to eat subscales

| Variable                              | $\Delta R^2$ | Coping | Social            | Compliance       | Pleasure |
|---------------------------------------|--------------|--------|-------------------|------------------|----------|
| <b>Restrictive eating<sup>a</sup></b> |              |        |                   |                  |          |
| Count ever ( $n = 811$ )              | .064***      | .15*** | -.09*             | .24***           | -.05     |
| Lifetime frequency<br>( $n = 272$ )   | .051**       | .16    | -.25 <sup>+</sup> | .42**            | .04      |
| <b>Bingeing</b>                       |              |        |                   |                  |          |
| Ever binge ( $n = 810$ )              | .127***      | .14*** | -.05**            | .08**            | .08***   |
| Lifetime frequency<br>( $n = 218$ )   | .019         | -.02   | -.12              | .19              | .27      |
| <b>Purging<sup>b</sup></b>            |              |        |                   |                  |          |
| Count ever ( $n = 811$ )              | .031***      | .06*   | -.06*             | .10***           | .01      |
| Lifetime frequency<br>( $n = 94$ )    | .078         | .01    | .18               | .40 <sup>+</sup> | .13      |

*Note.* All analyses are after controlling for gender. Lifetime frequency variables include only those respondents who have ever engaged in the behavior.

<sup>a</sup> Each indicator of “Restrictive eating” is a composite measure of fasting, appetite control pill use, and going on a strict diet.

<sup>b</sup> Each indicator of “Purging” is a composite measure of vomiting, laxative use, and diuretic use.

<sup>+</sup>  $p < .10$ .

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

counting for gender. Coping and Compliance motivations were significantly and positively related to purging, as expected. In contrast, but also as expected, Social motivations were significantly and negatively related to purging, whereas Pleasure motivations were unrelated. However, generally the motivations did not predict lifetime frequency of purging; Compliance did so only marginally so. As with bingeing, this suggests that the motivations are primarily useful in distinguishing between those who ever vs. never engaged in the behavior, and that they, at least in this sample, do not really help us further understand the degree of involvement in this behavior.

### 3.2.8. Incremental validity

A series of regression equations was estimated to determine whether the four Motivations to Eat subscales would predict these criterion-related behaviors above and beyond existing measures. Specifically, on the first step, the EES subscales, the DEBQ subscales, and gender were entered, and on the second step, the set of four Motivations to Eat subscales was entered. Because the Emotional Eating subscale of the DEBQ and the EES subscales assess the same general content (the DEBQ EE subscale correlates with EES anger/frustration,  $r = .74$ ; EES anxiety,  $r = .67$ ; and EES depression,  $r = .64$ ,  $ps < .001$ ), to reduce multicollinearity, only the EES scales were included in the reported analyses.<sup>4</sup> As shown in Table 8, each motivation to eat predicted the given eating behavior, in an overall pattern similar to in Table 7, above and beyond the EES subscales and the DEBQ scale. There was one important exception: including these measures on the first step eliminated or substantially reduced the predictive validity of Coping motivations. This was expected, though, given the substantial overlap of the Coping motivations measure with the EES subscales and DEBQ affect-related subscale noted in the convergent validity section. Notably even with the DEBQ External Eating scale in the equation, Pleasure motivations still predicted ever-bingeing. Thus, our measure appears to be an effective shorter substitute for these longer measures.

In sum, each eating motivation independently is associated with a unique pattern of eating behaviors, in expected ways, and predicts these behaviors above and beyond other established measures of eating motivations.

### 3.2.9. Effects of motivations to eat by gender

To determine if the effects of motivations to eat differ significantly between females and males, all six hierarchical multiple regression analyses from Table 7 were estimated with the addition of Gender X Motivation interaction terms on the last step. To reduce multicollinearity among the interaction terms and their constituent variables, all variables were centered before computing and entering their interactions (Aiken & West, 1991). To probe significant interactions, simple slopes were calculated from the overall regression equation to illustrate the relationship between a

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<sup>4</sup> We also tested an alternative model in which the DEBQ Emotional Eating subscale was included instead of the EES subscales. Results paralleled the findings reported in Table 8.

Table 8

Multiple regression analyses predicting eating behaviors from four eating motivations, alternative analyses

| Variable                            | $\Delta R^2$ | Coping | Social            | Compliance | Pleasure |
|-------------------------------------|--------------|--------|-------------------|------------|----------|
| Restrictive eating <sup>a</sup>     |              |        |                   |            |          |
| Count ever ( $n = 811$ )            | .037***      | .09    | -.08*             | .22***     | -.05     |
| Lifetime frequency<br>( $n = 272$ ) | .034**       | .11    | -.23 <sup>+</sup> | .38**      | -.02     |
| Bingeing                            |              |        |                   |            |          |
| Ever binge ( $n = 810$ )            | .028***      | .07*   | -.05**            | .08**      | .05*     |
| Lifetime frequency<br>( $n = 218$ ) | .010         | -.15   | -.10              | .20        | .17      |
| Purging <sup>b</sup>                |              |        |                   |            |          |
| Count ever ( $n = 811$ )            | .016**       | .02    | -.05*             | .09**      | .01      |
| Lifetime frequency<br>( $n = 94$ )  | .073         | -.15   | .27               | .30        | .21      |

Note. All analyses are after controlling for EES Anger/Frustration, EES Anxiety, EES Depression, DEBQ External Eating, & Gender. Lifetime frequency variables include only those respondents who have ever engaged in the behavior.

<sup>a</sup> Each indicator of “Restrictive eating” is a composite measure of fasting, appetite control pill use, and going on a strict diet.

<sup>b</sup> Each indicator of “Purging” is a composite measure of vomiting, laxative use, and diuretic use.

<sup>+</sup>  $p < .10$ .

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

given eating motivation and criterion variable among females and males separately (Aiken & West, 1991).

Six blocks of Gender X Motivation interaction terms (corresponding to each of the six dependent measures in Table 7) were tested. Of these, the only significant interaction was Coping differentially predicting lifetime frequency of binge eating by gender. Specifically, for males but not for females, the stronger the Coping Motivation, the lower the lifetime frequency of binge eating in the full sample (for males,  $b = -.29$ ,  $p < .05$ ; for females,  $b = .11$ ,  $p > .05$ ). In sum, the analysis of interaction effects suggests that eating motivation effects are largely invariant between females and males, with a possible exception in predicting some aspects of binge eating.

#### 4. General discussion

We developed and tested a four-category model of motivations to eat, extending parallel research done in the domain of alcohol use motivations (Cooper, 1994). As expected, analyses indicated the presence of four correlated factors that comprise motivations to eat: Coping, Social, Compliance, and Pleasure. This model provided an equally good fit for men and for women, as shown by tests of factorial invariance and by demonstrating good reliability across gender groups. Analysis of mean differences across groups suggests that, while there are no gender differences in self-

reported mean levels of Social, Compliance, and Pleasure motivations to eat (even when controlling for the potential confounds of age, weight, and socially desirable responding), women endorse higher levels of Coping motivations than do men.

The validity of the correlated four-category model was further reinforced by the fact that each eating motivation was associated with a unique pattern of eating behaviors, despite overlap among Motivations to Eat subscales. As hypothesized, Coping and Compliance motivations to eat both positively predicted restrictive eating, bingeing, and purging. Given that these are both aversive motivations, we would expect some similarity between them. However, Coping and Compliance motivations are differentiated from each other in that Coping motivations predicted bingeing more strongly, and Compliance predicted restrictive eating and purging more strongly (see Table 7). As expected, Pleasure motivations positively predicted binge eating and negatively predicted restrictive eating, and showed no relation to purging. Finally, Social motivations negatively predicted restrictive eating and purging, but positively predicted bingeing.

It seems then that healthy eating is in part the result of meeting the needs of these four psychological motivations in ways that are not dependent on food for their fulfillment, and that disturbed eating results from chronically acting on these motivations. For our present purposes, the absence of restrictive eating, bingeing, or purging represents healthy eating. Thus, when a motivation negatively predicts a behavior, this points us toward an understanding of the psychological bases of healthy eating. According to these data, social motivations negatively predict restrictive eating, bingeing, and purging. We speculate that healthy eating at least in part results from thoughtful, creative, and flexible responses to social motivations, and disturbed eating results from a unaware, chronic, and rigid responses to any of the psychological motivations to eat (cf. Heatherton & Baumeister, 1991). Moreover, we suggest that healthy eating requires that the needs corresponding to social motivations are fulfilled in ways that are independent of food alone (Mintz & Wright, 1993; Roth, 1993). We acknowledge that we did not assess important aspects of healthy eating behaviors, such as avoiding high fat or high sugar foods, or eating very healthy foods, such as fruits and vegetables (Conner, Norman, & Bell, 2002). Assessing how the four motivations predict these types of healthy eating behaviors could be more fully explored in future research.

The Motivations to Eat measure is the first validated instrument that is both theoretically-based and that examines a range of psychological motivations pertaining to eating. As expected, the Coping motivation subscale overlaps with other similar established scales, like the DEBQ and EES subscales. Hence, if an instrument is needed to distinguish among specific negative emotions, then researchers should consider using measures such as the EES. If an instrument is needed that provides a comprehensive measure of motivations that includes a more general Coping motivations subscale—akin to, but shorter than established scales like the DEBQ Emotional Eating subscales—then our measure should be administered.

Such an instrument has both clinical and research utility. The Motivations to Eat measure could be used in both individual treatment and prevention efforts of eating disorders. The measure could be given to clients in treatment for eating disorders, as

well as those identified as at-risk for eating disorders, to assess the reasons underlying their food intake. Counseling could then revolve around the identification of other ways to meet these needs. The Motivations to Eat measure could also be used in large-scale research aimed at identifying both risk and protective factors associated with the development of eating disorders. Studies could be conducted to examine the role that specific psychological motivations have in the etiology of eating disorders, including bulimia, anorexia, and EDNOS (eating disorders not otherwise specified). Likewise, it could be used in outcome research on the treatment of eating disorders (i.e., do motivation scale scores change as a result of treatment?).

Several limitations of the present study should be acknowledged. First, our samples were limited to college students. As well, while we speculate that our eating motivations measure will have clinical relevance, we did not use indices of eating disorders per se, nor did we examine the subscales in samples of individuals diagnosed with eating disorders. Also, given the correlational nature of the data, we cannot make claims about the temporal or causal relationships between the motivations and eating behaviors. Finally, we used only self-report data to measure the motivations and eating behaviors.

To begin to address these limitations, future research should collect psychometric data on the entire 20-item measure using broader, more representative samples (e.g., across a different range of ages and cultural backgrounds). The subscales should also be related to clinically-accepted indices of eating disorders, and administered to clinical samples. Longitudinal designs examining the development of motivations to eat and their causes and consequences would shed light on the temporal aspects we could not address with the present data. Experimental designs would help us understand the causal mechanisms involved with these motivations (e.g., can the priming of individual motivations cause different types of eating behaviors?). Finally, as in other research on motivations, non-self-report measures (e.g., projective measures, behavioral observation) could be developed to assess motivations to eat.

In sum, this investigation extends knowledge about the psychological bases of eating behaviors, as prior research focused on only coping and compliance motivations to eat. We do not intend this as necessarily a comprehensive model of all possible reasons people eat, but of major psychological motivations for eating. As such, we believe that in making parallels with motivational models in other health domains, the Motivations to Eat measure is an important contribution.

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