Published in final edited form as:

Behav Res Ther. 2018 June ; 105: 36–42. doi:10.1016/j.brat.2018.03.008.

Meal and Snack-time Eating Disorder Cognitions Predict Eating Disorder Behaviors and Vice Versa in a Treatment Seeking Sample: A Mobile Technology Based Ecological Momentary Assessment Study

Cheri A. Levinson¹, Margarita Sala², Laura Fewell¹, Leigh C. Brosos¹, Lauren Fournier³, and Eric J. Lenze⁴

¹University of Louisville, Department of Psychological & Brain Sciences

²Southern Methodist University, Department of Psychology

³Washington University in St. Louis, Department of Psychological & Brain Sciences

⁴Washington University in St. Louis, Department of Psychiatry

Abstract

Individuals with eating disorders experience high anxiety when eating, which may contribute to the high relapse rates seen in the eating disorders. However, it is unknown if specific cognitions associated with such anxiety (e.g., fears of gaining weight) may lead to engagement in eating disorder behaviors (e.g., weighing oneself). Participants ($N=66$) recently treated at a residential eating disorder facility and diagnosed with an eating disorder (primarily anorexia nervosa; $n = 40$; 60.6%) utilized a mobile application to answer questions about mealtime cognitions, anxiety, and eating disorder behaviors four times a day for one week. Hierarchical linear models using cross-lag analyses identified that there were quasi-causal (and sometimes reciprocal) within person relationships between specific eating disorder cognitions and subsequent eating disorder behaviors. These cognitions predicted higher anxiety during the next meal and eating disorder pathology at one-month follow-up. Interventions personalized to target these specific cognitions in real time might reduce eating disorder relapse.

Keywords

eating disorders; anorexia nervosa; mealtime; exposure; cognitions

Individuals with eating disorders (EDs) struggle to eat during meals and snacks, which leads to significant weight loss and risk of relapse after treatment (Gianini et al., 2015; Treasure, Cardi, & Kan, 2012). The ability to eat consistently is a key component of treatment, such that in inpatient, residential, and partial hospital settings the primary intervention for

Correspondence on this article should be directed to Cheri A. Levinson, cheri.levinson@louisville.edu, 502-852-7710.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

anorexia nervosa (AN) and bulimia nervosa (BN) is refeeding and establishment of regular eating patterns (Garfinkel & Garner, 1982; Guarda, 2008). Regular eating is established by eating several meals and snacks per day with the goal of restoring or achieving a healthy weight to implement healthy eating patterns (Long, Wallis, Leung, Arcelus, & Meyer, 2012). These experiences are reported as highly anxiety provoking (Long et al., 2012).

Unfortunately, after discharge from intensive treatment, individuals with EDs continue to exhibit difficulty eating, consuming fewer calories than healthy controls (Mayer et al., 2012). Indeed, the majority of patients discharged from intensive treatment continue to struggle around food and during meal and snack-times and report very high levels of fear of food (Levinson & Byrne, 2015). In laboratory studies, among weight-restored individuals with anorexia nervosa, anxiety before a meal is correlated with caloric intake, showing how anxiety negatively impacts eating behaviors (Steinglass et al., 2010). It seems likely that the high relapse rates in the EDs are influenced by difficulty continuing to maintain or gain weight in outpatient settings, which is influenced by eating-related anxiety (Kaplan et al., 2009; Steinglass et al., 2010), given that difficulty adhering to a meal plan is associated with poor treatment outcomes (McFarlane, Olmsted, & Trottier, 2008). This research highlights the importance of understanding the mealtime experiences of individuals with EDs, with the ultimate goals of reducing anxiety, increasing caloric intake to stabilize a healthy weight and eating patterns, and preventing relapse. To address such anxiety, we need data that focuses on how cognitions and emotions around meal and snack-time impact ED behaviors across transdiagnostic categories, which may ultimately inform our understanding of what contributes to relapse and may help individuals with EDs maintain a healthy weight.

Cognitions that may contribute to difficulty eating meals across all eating disorders include (1) fears of weight gain and feelings of fatness (Cooper, Deepak, Grocutt, & Bailey, 2007; Murray et al., 2016; Koskina, Campbell, & Schmidt, 2013) and (2) perfectionism surrounding eating (e.g., Egan et al., 2013). Fear of weight gain and feelings of fatness are core, but distinct, fears in the EDs (Cooper, Deepak, Grocutt, & Bailey, 2007; Fairburn, Cooper, & Shafran, 2003; Levinson et al., 2017) and are hypothesized to maintain ED psychopathology (Fairburn et al., 2003). These fears may be particularly salient during mealtime (Murray, Loeb, & LeGrange, 2016). Additionally, perfectionism, and specifically concern over mistakes (COM; or the excessive worry over making mistakes; Bulik et al., 2003), is a core maintaining factor for EDs, and is elevated in individuals with EDs as compared to healthy controls (Bardone-Cone et al., 2007).

One major challenge of this kind of research is that these cognitions and ED behaviors are context-dependent and transient. Indeed, there has been very little research measuring momentary cognitions and even less research assessing real-time cognitions in the EDs or around mealtime (Marhe, Waters, van de Wetering, & Franken, 2013; Waters et al., 2014). We used ecological momentary assessment (EMA), which is a particularly good technique for detecting transient and context-dependent phenomenon (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004) and has been used to assess ED behaviors and emotions (e.g., Engel et al., 2016; Haedt-Matt & Keel, 2011; Smyth et al., 2001; Smyth et al., 2009). Measurement of cognitions is inherently difficult, given their brief, but frequent nature (Obsessive Compulsive Cognitions Working Group, 1997). EMA allows for 'real world'

measurement of cognitions during or shortly after mealtimes. Additionally, EMA analyses allow us to test whether within person deviations (e.g., temporal deviations from an individual average) in predictors (e.g., cognitions) predict subsequent outcomes (e.g., behaviors). In other words, we are able to approximate relationships with naturalistic data by disaggregating variables and taking temporal precedence into account.

In the current study, we used EMA to test if cognitions which occur during, or briefly after, mealtime predict subsequent ED behaviors. We specifically assessed these cognitions and behaviors in a trans-diagnostic sample of eating disorders ($N = 66$; primarily AN $n = 40$). We assessed two categories of cognitions: fears of weight gain/feelings of fatness and perfectionistic thoughts about a meal. We also assessed ED behaviors: restriction, weighing oneself, compensatory behaviors/vomiting, body checking, and excessive exercise. If we are able to identify specific cognitions leading to subsequent behaviors (and vice versa), we can target interventions to disrupt the association between these specific behaviors and cognitions.

Accordingly, we had two primary hypotheses. First, there would be specific cognitions and behaviors that predict each other across ensuing mealtimes, representing a self-reinforcing cycle. Second, these cognitions would predict subsequent higher anxiety (or lower anxiety if they serve an avoidance function) and higher ED symptoms at one-month follow-up.

Methods

Procedures

All procedures were approved by the Washington University IRB. Participants were recruited from an ED clinic after discharge from either a residential or partial hospitalization treatment program. Participants were invited to participate in a study of daily habits in general and specifically around meals. All procedures were completed either online or through a mobile application; participants living in any area of the country could participate. Participants provided informed consent (adolescent parents provided consent and adolescents provided assent) and then completed an online survey through RedCap asking about ED symptoms (see measures below), behaviors, treatment history, and demographics. After completion of the online survey, participants were given instructions on how to download and access a mobile application measuring daily habits (please see <http://www.christophermetts.com/status-post>). This application notified participants four times a day for one week and asked questions about mealtime cognitions, as well as ED behaviors and anxiety. Participants were asked to provide a window of time that was at least 12 hours during the day. They were also asked to indicate what times they generally eat. Assessments were then random around these time points, within a four-hour block, to attempt to hit as many meal and snack times as possible, while considering there would be variation in when meals and snacks were actually eaten. At the beginning of each survey, participants were asked if they had eaten since their last check in. In the analyses that we report we only include individuals who endorse having eaten since the last check in, which was 75.3% of total responses. We also assessed time since their last meal on the following scale: (1 = 0 minutes; 2 = 1-10 minutes; 3 = 11-20 minutes; 4 = 21-30 minutes; 5 = 31-60 minutes; 6 = 1-2 hours; 7 = 2-3 hours; 8 = 3-4 hours; 9 = more than 4 hours). After assessing if the

participant had eaten and when, participants were asked a series of questions focused on the last meal or snack they completed using the Daily Life Daily Habits Questionnaire (see measure description below) and were then asked about ED behaviors. One month after completion of the mobile application questions, participants completed a short follow-up questionnaire asking about ED symptoms (EDI-2). We used aggregation of all responses to create means for ED symptoms at one month follow up. Participants were compensated based on the number of times they responded to the mobile application questionnaires and could receive up to 25 dollars for participation.

Participants

Participants were 66 individuals diagnosed with an ED. Participants were primarily female ($n = 64$; 97.0%); European American ($n = 56$; 86.2%); average age of 24.98 ($SD = 7.31$; Range = 14–41). Other ethnicities reported were Asian ($n = 3$; 4.5%) Hispanic ($n = 3$; 4.5%); Black ($n = 1$; 1.5%) multiracial ($n = 2$; 3%) and 1 reported her ethnicity was not listed.

Diagnoses and Clinical Characteristics—Based on the Eating Disorder Diagnostic Scale (EDDS; Stice, Telch, & Rizvi; see measures below) the following diagnoses based on the DSM-5 were made the day prior to beginning the EMA protocol: AN ($n = 40$; 60.6%), atypical AN ($n = 14$; 21.2%), BN ($n = 6$; 9.1%), low frequency BN ($n = 1$; 1.5%), and feeding and eating disorders not otherwise specified ($n = 5$; 7.6%). The majority of participants reported that they were currently in treatment for an ED ($n = 49$; 74.2%) with an average of 2.5 hours ($SD = 4.53$; Range = 0 to 30 hours) of treatment per week. Of those in treatment the following report the following levels of care: 4.5% in residential ($n = 3$); 1.5% in partial hospital ($n = 1$); 3.0% in intensive outpatient ($n = 2$); and 68.2% in outpatient ($n = 45$). Median body mass index (BMI) was 20.66 ($SD = 3.46$; Range 13.89–32.28). Other self-reported current diagnoses (using a one item question *Which other diagnoses have you been given, if any* to assess any other diagnoses) were Anxiety Disorder ($n = 41$; 62.1%); Depressive Disorder ($n = 38$; 57.6%); OCD ($n = 13$; 19.7%); and PTSD ($n = 7$; 10.6%).

Self-report Measures

Eating Disorder Diagnostic Scale (EDDS; Stice, Telch, & Rizvi, 2000). The EDDS is a brief self-report measure used to diagnose EDs, such as anorexia, bulimia, and binge eating disorder. We used criteria for DSM-5 diagnoses. The EDDS has demonstrated adequate internal consistency, as well as criterion and convergent validity (Stice, Fisher, & Martinez, 2004).

Eating Disorder Inventory-2 (EDI-2; Garner, Olmstead, & Polivy, 1983). The EDI-2 is a 91-item self-report questionnaire designed to measure psychological features commonly associated with AN and BN. It has good internal consistency and good convergent and discriminant validity (Garner et al., 1983) and is frequently used by clinicians for the assessment of ED symptoms (Brookings & Wilson, 1994). Three of the eleven subscales were used for this study: The Drive for Thinness (DT), Body Dissatisfaction (BD), and Bulimia symptoms (BN) subscales. In the current sample, BD ($\alpha = .91$) exhibited excellent internal consistency and DT ($\alpha = .88$) and BN ($\alpha = .78$) exhibited good internal consistency.

EMA Measures

Daily Life Daily Habits Questionnaire: This questionnaire was developed to assess behaviors, cognitions, and emotions before, during, and after mealtimes. It was developed by adapting questions from the Frost Multidimensional Perfectionism Scale (Frost et al., 1990) and the Eating Disorder Examination Questionnaire (Fairburn & Beglin, 1994). We assessed two categories of ED cognitions all focused on the participants' experience during their most recent meal: (a) worries about gaining weight and wanting to be thin/feelings of fatness and (b) perfectionistic thoughts. Directions for the cognitions and emotions (anxiety) were as follows: Please reflect on your last meal/snack. Please rate the following statements based on HOW YOU FELT DURING the meal/snack. Please use a 1 to 6 scale where 1=not at all and 6=extremely. Directions for the ED behaviors were as follows: Please rate how much you have engaged in the following behaviors since your last meal/check in using 1 (not at all) to 6 (a lot).

Each of the five cognitions and five behaviors were measured with one item (repeated 28 times). The following five ED cognitions were assessed with the following items: (a) (*worries about weight gain*) *I felt worried about gaining weight during the meal and I am preoccupied with the desire to be thinner* and *I felt fat during the meal (feelings of fatness)* and (b) (*perfectionistic thoughts*) *I was concerned about making mistakes during the meal* and *I had high standards for myself during the meal*. The following five ED behaviors were assessed and used in the current study: *restriction; weighing oneself; body checking; vomiting or other compensatory behavior; and excessive exercise*.

Anxiety before, during, and after the meal: We also assessed anxiety before, during, and after the meal with the following items: *I felt anxious before the meal or snack; I felt anxious during the meal or snack; I felt anxious right after the meal or snack*. These items were also assessed on a 1 (no anxiety) to 6 (extreme anxiety) scale.

Statistical Analyses

Data were analyzed using multilevel modeling (MLM) using a general linear model. MLM is robust to missing data (Quene et al., 2004), therefore we were able to include all data. We used a one-assessment lag to test for temporal precedence including cross-day lagged assessments. For example, we tested whether compensatory behavior at time t was predicted by worry about weight gain at time $t-1$. As suggested by recent research (Hamaker, Kuiper, & Grassman, 2015), time varying predictors (TVPs) were disaggregated into the participants' mean across all 28 assessments (TVP_{mean} ; the between-person component) and their deviation from their mean at each session ($TVP_{\text{deviation}}$; the within-person component; $TVP_{\text{dev}} = TVP_{\text{raw}} - TVP_{\text{mean}}$). In the results outlined below, significant lagged TVP_{dev} effects can be interpreted as reflecting within person effects of temporal deviations in the predictor on the subsequent outcome within individuals, whereas significant TVP_{mean} effects can be interpreted as between-subjects covariation between the predictors and the outcomes (i.e., people with higher average levels of worry about weight gain might have greater ED symptoms). This type of approach allows us to capture relations among variables longitudinally, rather than examine relations among variables at each time point cross-sectionally. Fixed effects included the cognitions means and deviations and the intercept was

included as a random effect. AR1 or AR1H was used for covariance structure depending on which exhibited best fit.

We first tested whether ED cognitions predicted subsequent (the measurement point following the assessment of the cognition) ED behaviors. For any ED behavior that an ED cognition significantly predicted, we tested whether these relationships were reciprocal (i.e., if ED behaviors also predicted ED cognitions). We also tested if these ED cognitions and behaviors predicted anxiety before, during, or after the meal. In these analyses, we grouped each set of cognitions (i.e., fear of weight gain/feelings of fatness, perfectionism) into its own multivariate model (two models, each category of cognition tested separately). Given that the study aims to identify the effects of *within-person* deviations in the predictors on the subsequent outcome, we limit our reporting to TVP_{dev} effects for the analyses outlined above, although TVP_{mean} effects were included in all analyses (as was necessary to accurately assess the TVP_{dev} effects; Hamaker et al., 2015). Finally, we tested whether mean ED cognitions predicted higher ED symptoms at one-month follow-up (time 2) while controlling for baseline ED symptoms (time 1). Because of the small sample size, we conducted this last set of analyses using univariate models.

Results

ED Cognitions & Behaviors

Participants provided 1,204 separate EMA recordings after eating meals. The average time since eating was $M = 5.35$; $SD = 2.35$, or approximately 40 minutes (Median = 1-2 hours; Mode = 1-2 hours). Frequencies = 0 minutes: 5%; 1-10 minutes 11.1%; 11-20 minutes: 6.1%; 21-30 minutes: 8.5%; 31-60 minutes: 12.3%; 1-2 hours: 19.7%; 2-3 hours: 15.8%; 3-4 hours: 9.0%; 4+ hours: 12.6%. Compliance averaged 74% (range 14-100%). Table 1 shows the descriptive statistics of the five ED cognitions and five ED behaviors, as well as mealtime anxiety. Table 2 summarizes each cognition and its prediction of each of the five ED behaviors. In Table 2 reciprocal relationships, in which the behavior also predicts the cognition, are bolded and notated with a + symbol.

Fears of weight gain/feelings of fatness/preoccupation with thinness

Please see Table 2 for a summary. Higher worry about weight gain significantly predicted greater subsequent compensatory behaviors ($b = .04$, $SE = .02$, $p = .01$) and body checking ($b = .08$, $SE = .03$, $p = .03$), but did not significantly predict subsequent excessive exercise, weighing oneself, or restriction (all $ps > .32$). Higher feelings of fatness significantly predicted greater subsequent compensatory behaviors ($b = .08$, $SE = .02$, $p < .001$), excessive exercise ($b = .06$, $SE = .03$, $p = .02$), and body checking ($b = .14$, $SE = .04$, $p < .001$), but did not significantly predict subsequent weighing oneself or restriction ($ps > .16$). Higher preoccupation with thinness significantly predicted greater subsequent compensatory behaviors ($b = .06$, $SE = .02$, $p = .006$), excessive exercise ($b = .06$, $SE = .03$, $p = .03$), and body checking ($b = .14$, $SE = .05$, $p = .002$), but did not significantly predict subsequent weighing oneself or restriction ($ps > .50$). Reciprocal relationships are notated in Table 2 in bold and with a + symbol. Higher compensatory behaviors significantly predicted greater subsequent feelings of fatness ($b = .15$, $SE = .06$, $p = .02$), but did not predict subsequent worry about weight gain or preoccupation

with thinness ($ps > .39$). Excessive exercise did not predict subsequent feelings of fatness or preoccupation with thinness ($ps > .12$). Higher body checking significantly predicted greater subsequent preoccupation with thinness ($b = .08$, $SE = .03$, $p = .01$), but did not significantly predict subsequent worry about weight gain or feelings of fatness ($ps > .16$).

Anxiety before, during, and after meal—Higher worry about feeling fat significantly predicted lower subsequent anxiety before a meal ($b = -.12$, $SE = .05$, $p = .02$). Higher worry about weight gain significantly predicted lower subsequent anxiety during a meal ($b = -.10$, $SE = .05$, $p = .03$). Higher preoccupation with thinness significantly predicted higher subsequent anxiety during a meal ($b = .10$, $SE = .05$, $p = .05$). Higher worry about weight gain significantly predicted lower subsequent anxiety after the meal ($b = -.11$, $SE = .05$, $p = .05$). All other relationships between fears of weight gain and anxiety were non-significant ($ps > .06$).

One Month Follow Up—As seen in Table 3, fears of weight gain, feeling fat, and preoccupation with weight all significantly predicted DT at follow up, while co-varying for drive for thinness at Time 1. No weight related cognition predicted BN or BD at 1-month follow up.

Perfectionism

Please see Table 2 for a summary. Higher COM significantly predicted greater subsequent compensatory behaviors ($b = .05$, $SE = .02$, $p = .02$), excessive exercise ($b = .07$, $SE = .03$, $p = .01$), body checking ($b = .11$, $SE = .04$, $p = .01$), and weighing oneself ($b = .06$, $SE = .03$, $p = .05$), but did not significantly predict subsequent restriction ($b = .06$, $SE = .05$, $p = .23$). Higher standards significantly predicted greater subsequent compensatory behaviors ($b = .06$, $SE = .03$, $p = .01$), excessive exercise ($b = .06$, $SE = .03$, $p = .02$), body checking ($b = .12$, $SE = .04$, $p = .009$), and restriction ($b = .11$, $SE = .05$, $p = .02$), but did not significantly predict subsequent weighing oneself ($b = .03$, $SE = .03$, $p = .31$). Reciprocal relationships are notated in Table 2 in bold and with a + symbol. Higher weighing oneself significantly predicted higher subsequent COM ($b = .09$, $SE = .04$, $p = .03$). Higher excessive exercise significantly predicted higher subsequent high standards ($b = .11$, $SE = .05$, $p = .02$), but did not significantly predict subsequent COM ($b = .05$, $SE = .05$, $p = .31$). Compensatory behaviors did not significantly predict subsequent COM or high standards ($ps > .59$). Body checking did not significantly predict subsequent COM or high standards ($ps > .17$). Restriction did not significantly predict subsequent high standards ($p = .30$).

Anxiety—COM and high standards did not significantly predict anxiety before, during, or after the meal (all $ps > .13$).

One-month-follow up—As seen in Table 3, COM significantly predicted BN at follow up while co-varying for BN at Time 1, but did not predict DT or BD. High standards did not significantly predict any ED symptoms at one-month follow up.

Discussion

We used a mobile EMA application to test if there were relationships between mealtime cognitions and subsequent ED behaviors. We pinpointed quasi-causal, within person

relationships between ED cognitions and behaviors that occur after mealtime and how they perpetuate the disorder. Overall, we found that mealtime cognitions predict subsequent ED behaviors and vice versa.

Specifically, we identified that the following cognitions predicted subsequent ED behaviors. First, having high standards during a meal predicted subsequent **restriction**. Worrying about weight gain during a meal and concerns about making mistakes during the meal predicted subsequent **weighing oneself**. All five cognitions predicted subsequent **body checking** and **compensatory behaviors**. Similarly, feeling fat during the meal, preoccupation with thinness, as well as both aspects of perfectionism (high standards and COM) predicted subsequent **excessive exercise**. Thus, if an individual engages in one of these ED behaviors, clinicians should consider targeting the specific cognitions that predicts the subsequent behavior.

For each of the five behaviors we examined, with the exception of restriction, we found that there were reciprocal relationships between mealtime cognitions and behaviors in the short-term (in daily life across approximately four hours). Concern over making mistakes during a meal had a reciprocal relationship with weighing oneself, whereas high standards had a reciprocal relationship with excessive exercise. Feeling fat during the meal had a reciprocal relationship with vomiting or compensatory behaviors, whereas preoccupation with thinness had a reciprocal relationship with body checking. These findings identify clear reciprocal pathways between perfectionistic and fear of weight gain cognitions and ED behaviors. When a patient with an ED engages in such behaviors, clinicians should consider explicitly discussing and targeting the related cognition.

Mealtime cognitions

This study adds to the literature using EMA in ED populations (e.g., Engel et al., 2016; Haedt-Matt & Keel, 2011; Smyth et al., 2009) and represents one of the first attempts to assess cognitions using EMA (Marhe, Waters, van de Wetering, & Franken, 2013; Waters et al., 2014). Furthermore, this study is the first, of which we are aware, to assess cognitions in an ED sample specifically around mealtime. Our findings build on research implicating fears of weight gain as core to ED psychopathology (Levinson et al., 2017; Fairburn, Cooper, Doll, & Davies, 2005; Murray et al., 2016) and research finding that perfectionism is elevated in individuals diagnosed with an ED (e.g., Bardone-Cone et al., 2007; Wade, O'Shea, & Shafran, 2016). However, this data extends these findings to focus specifically on fears of weight gain and perfectionistic thoughts occurring *during or shortly after mealtime*. Future research should continue to explore the impact of such cognitions within the EDs and how they may contribute to difficulty eating, potentially leading to repeated relapses. This research is a first step towards identifying specific relationships between mealtime cognitions and ED behaviors and outcomes. Below we outline how specific cognitions related to ED behaviors and emotions.

Weight-related cognitions

We found several significant relationships between worries of weight gain and fears of fatness and ED behaviors. We found that these worries predicted subsequent compensatory

behaviors, body checking, and excessive exercise, but did not predict subsequent weighing or restriction. In the opposite direction, we found that compensatory behaviors predicted subsequent worries about becoming fat and that body checking predicted subsequent preoccupation with thinness. These worries may lead to the specific ED behaviors of compensating for food intake, body checking, and excessive exercise. These findings also suggest that there is a cycle of thoughts and behaviors between worrying about becoming fat and compensatory behaviors, preoccupation with thinness and body checking, in which these thoughts and behaviors may build upon each other. This finding suggests that when intervening specifically on worries about becoming fat and preoccupation with thinness, it is necessary to engage in response prevention targeting disruption of body checking and compensatory behaviors. Without also targeting these behaviors, exposing patients to these worries may not result in learning if they continue to engage in such compulsive behaviors (Otto et al., 2008).

We also found that higher worries about weight gain significantly predicted lower subsequent mealtime anxiety, whereas higher preoccupation with thinness significantly predicted higher mealtime anxiety. It may be that worrying about weight gain serves as a cognitive avoidance technique that prohibits the individual from fully experiencing (and potentially learning from) exposure to meals. Research has documented the function of rumination and worry as an avoidance behavior (e.g., Borkovec, Ray, & Stober, 1998; Segerstrom, Tsao, Alden, & Craske, 2000) and it is entirely possible that if worry about weight gain is serving an avoidance function it would lead to short-term (but not long-term) reductions in anxiety. Finally, we also found that worries about gaining weight, becoming fat, and preoccupation with thinness predicted higher drive for thinness at a one-month follow-up, suggesting that these cognitions have a long-term impact on ED symptoms.

Perfectionism cognitions

We found that both COM and high standards during a meal predicted subsequent compensatory behaviors, excessive exercise, and body checking. COM also predicted subsequent weighing oneself and high standards predicted subsequent restriction. In the opposite direction, weighing oneself and excessive exercise predicted higher standards. This finding suggests that when an individual engages in weighing or exercise behaviors, they continue to set higher standards for themselves. It seems likely that continuing to set higher and higher standards for exercise and weight (loss) would perpetuate ED symptoms (e.g., Wade et al., 2016). Regarding the relationship between restriction and high standards, future research should explore the relationship between pre-meal anxiety, restriction, and high standards cognitions, given work linking pre-meal anxiety to lower caloric intake (Steinglass et al., 2010). It is entirely possible that the relationship between high standards cognitions and restriction is mediated by anxiety before eating.

There was also a reciprocal relationship between COM and weighing oneself, suggesting that weighing oneself may be a way to alleviate fears of making mistakes during meals (e.g., fears of not adhering to the meal plan, dropping food out of the mouth etc.), but that this fear then leads to additional heightened weighing behaviors. We also found that COM predicted higher compensatory behaviors at one-month follow-up. Taken together, these results

suggest that interventions focusing on purposively making mistakes (e.g., dropping food) could decrease these behaviors, without intervening with the behaviors themselves. Treatments developed to target perfectionism have been shown to decrease ED symptoms (Handley, Egan, Kane, & Rees, 2015; Shafran, Coughtrey, & Kothari, 2016). Future research should test if targeting COM directly during mealtime could decrease excessive exercise, unhealthy weighing behaviors, compensatory behaviors, and body checking.

Implications for our conceptualization of Mealtime Cognitions and Behaviors

We found several relationships between mealtime cognitions and subsequent eating disorder behaviors and vice versa. In several cases the relationship between cognition and behavior were reciprocal, suggesting they may be similar to obsessions and compulsions as seen in Obsessive Compulsive Disorder (OCD; Otto et al., 2008). There is high comorbidity between OCD and EDs, with OCD and EDs sharing genetic and etiological overlap (e.g., Cederlof et al., 2015). Further research is needed to replicate these findings to determine if these cognitions and behaviors serve a similar function to obsessions and compulsions as those that occur in OCD, though this research supports that they may. If these findings are replicated, it is possible that fears of weight gain and perfectionistic thoughts could be conceptualized as obsessions associated with subsequent eating disorder compulsions. This conceptualization may lead to targeted interventions, such as exposure and response prevention therapy, personalized for specific obsessions, while refraining from compulsive ED behaviors. Additionally, this research enhances our understanding of why individuals with eating disorders may continue to struggle during mealtimes. Several of these cognitions led to lower anxiety at the next mealtime, suggesting that they may possibly serve an avoidance function, though we await future research to determine why some cognitions might lead to lower versus higher anxiety. We did not specifically measure learning or habituation during meals. Moreover, recent research suggests that anxiety may not decrease during exposure, but rather that individuals become better able to tolerate the anxiety (Craske et al., 2008). Therefore, there is still much to learn regarding the role of mealtime anxiety in the eating disorders, including testing if and how fears of weight gain and perfectionism might impact learning and habituation leading to the continuance of anxiety during mealtimes.

Clinical Implications

There are several clinical implications that stem from this work. First and foremost, this research begins to provide a roadmap for which cognitions should be targeted if clients engage in certain ED behaviors. In other words, if a client engages in restriction, high standards surrounding recent meals should be assessed for and then targeted in treatment. Second, for cognitions and behaviors that have reciprocal relationships, interventions should target both the cognition and behavior (perhaps using exposure and response prevention therapy). For example, we found that COM during a meal predicted subsequent weighing oneself, which then predicted subsequent COM. Interventions could target purposively making mistakes during a meal or could focus on challenging such thoughts. However, for this intervention to be effective, individuals must also participate in response prevention and refrain from engaging in repeated weighing behaviors, in addition to challenging the cognition. For cognitions that predict subsequent behaviors (but not vice versa),

interventions could focus more closely on targeting the cognition, with the hope that this will decrease subsequent related ED behaviors. For example, high standards around a meal predicted subsequent restriction. Reducing restriction is notoriously difficult (Alberts, Thewissen, & Raes, 2012). However, it is possible that attempting to lower standards around a meal could produce lower subsequent restriction. We hope that future research will test if these interventions are effective for specific cognitions and behaviors. We also hope that future research will expand on these data to include additional emotions (in addition to anxiety) and explore how emotion regulation may impact mealtime cognitions and behaviors (e.g., Lavender et al., 2015; Racine & Wildes, 2015).

Limitations

We had a relatively small sample size, and replication in a larger sample is needed. We did not assess all possible mealtime cognitions and focused only on two areas that the literature showed to be most relevant. Given that there has been little research on mealtime cognitions, there was no pre-existing measurement of such thoughts. Thus, we also do not know if these thoughts only occur during and after meal and snack-time or if they are prevalent throughout the day. We also do not have information on the reliability and validity of the measures we used performed through EMA, though we attempted to adhere to standardized measures. Relatedly, our questions are still retrospective and subject to limitations of self-report. Furthermore, we did not provide a training on how to interpret the questions; therefore there could be variability in how they were interpreted. Additionally, there are limitations to our sampling methodology. Given that a large percentage of individuals with EDs do not seek treatment (Hart, Granillo, Jorm, & Paxton, 2011) we cannot determine if these results generalize to non-treatment seeking samples. Furthermore, we did not use a structured clinical interview to determine diagnosis because all methods were completed online (to include participants across the country) and instead relied on a self-report diagnostic interview. However, given that our ultimate goal is to improve treatment after discharge from such facilities, the strong literature behind the usage of the EDDS (e.g., Stice, Telch, & Rizvi, 2000; Stice, Fisher, & Martinez, 2004), and that all participants had recently discharged from intensive treatment for an ED, we think that this sample was ideal for the current research. We also did not assess how long these participants were in treatment or usage of psychotropic medication, which may impact the results presented here. Additionally, because we were measuring cognitions, it is possible that measurement of cognitions caused individuals to pay more attention to their thoughts and contributed to greater reactivity. Furthermore, we did not use a direct measure of food intake nor did we assess if eating episodes were binge eating episodes, so we are unable to determine if these cognitions impact caloric intake and binge eating behaviors. Finally, though alerts were timed around meals we were not able to always assess cognitions immediately following meals. We hope that future research will consider these limitations and conduct research with this type of measurement. Finally, although the results reported examined whether temporal deviations from individual average predicted subsequent outcomes within people, they cannot prove causality as this was a naturalistic, observational study.

Conclusions

Overall, we had three key findings. First, we were able to identify how specific worries about weight gain/feeling fat and perfectionistic thoughts during mealtime influenced subsequent ED behaviors, such as restriction, compensatory behaviors, and excessive exercise. We also found that several of the relationships between mealtime cognitions and ED behaviors were reciprocal, meaning that they seem to be cyclical and reinforce each other. Second, we identified which specific mealtime cognitions (e.g., worry about gaining weight), as well as ED behaviors, predicted subsequent anxiety before, during, and after the next meal. Last, we found that several of these cognitions (e.g., COM) predicted higher ED symptoms at one-month follow-up. These cognitions may be specific, important, and targetable for the reduction of ED behaviors; doing so may prevent relapse after intensive treatment. Our research begins to provide a roadmap outlining which ED cognitions are related to specific ED behaviors. Our research also shows that ED cognitions may be similar to and conceptualized as obsessions and compulsions in OCD. Furthermore, we were able to show how researchers can utilize EMA to identify cognitions related to specific behaviors and cognitions around meals. We hope that future research will expand on this research to test if interventions targeting these specific cognitions will reduce subsequent ED behaviors, leading to decreased suffering in individuals with EDs.

Acknowledgments

This research was supported by NIH T32-DA007261-25 to Washington University in St. Louis.

References

- Abramowitz JS. Variants of exposure and response prevention in the treatment of obsessive-compulsive disorder: A meta-analysis. *Behavior Therapy*. 1996; 27(4):583–600.
- Abramowitz, JS., Deacon, BJ., Whiteside, SP. *Exposure therapy for anxiety: Principles and practice*. Guilford Press; 2012.
- Alberts HJ, Thewissen R, Raes L. Dealing with problematic eating behavior. The effects of a mindfulness-based intervention on eating behavior, food cravings, dichotomous thinking, and body image concern. *Appetite*. 2012; 58(3):847–851. [PubMed: 22265753]
- American Psychiatric Association. *Treatment of patients with eating disorders*, third edition. American Psychiatric Association. *The American Journal of Psychiatry*. 2006; 163:4–54. [PubMed: 16925191]
- Bardone-Cone AM, Wonderlich SA, Frost RO, Bulik CM, Mitchell JE, Uppala S, Simonich H. Perfectionism and eating disorders: Current status and future directions. *Clinical Psychology Review*. 2007; 27(3):384–405. [PubMed: 17267086]
- Biran M, Terence G. Treatment of phobic disorders using cognitive and exposure methods: A self-efficacy analysis. *Journal of Consulting and Clinical Psychology*. 1981; 49(6):886–899. [PubMed: 6118383]
- Brown LA, LeBeau RT, Yi Chat K, Craske MG. Associative learning versus fear habituation as predictors of long-term extinction retention. *Cognition and emotion*. 2016:1–12.
- Borkovec TD, Ray WJ, Stober J. Worry: A cognitive phenomenon intimately linked to affective, physiological, and interpersonal behavioral processes. *Cognitive Therapy and Research*. 1998; 22(6):561–576.
- Bulik CM, Tozzi F, Anderson C, Mazzeo SE, Aggen S, Sullivan PF. The relation between eating disorders and components of perfectionism. *The American Journal of Psychiatry*. 2003; 160(2):366–368. [PubMed: 12562586]

- Carter JC, Stewart DA, Dunn VJ, Fairburn CG. Primary prevention of eating disorders: might it do more harm than good? *The International Journal of Eating Disorders*. 1997; 22(2):167–172. [PubMed: 9261655]
- Cederlöf M, Thornton LM, Baker J, Lichtenstein P, Larsson H, Rück C, et al. Mataix-Cols D. Etiological overlap between obsessive-compulsive disorder and anorexia nervosa: a longitudinal cohort, multigenerational family and twin study. *World Psychiatry*. 2015; 14(3):333–338. [PubMed: 26407789]
- Choy Y, Fyer AJ, Lipsitz JD. Treatment of specific phobia in adults. *Clinical Psychology Review*. 2006; 27(3):266–286. [PubMed: 17112646]
- Cooper MJ, Grocutt E, Deepak K, Bailey E. Metacognition in anorexia nervosa, dieting and non-dieting controls: A preliminary investigation. *British Journal of Clinical Psychology*. 2007; 46:113–117. [PubMed: 17472205]
- Craske MG, Kircanski K, Zelikowsky M, Mystkowski J, Chowdhury N, Baker A. Optimizing inhibitory learning during exposure therapy. *Behaviour Research & Therapy*. 2008; 46(1):5–27. [PubMed: 18005936]
- Curci A, Lanciano T, Soleti E, Rimé B. Negative emotional experiences arouse rumination and affect working memory capacity. *Emotion*. 2013; 13(5):867–880. [PubMed: 23731432]
- Egan SJ, Wade TD, Shafran R. Perfectionism as a transdiagnostic process: A clinical review. *Clinical Psychology Review*. 2010; 31(2):203–212. [PubMed: 20488598]
- Egan SJ, Watson HJ, Kane RT, McEvoy P, Fursland A, Nathan PR. Anxiety as a mediator between perfectionism and eating disorders. *Cognitive Therapy & Research*. 2013; 37(5):905–913.
- Engel SG, Crosby RD, Thomas G, Bond D, Lavender JM, Mason T, et al. Wonderlich SA. Ecological momentary assessment in eating disorder and obesity research: a review of the recent literature. *Current psychiatry reports*. 2016; 18(4):1–9. [PubMed: 26685903]
- Fairburn CG, Beglin SJ. Assessment of eating disorders: Interview or self-report questionnaire? *The International Journal of Eating Disorders*. 1994; 16(4):363–370. [PubMed: 7866415]
- Fairburn CG, Cooper Z, Shafran R. Cognitive behaviour therapy for eating disorders: A “transdiagnostic” theory and treatment. *Behaviour Research & Therapy*. 2003; 41(5):509–528. [PubMed: 12711261]
- Fairburn CG, Cooper Z, Doll HA, Davies BA. Identifying dieters who will develop an eating disorder: A prospective, population-based study. *The American Journal of Psychiatry*. 2005; 162(12):2249–2255. [PubMed: 16330587]
- Frost RO, Steketee, G., editors. *Cognitive approaches to obsessions and compulsions: Theory, assessment, and treatment*. Amsterdam, Netherlands: Pergamon/Elsevier Science, Inc; 2002.
- Frost RO, Marten P, Lahart C, Rosenblate R. The dimensions of perfectionism. *Cognitive Therapy & Research*. 1990; 14(5):449–468.
- Garner DM, Garfinkel PE. Body image in anorexia nervosa: Measurement, theory and clinical implications. *The International Journal of Psychiatry in Medicine*. 1982; 11(3):263–284.
- Garner DM, Olmstead MP, Polivy J. Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *International Journal of Eating Disorders*. 1983; 2(2):15–34.
- Gianini L, Liu Y, Wang Y, Attia E, Walsh BT, Steinglass J. Abnormal eating behavior in video-recorded meals in anorexia nervosa. *Eating Behaviors*. 2015; 19:28–32. [PubMed: 26164671]
- Guarda AS. Treatment of anorexia nervosa: Insights and obstacles. *Physiology & Behavior*. 2008; 94(1):113–120. [PubMed: 18155737]
- Haedt-Matt AA, Keel PK. Revisiting the affect regulation model of binge eating: a meta-analysis of studies using ecological momentary assessment. *Psychological Bulletin*. 2011; 137(4):660. [PubMed: 21574678]
- Hamaker EL, Kuiper RM, Grasman RP. A critique of the cross-lagged panel model. *Psychological Methods*. 2015; 20(1):102–116. [PubMed: 25822208]
- Handley AK, Egan SJ, Kane RT, Rees CS. A randomised controlled trial of group cognitive behavioural therapy for perfectionism. *Behaviour Research & Therapy*. 2015; 68:37–47. [PubMed: 25795927]

- Hofmann SG. Cognitive processes during fear acquisition and extinction in animals and humans: Implications for exposure therapy of anxiety disorders. *Clinical Psychology Review*. 2008; 28(2): 199–210. [PubMed: 17532105]
- Hart LM, Granillo MT, Jorm AF, Paxton SJ. Unmet need for treatment in the eating disorders: a systematic review of eating disorder specific treatment seeking among community cases. *Clinical Psychology Review*. 2011; 31:727–735. [PubMed: 21501580]
- Kahneman D, Krueger AB, Schkade DA, Schwarz N, Stone AA. A survey method for characterizing daily life experience: the day reconstruction method. *Science*. Dec 3; 2004 306(5702):1776–1780. [PubMed: 15576620]
- Kaplan AS, Walsh BT, Olmsted M, Attia E, Carter JC, Devlin MJ, et al. Parides M. The slippery slope: prediction of successful weight maintenance in anorexia nervosa. *Psychological Medicine*. 2009; 39:1037–1045. [PubMed: 18845008]
- Koskina A, Campbell IC, Schmidt U. Exposure therapy in eating disorders revisited. *Neuroscience & Biobehavioral Reviews*. 2013; 37:193–208. [PubMed: 23201859]
- Lavender JM, Wonderlich SA, Engel SG, Gordon KH, Kaye WH, Mitchell JE. Dimensions of emotion dysregulation in anorexia nervosa and bulimia nervosa: A conceptual review of the empirical literature. *Clinical Psychology Review*. 2015; 40:111–122. [PubMed: 26112760]
- Levinson CA, Byrne M. The fear of food measure: A novel measure for use in exposure therapy for eating disorders. *International Journal of Eating Disorders*. 2015; 48(3):271–283. [PubMed: 25087651]
- Levinson CA, Zerwas SC, Calebs B, Marcus M, Kordy H, Hamer RM, Hofmeier SM, Levine M, Zimmer B, Moesner M, Peat C, Runfola CD, Bulik CM. The Core Symptoms of Bulimia Nervosa, Anxiety, and Depression: A Network Analysis. *Journal of Abnormal Psychology*. 2017; 126:340–354. [PubMed: 28277735]
- Long S, Wallis DJ, Leung N, Arcelus J, Meyer C. Mealtimes on eating disorder wards: A two-study investigation. *International Journal of Eating Disorders*. 2012; 45(2):241–246. [PubMed: 21472761]
- Long S, Wallis D, Leung N, Meyer C. “All eyes are on you”: Anorexia nervosa patient perspectives of in-patient mealtimes. *Journal of Health Psychology*. 2012; 17(3):419–428. [PubMed: 21868423]
- Marhe R, Waters AJ, van de Wetering BJ, Franken IH. Implicit and explicit drug-related cognitions during detoxification treatment are associated with drug relapse: An ecological momentary assessment study. *Journal of Consulting and Clinical Psychology*. 2013; 81(1):1. [PubMed: 23231572]
- Mayer LE, Schebendach J, Bodell LP, Shingleton RM, Walsh BT. Eating behavior in anorexia nervosa: Before and after treatment. *International Journal of Eating Disorders*. 2012; 45(2):290–293. [PubMed: 21495053]
- McFarlane T, Olmsted MP, Trottier K. Timing and predication of relapse in a transdiagnostic eating disorder sample. *International Journal of Eating Disorders*. 2008; 41(7):587–593. [PubMed: 18473336]
- Murray SB, Loeb KL, Le Grange D. Dissecting the core fear in anorexia nervosa: Can we optimize treatment mechanisms? *JAMA Psychiatry*. 2016; 73(9):891–892. [PubMed: 27463780]
- Murray SB, Treanor M, Liao B, Loeb KL, Griffiths S, Le Grange D. Extinction theory & anorexia nervosa: Deepening therapeutic mechanisms. *Behaviour Research & Therapy*. 2016; 87:1–10. [PubMed: 27580026]
- Norring CEA, Sohlberg SS. Outcome, recovery, relapse and mortality across six years in patients with clinical eating disorders. *Acta Psychiatrica Scandinavica*. 1993; 87(6):437–444. [PubMed: 8356896]
- Obsessive Compulsive Cognitions Working Group. Cognitive assessment of obsessive-compulsive disorder. *Behaviour Research and Therapy*. 1997; 35(7):667–681. [PubMed: 9193129]
- Olstad S, Solem S, Hjemdal O, Hagen R. Metacognition in eating disorders: Comparison of women with eating disorders, self-reported history of eating disorders or psychiatric problems, and healthy controls. *Eating Behaviors*. 2015; 16:17–22. [PubMed: 25464061]
- Pallister E, Waller G. Anxiety in the eating disorders: Understanding the overlap. *Clinical Psychology Review*. 2008; 28(3):366–386. [PubMed: 17707562]

- Racine SE, Wildes JE. Dynamic longitudinal relations between emotion regulation difficulties and anorexia nervosa symptoms over the year following intensive treatment. *Journal of Consulting and Clinical Psychology*. 2015; 83:785. [PubMed: 25181027]
- Riemann BC, McNally RJ. Cognitive processing of personally relevant information. *Cognition and Emotion*. 1995; 9(4):325–340.
- Salkovskis PM. The importance of behaviour in the maintenance of anxiety and panic: A cognitive account. *Behavioural Psychotherapy*. 1991; 19(01):6–19.
- Schneider S, Stone AA. Ambulatory and diary methods can facilitate the measurement of patient-reported outcomes. *Quality of Life Research*. 2016; 25(3):497–506. [PubMed: 26101141]
- Segal ZV, Hood JE, Shaw BF, Higgins TE. A structural analysis of the self-schema construct in major depression. *Cognitive Therapy & Research*. 1988; 12(5):471–485.
- Segerstrom SC, Tsao JC, Alden LE, Craske MG. Worry and rumination: Repetitive thought as a concomitant and predictor of negative mood. *Cognitive Therapy and Research*. 2000; 24:671–688.
- Shafran R, Coughtrey A, Kothari R. New frontiers in the treatment of perfectionism. *International Journal of Cognitive Therapy*. 2016; 9(2):156–170.
- Siep N, Jansen A, Havermans R, Roefs A. Cognitions and emotions in eating disorders. *Current Topics In Behavioral Neurosciences*. 2011; 6:17–33. [PubMed: 21243468]
- Smyth JM, Wonderlich SA, Sliwinski MJ, Crosby RD, Engel SG, Mitchell JE, Calogero RM. Ecological momentary assessment of affect, stress, and binge-purge behaviors: Day of week and time of day effects in the natural environment. *International Journal of Eating Disorders*. 2009; 42(5):429–436. [PubMed: 19115371]
- Steinglass JE, Sysko R, Mayer L, Berner LA, Schebendach J, Wang Y, et al. Walsh BT. Pre-meal anxiety and food intake in anorexia nervosa. *Appetite*. 2010; 55:214–218. [PubMed: 20570701]
- Stice E, Fisher M, Martinez E. Eating Disorder Diagnostic Scale: Additional evidence of reliability and validity. *Psychological Assessment*. 2004; 16(1):60–71. [PubMed: 15023093]
- Stice E, Telch CF, Rizvi SL. Development and validation of the Eating Disorder Diagnostic Scale: A brief self-report measure of anorexia, bulimia, and binge-eating disorder. *Psychological Assessment*. 2000; 12(2):123–131. [PubMed: 10887758]
- Treasure J, Cardi V, Kan C. Eating in eating disorders. *European Eating Disorders Review*. 2012; 20(1):42–49.
- Wade, TD., O'Shea, A., Shafran, R. Perfectionism and eating disorders. In: Sirois, M. Molnar, DS. Sirois, FM., Molnar, DS., editors. *Perfectionism, Health, and Well-Being*. Cham, Switzerland: Springer International Publishing; 2016. p. 205-222.
- Waters AJ, Szeto EH, Wetter DW, Cinciripini PM, Robinson JD, Li Y. Cognition and craving during smoking cessation: an ecological momentary assessment study. *Nicotine & tobacco research*. 2014; 16(Suppl 2):S111–S118. [PubMed: 23901053]

Highlights

- Participants with an eating disorder (ED) reported on cognitions, behaviors, and emotions around meals.
- We found specific relationships between mealtime cognitions and subsequent ED behaviors
- Mealtime cognitions predicted subsequent higher anxiety and ED symptoms at a one-month follow up
- Interventions personalized to target these specific cognitions in real time might reduce ED relapse

Table 1
Means, Standard Deviations and Range of Eating Disorder Cognitions, Behaviors, and Anxiety about a Meal

Variable	<i>M (SD)</i>	<i>Range</i>
Eating disorder cognitions		
Worries about weight gain	3.65 (1.88)	1 - 6
Feelings of fatness	3.91 (1.95)	1 - 6
Preoccupation with thinness	4.10 (1.85)	1 - 6
Concern about mistakes	2.13 (1.37)	1 - 6
High standards	2.22 (1.47)	1 - 6
Eating disorder behaviors		
Restriction	2.22 (1.53)	1 – 6
Weighting oneself	1.59 (1.45)	1 – 6
Body checking	3.02 (1.87)	1 – 6
Compensatory behavior	1.31 (0.97)	1 – 6
Excessive exercise	1.63 (1.30)	1 – 6
Anxiety		
Before meal	2.66 (1.61)	1 - 6
During meal	2.96 (1.61)	1 - 6
After the meal	3.14 (1.73)	1 - 6

Note. *M* = Mean; *SD* = Standard Deviation.

Table 2
Mealtime Cognitions Predict Subsequent Eating Disorder Behaviors

	Restriction	Weighing oneself	Body checking	Compensatory behaviors	Excessive exercise
<i>Fears of Weight gain/Feelings of Fatness</i>					
Fear of wt gain	ns	ns	.08 *	.04 * +	ns
Felt fat	ns	ns	.14 ***	.08 ***	.06 *
Preoccupation with Thinness	ns	ns	.14 *** +	.06 *	.06 *
<i>Perfectionism thoughts</i>					
Concern about mistakes	ns	.06 * +	.11 *	.05 *	.07 *
High Standards	.11 *	ns	.12 *	.06 *	.06 * +

Note.

*** $p < .001$,

* $p < .05$,

bolding and + indicates that the relationship goes in both directions; fear of wt gain = I felt worried about gaining weight during the meal; Felt fat = I felt fat during the meal; Preoccupation with Thinness = I am preoccupied with the desire to be thinner; Concern about mistakes = I was concerned about making mistakes during the meal; High Standards = I had high standards for myself during the meal; compensatory behaviors = vomiting or compensatory behaviors.

Table 3
Mealtime Cognitions Predicting Eating Disorder Symptoms at One Month Follow-Up

	Drive for thinness	Bulimic symptoms	Body dissatisfaction
<i>Fears of Weight gain/Feelings of Fatness</i>			
Fear of wt gain	.26 *	ns	ns
Felt fat	.23 *	ns	ns
Preoccupation with Thinness	.26 *	ns	ns
<i>Perfectionism thoughts</i>			
Concern about mistakes	ns	.12 *	ns
High Standards	ns	ns	ns

Note.

**
 $p < .001$,

*
 $p < .05$;

Time 1 symptoms are controlled for meaning that all relationships are over and above initial reports of eating disorder symptoms; fear of wt gain = I felt worried about gaining weight during the meal; Felt fat = I felt fat during the meal; Preoccupation with Thinness = I am preoccupied with the desire to be thinner; Concern about mistakes = I was concerned about making mistakes during the meal; High Standards = I had high standards for myself during the meal; compensatory behaviors = vomiting or compensatory behaviors.