Published in final edited form as:

Int J Eat Disord. 2014 December ; 47(8): 853–859. doi:10.1002/eat.22292.

Eating Behaviors and Negative Affect in College Women's Everyday Lives

Kristin E. Heron, Ph.D.¹, Stacey B. Scott, Ph.D.², Martin J. Sliwinski, Ph.D.¹, and Joshua M. Smyth, Ph.D.¹

¹The Pennsylvania State University

²University of Southern Florida

Abstract

Objective—A growing body of research seeks to understand the relationship between mood and eating behaviors. Ecological Momentary Assessment (EMA) methods provide a method for assessing these processes in natural settings. We used EMA to examine the relationship between mood and eating behaviors in everyday life among women with subclinical disordered eating behaviors.

Method—Participants ($N=127$, age $M=19.6$, BMI $M=25.5$) completed 5 daily EMA reports on palmtop computers for 1 week. Assessments included measures of negative affect (NA) and eating-related behavior during eating (eating large amounts of food, loss of control over eating, restricting food intake) and non-eating episodes (skip eating to control weight/shape). Time-lagged multi-level models tested mood-eating behavior relationships.

Results—Higher NA did not precede any unhealthy eating and weight control behaviors. However, NA was higher when women reported eating large quantities of food, losing control over eating, and restricting food intake during their most recent eating episode, but not after skipping eating to control weight/shape.

Discussion—These findings elucidate processes in daily life that may influence the development and maintenance of unhealthy eating and weight control behaviors that, in turn, can inform interventions.

A growing body of research seeks to understand the relationship between eating behaviors and mood, with the goal of identifying factors that may influence people to engage in unhealthy or disordered eating behaviors (1,2). One limitation of most previous work is a reliance on retrospective questionnaires or laboratory-based designs (3,4). Although these methods provide valuable information, they raise concerns regarding memory biases and reporting accuracy on questionnaires, and questions about real-world generalizability for laboratory studies. Ecological Momentary Assessment (EMA) provides an alternative data collection approach that allows researchers to collect multiple assessments from people regarding current or very recent events or experiences, in their natural environment. The advantages of this method are discussed at length elsewhere (1), but in brief, EMA reduces

memory biases, provides data more generalizable to real-world contexts, and allows for the assessment of dynamic processes.

EMA methods have been used to study eating behaviors – primarily binge eating – and mood among women with bulimia nervosa (BN) and binge eating disorder (BED). Much of this work has developed as a means of testing theoretical models that posit that negative affect may play a critical regulatory role in the onset and maintenance of disordered eating behaviors (or eating behaviors more generally; e.g., 5). The affect regulation model suggests that binge eating is triggered by increases in negative emotions, and that the binge eating then serves to reduce these negative emotions (6). Various derivations of this model have also been developed that attempt to more carefully identify the mechanism whereby affect regulation occurs. For example, theories posit binge eating may serve as a way to distract oneself from negative emotions (escape from self-awareness; 7), mask the true causes of negative emotions (masking theory; 8), or replace one negative emotion (e.g., depression before binge eating) with a less aversive one (e.g., guilt after binge eating; trade-off theory; 9). In general, all of these affect regulation models assume that binge eating in response to negative emotions is maintained through negative reinforcement, and test two primary hypotheses: (1) binge eating is preceded by an increase in negative affect; and (2) binge eating results in a decrease in negative emotions. Several EMA studies have examined the mood antecedents and consequences of binge eating and found NA is higher prior to binge eating events, relative to either average NA or NA before regular eating (10-14). Findings regarding negative mood after binge eating episodes are inconsistent; some EMA studies report immediate post-binge increases in NA (11,15,16), whereas others find a decrease in NA in the hours after binge episodes (10,12,13). In studies that have examined NA relative to purging events (e.g., self-induced vomiting, laxative use), findings in women with bulimia show that NA increases in the time leading up to the purge, and decreases following the event (10,13).

Substantially fewer studies use EMA to examine the relationship between mood and other disordered eating behaviors beyond binge eating and purging. Carels and colleagues have used real-time assessment methods to evaluate mood states that are associated with lapses in dieting among obese adults. Results have demonstrated that dietary lapses were significantly associated with concurrently feeling more sad or stressed at times when participants reported lapses in dieting (17,18). An EMA pilot study of patients with anorexia nervosa [AN] demonstrated that negative affect lability is associated with restrictive behaviors and rituals (19). These studies, however, did not evaluate the mood-behavior relationship at consecutive assessment points (i.e., before and after events) as has been done with binge eating and purging behaviors. Furthermore, there remains a dearth of information regarding the momentary relationship between mood and other disordered eating behaviors that are frequently seen in clinical and subclinical disorders. For example, the real-time assessment of mood and restrictive eating behaviors that are seen with many eating disorders (e.g., AN, BN) have not been studied beyond studies of dietary lapses (17,18) in non-eating disorder patients. In addition, although loss of control over eating is a component of binge eating, many studies operationalize binge eating as only eating a large quantity of food in a discrete period of time (16,20), and loss of control has not yet been evaluated independently.

There is a similar lack of information examining mood-eating behavior processes in women who engage in unhealthy eating behaviors, but do not meet criteria for an eating disorder. Particularly among college-aged samples, research suggests that a substantial number of women engage in subclinical disordered eating behaviors. For example, in a study of 643 non-obese college women, although only 3% were classified as having bulimia, 61% were identified as having some form of disordered eating, such as chronic dieting, subclinical bulimia, or bingeing/purging alone (21). Other studies have similarly shown that more than a quarter (25.9%) of women age 18-22 report having bulimic episodes within the last month (22), and among college women, 16.3% reported they had binged, 10.3% had purged, and 18.6% had used laxatives, diet pills, or diuretics in the last 3 months (23).

Although not at clinically diagnostic levels, these behaviors are potentially problematic because eating and weight-related concerns can significantly interfere with social and academic performance (23), and are associated with more negative body image, lower self-esteem, and depression (21,24). Given the high prevalence of disordered eating and the significant negative impact these behaviors can have on women, studies examining behaviors in these samples are warranted. Furthermore, because disordered eating behaviors are risk factors for the development of clinical eating disorders (e.g., 25), understanding the processes that may influence the onset or maintenance of these behaviors early on could be useful for informing intervention and prevention efforts.

The goal of the present study was to provide a preliminary examination of the relationships between negative mood and a range of eating behaviors, as they are experienced in everyday life by young women with subclinical disordered eating. EMA methods were used to assess negative mood and disordered eating and weight control behaviors, including eating unusually large quantities of food, loss of control over eating, restricting food intake, and skipping meals to control weight or shape. The aims of this study were: (1) to evaluate whether higher levels of disordered eating behavior was associated with higher NA prior to the behavior; and (2) to determine if higher current NA was associated with reporting recently engaging in greater levels of disordered eating.

Method

Participants

Undergraduate women completed a battery of online questionnaires, including two screening measures to identify individuals with high levels of eating and/or body-related concerns. In this study, we aimed to identify women who were experiencing subclinical symptoms of eating disorders, including behavioral and cognitive/affective aspects of body shape- and weight-concerns, and therefore, used both the Eating Disorder Examination Questionnaire (EDE-Q; 26) and the Body Shape Questionnaire (BSQ; 27) to identify participants. Eligibility criteria were: (1) a score of ≥ 2.30 on the EDE-Q or ≥ 110 on the BSQ; (2) no current eating disorder diagnosis or treatment; (3) age 18-24. The EDE-Q and BSQ criteria were based on previously published work suggesting that these cut-off scores appropriately identify women with potentially problematic disordered eating behaviors and attitudes (22,28). Online screening was completed by 795 women, of which 37% ($n = 296$) met inclusion criteria. The EDE-Q and BSQ were highly correlated in this sample ($r = .70$),

and among participants in this study, 63% ($n = 82$) met both the EDE-Q and BSQ requirements for eligibility, 32% ($n = 84$) met only the EDE-Q criteria, and 5% ($n = 7$) met only the BSQ criteria. Eligible women were contacted via email and 44% ($n = 131$) enrolled in the study; participants did not differ on measures of disordered eating or body dissatisfaction from eligible women who declined participation ($ps > .26$). Participants were young ($M = 19.6$ years, $SD = 1.18$), had a mean BMI of 25.5 ($SD = 4.65$), and were mostly Caucasian (71%) or Asian (18%) with high levels of eating pathology; participants reported an average EDE-Q score of 3.35 ($SD = 0.92$) and BSQ score of 124.67 ($SD = 29.88$).

EMA Measures

A customized EMA survey was developed using Satellite Forms MobileApp Designer (Intellisync Corporation; <http://www.satelliteforms.net>) for use on palmtop computers. Handheld computers (Palm m105 and Z22) were used. All EMA surveys were time and date stamped for compliance monitoring. The survey included the measures described below.

Negative affect (NA)—Five items from the Positive and Negative Affect Schedule (PANAS-X; 29) selected to include both high- and low-arousal states were adapted to enquire about current mood. A 7-point scale ($0 = \text{not at all}$, $6 = \text{very much}$) was used to rate currently feeling angry, worried, sad, unhappy, and frustrated. Ratings for these items were summed to form a composite NA measure, with higher scores reflecting higher levels of NA. The reliability of the mean for NA was .93 in the present sample; the intraclass correlation, an index of the proportion of total variance due to differences between individuals, was .29.

Disordered eating behaviors—Four EDE-Q items were adapted for EMA by enquiring about behavior during the last several hours. At each assessment, participants reported if they had eaten since the last assessment. If they had, they reported (for that eating episode) the extent to which they ate an unusually large amount (“Did you binge eat, or eat a large amount of food, given the circumstances?”), lost control over their eating (“Did you lose control over your eating?”), and intentionally restricted food (“Did you try to limit the amount of food you ate?”). If they had not eaten, they rated the extent to which this was due to attempting to control weight/shape (“How much did the following factors influence you to NOT eat since the last beep?: I am trying to control my weight and/or shape”). Each item was rated on a 7-point scale ($0 = \text{not at all}$, $6 = \text{very much}$). The intraclass correlations were .43, .33, .61, and .59 for eating large amounts, loss of control, restricting, and skipping eating, respectively.

Procedures

All procedures were approved by the Institutional Review Board and participants provided informed consent. Eligible women attended a group appointment (groups of 2-6), during which they first completed questionnaires as part of a larger study. They were provided a handheld computer, and completed a training session on the device and EMA procedures. During the training, all of the EMA survey items were reviewed with participants and additional clarification was provided if needed. In particular, the *binge* item taken from the EDE-Q was clarified as meaning “eating a large amount of food given the circumstances”

and the *loss of control* item was described as meaning “could not stop eating, even if you wanted to.” For one week, participants were signaled to complete the survey at five semi-random times (9:00am-10:00pm). A stratified random sampling design was used, which resulted in participants being signaled approximately once every 2 to 3.5 hours (M time between signals = 2 hours 43 minutes). Overall, participants reported on their NA and disordered eating behaviors up to 35 times during the week assessment period. Participants received \$40 for completing these activities.

Results

EMA Compliance and Descriptive Statistics

Two participants dropped out of the study prior to beginning EMA and data from two additional participants were lost due to technical problems, leaving data from 127 women. Compliance with the EMA was excellent; 90% of all surveys were completed, with 85% of surveys completed within 30 minutes of the prompt. Only assessments completed within 30 minutes of a prompt were used for analyses.

Mean NA levels were calculated for each person based on all of her EMA reports and descriptive statistics were calculated based on these values, so as not to weight the mean towards people who completed more EMA. The mean composite NA level was 6.48 ($SD = 3.59$). Across all assessments the full range of possible values was observed (0-30). During about half of the surveys (51%) participants reported eating during the last 2-3 hours. Table 1 presents mean ratings for disordered eating behaviors and the percentage of assessments during which the behaviors were reported at any level (i.e., non-zero values) or reported as *not at all* occurring (i.e., value of 0).

Mood-Eating Behavior Effects

Multilevel models were used in all analyses to account for the nested data structure inherent in EMA designs and analyses were conducted using SAS proc mixed (version 9.3). We examined the relationship between mood and eating behaviors for four different dependent variables (eating unusually large quantities of food, loss of control over eating, restricting food intake, and skipping meals to control weight or shape). Given that these analyses are exploratory, we did not pose differential predictions for each of the outcomes, and thus (due to type-1 error concerns), the results that are significant at the .05 level should be viewed with caution and require replication in future studies.

Aim 1: Prior NA and eating behavior—At each assessment women reported on their current NA and recent (last 2-3 hours) eating behaviors, thus, to address Aim 1 we lagged mood reports to evaluate the relationship between prior NA on each eating behavior. This was tested in the following model:

$$\begin{aligned} \text{Eating Behavior}_{ijk} &= \beta_0 + \beta_1 \text{Affect}_{ijk-1} + \beta_2 \text{Eating Behavior}_{ijk-1} + e_{ijk} \\ \beta_0 &= G_{00} + u_{0jk} \text{ (day-level random effects)} \\ G_{00} &= L_{000} + L_{001} \text{Person's Average NA}_k + v_{0k} \text{ (person-level random effects)} \end{aligned}$$

Person-level average affect was included in all models to separate the between- and within-person effects. The lagged predictors were person-day centered to separate individual differences (i.e. between-person effects) from the within-person effects of interest (30).¹ Results are presented in Table 2. Controlling for all other predictors, there were no effects of previous NA on eating large amounts of food, loss of control over eating, limiting food intake, or skipping eating.

Aim 2: Current NA and earlier eating behavior—To test mood following the eating behaviors, we examined how women's current NA levels at a given assessment were associated with their reports of each disordered eating behavior measured at that same assessment, but regarding behavior that occurred during the last 2-3 hours. Aim 2 was tested using the following model:

$$\begin{aligned} \text{Eating Behavior}_{ijk} &= \beta_0 + \beta_1 \text{Affect}_{ijk} + \beta_2 \text{Eating Behavior}_{ijk-1} + e_{ijk} \\ \beta_0 &= G_{00} + u_{0jk} \text{ (day-level random effects)} \\ G_{00} &= L_{000} + L_{001} \text{Person's Average NA}_k + v_{0k} \text{ (person-level random effects)} \end{aligned}$$

Person-level average affect was included again in this model to separate the between- and within-person effects. The lagged predictor variable (β_2) was person-day centered as was done in the first model. As shown in Table 3, after accounting for individual differences in NA, at times when participants had current levels of NA that were higher than their average for that day, they also indicated that during a recent eating episode (i.e., in the previous 2-3 hours), they had eaten larger amounts of food, experienced greater loss of control over eating, or limited food intake more; current reports of NA were not related to reporting recently skipping eating to control weight/shape.

Discussion

This EMA study examined the relationship between mood and unhealthy eating behaviors in daily life for young women with subclinical disordered eating. We found that: (1) higher levels of disordered eating behavior was not seen after times when women reported higher levels of NA in the previous minutes or hours; and (2) at moments when women reported higher NA they also indicated that during a recent eating episode they engaged in several eating disorder behaviors (eating large quantities of food, losing of control over eating, and restricting of food intake) to a greater extent. We found no evidence of mood changes prior to reporting engaging in disordered eating behaviors, including eating large quantities of food, loss of control over eating, restricting intake, and skipping meals. These findings are consistent with, and extend, studies finding no changes in NA prior to a binge in women with subclinical binge eating (16,20), or prior to eating episodes in women without eating disorders (15,31). However, among women with BN and BED, higher NA is reliably seen in the time leading up to a binge episode (11). The women in the present study did not have

¹We also including the length of time since eating occurred in all models in order to test whether the mood effects differed based on time since eating. The pattern of results did not differ when this variable was included suggesting time since eating did not influence the eating-mood relationship in this sample. Given the null findings, we removed length of time since eating occurred from all of the models presented.

eating disorders, but they were selected based on reporting high levels of disordered eating behavior and body dissatisfaction at the start of the study, as was evidenced by their EDE-Q and BSQ scores. Although negative emotions may precipitate the onset of binge eating in patients with BN and BED, this does not appear to be the case in subclinical and non-clinical samples, including the present subclinical sample.

Negative affect has been examined as a potential factor driving unhealthy eating behaviors, but it is possible that other influences may play a greater role in the onset and maintenance of disordered eating behaviors, particularly for college women (32). Research has shown that among young women, peer modeling and social pressure to conform to unhealthy eating behaviors have a significant influence on individuals' behavior (33,34). For example, Crandall found that peer-group norms influence the amount that women binge eat, and as social groups become more cohesive, women become more similar in their levels of binge eating (34). Although the present findings are consistent with previous work showing that in subclinical samples, negative mood may not be a precursor for the occurrence of disordered eating behaviors, future research examining how social influences and peer relationships may drive the occurrence of disordered eating behaviors in college women is warranted. More generally, the relationship between emotions and eating is complex and is not fully understood in either clinical or non-clinical samples (5), but EMA approaches may provide a way to examine these processes as they occur in natural settings.

This study found negative mood was higher when women reported recent eating events during which they ate large amounts of food or lost control over eating (both characteristic of binge eating). Although some studies have reported immediate post-binge increases in NA (15,16), studies using intensive EMA protocols found a decrease in NA in the hours after a binge episode (10,12,13). A meta-analysis suggests post-binge NA is higher than pre-binge NA (11), although the timing of post-binge NA measurement varies greatly across studies and likely influenced the pattern of results. With NA increasing subsequent to binge eating, questions regarding the reinforcing qualities of binge eating emerge. As has been discussed elsewhere (11), it is possible that the binge eating is reinforced *during* the episode either due to a decrease in negative, or increase in positive affect, although future EMA studies testing these hypotheses are needed.

Several limitations of the present study should be noted. First, the EMA study design provided data regarding mood and behavior every 2-3 hours allowing only for observations of how mood and behavior are related at consecutive time points. In addition, eating behavior during the last 2-3 hours and current mood were both assessed at each time point. It is possible that providing ratings of previous eating behaviors influenced mood ratings at a given assessment, rather than what occurred during the eating episode itself. We attempted to minimize this concern by having participants make their current mood ratings before they provided reports on recent eating behaviors. Relatedly, women's current mood could have influenced their perceptions (and thus, ratings) of their behavior during the previous 2-3 hours. Ancillary analyses indicated controlling for length of time since eating did not affect the results (see Footnote 1), suggesting the sampling intensity and design is not likely fully responsible for the pattern of findings. Nonetheless, additional research using event-contingent sampling to assess eating events and mood at separate time points and/or

increasing the sampling frequency to capture experiences with greater temporal granularity will allow for mood changes over shorter time periods to be modeled (e.g., minutes, hours; 20). Second, a limited set of mood items was used, and other specific aspects of NA not included here may also be important. Additional research evaluating specific facets of momentary NA – for example, guilt or shame (10) – and their relationships to eating behaviors is clearly needed. Third, this study included a sample of undergraduate women with subclinical disordered eating behavior, so it is unclear if these findings can be generalized to young women not attending college or women in other age groups. Fourth, although this study tested temporal relationships between mood and disordered eating, claims regarding the causal relationships between these variables cannot be made due to the observational nature of this study. The current study was designed to test within-day relationships, however, the question of “good days” compared to “bad days” which appears in other descriptions of eating behaviors (13) is an interesting one for future study. Although we do not include day-level predictors, we attend to the possible influences of day-to-day differences by separating momentary- and day-level variation through our use of centering. If we did not do so, the temporal dynamics of day-level processes would be conflated with momentary effects (30). Future work should examine characteristics of days which may make disordered eating behaviors more likely and affect the relationship between mood and eating.

The present study extends previous research in two important ways. First, this study moves beyond only evaluating binge eating to assess a range of different disordered eating behaviors. NA was higher not only after binge eating, but also after times when women engage in more restrictive eating. Prior work has shown that dietary lapses are followed by higher NA (17,18) but, to our knowledge, this is the first study to demonstrate in natural settings that negative mood is higher when women report recently having restricted food intake as a means of controlling their weight or shape. Future research should replicate these findings, but these data could be useful for identifying momentary, real-world factors that may impact weight management behaviors and interventions. Second, we extended prior work by studying a non-clinical sample of college women who engage in substantial unhealthy eating behaviors, but do not meet criteria for an eating disorder. By understanding the mood-related factors that may be influencing the onset or maintenance of unhealthy behaviors in the moment, this can inform efforts to prevent the onset and/or progression of eating disorders or other more severe pathology.

Acknowledgments

Grant funding

This research was funded in part by an NIHM National Research Service Award individual predoctoral fellowship awarded to the first author (F31MH082564)

References

1. Smyth JM, Wonderlich SA, Crosby RD, Miltenberger R, Mitchell JE, Rorty M. The use of ecological momentary assessment approaches in eating disorder research. *Int J Eat Disord*. 2001; 30:83–95. [PubMed: 11439412]

2. Stice E. Risk and maintenance factors for eating pathology: A meta-analytic review. *Psychol Bull.* 2002; 128:825–48. [PubMed: 12206196]
3. Stice E. A prospective test of the dual-pathway model of bulimic pathology: Mediating effects of dieting and negative affect. *J Abnorm Psychol.* 2001; 110(1):124–35. [PubMed: 11261386]
4. Walsh BT, Boudreau G. Laboratory studies of binge eating disorder. *Int J Eat Disord.* 2003; 34(S1):S30–S38. [PubMed: 12900984]
5. Macht M. How emotions affect eating: A five-way model. *Appetite.* Jan; 2008 50(1):1–11. [PubMed: 17707947]
6. Hawkins, R.; Clement, P. Binge eating: Measurement problems and a conceptual model. In: Hawkins, R.; Fremouw, W.; Clement, P., editors. *The binge purge syndrome: Diagnosis, treatment, and research.* Springer Publishing Inc.; New York: 1984. p. 229-51.
7. Heatherton TF, Baumeister RF. Binge eating as escape from self-awareness. *Psychol Bull.* Jul; 1991 110(1):86–108. [PubMed: 1891520]
8. Polivy J, Herman CP. Distress and eating: why do dieters overeat? *Int J Eat Disord.* Sep; 1999 26(2):153–64. [PubMed: 10422604]
9. Kenardy J, Arnow B, Agras WS. The aversiveness of specific emotional states associated with binge-eating in obese subjects. *Aust N Z J Psychiatry.* 1996; 30:839–44. [PubMed: 9034475]
10. Berg KC, Crosby RD, Cao L, Peterson CB, Engel SG, Mitchell JE, et al. Facets of negative affect prior to and following binge-only, purge-only, and binge/purge events in women with bulimia nervosa. *J Abnorm Psychol.* Feb; 2013 122(1):111–8. [PubMed: 22985015]
11. Haedt-Matt AA, Keel PK. Revisiting the affect regulation model of binge eating: a meta-analysis of studies using ecological momentary assessment. *Psychol Bull.* Jul; 2011 137(4):660–81. [PubMed: 21574678]
12. Munsch S, Meyer AH, Quartier V, Wilhelm FH. Binge eating in binge eating disorder: A breakdown of emotion regulatory process? *Psychiatry Res.* Feb 28; 2012 195(3):118–24. [PubMed: 21849214]
13. Smyth JM, Wonderlich SA, Heron KE, Sliwinski MJ, Crosby RD, Mitchell JE, et al. Daily and momentary mood and stress are associated with binge eating and vomiting in bulimia nervosa patients in the natural environment. *J Consult Clin Psychol.* 2007; 75:629–38. [PubMed: 17663616]
14. Stein RI, Kenardy J, Wiseman CV, Douchis JZ, Arnow BA, Wilfley DE. What's driving the binge in binge eating disorder?: A prospective examination of precursors and consequences. *Int J Eat Disord.* Apr; 2007 40(3):195–203. [PubMed: 17103418]
15. Hilbert A, Tuschen-Caffier B. Maintenance of binge eating through negative mood: A naturalistic comparison of binge eating disorder and bulimia nervosa. *Int J Eat Disord.* Sep; 2007 40(6):521–30. [PubMed: 17573697]
16. Wegner KE, Smyth JM, Crosby RD, Wittrock D, Wonderlich SA, Mitchell JE. An evaluation of the relationship between mood and binge eating in the natural environment using ecological momentary assessment. *Int J Eat Disord.* Nov; 2002 32(3):352–61. [PubMed: 12210650]
17. Carels RA, Hoffman J, Collins A, Raber AC, Cacciapaglia H, O'Brien WH. Ecological momentary assessment of temptation and lapse in dieting. *Eat Behav.* 2001; 2(4):307–21. [PubMed: 15001025]
18. Carels RA, Douglass OM, Cacciapaglia HM, O'Brien WH. An Ecological Momentary Assessment of Relapse Crises in Dieting. *J Consult Clin Psychol.* Apr; 2004 72(2):341–8. [PubMed: 15065966]
19. Engel SG, Wonderlich SA, Crosby RD, Wright TL, Mitchell JE, Crow SJ, et al. A study of patients with anorexia nervosa using ecologic momentary assessment. *Int J Eat Disord.* Dec; 2005 38(4): 335–9. [PubMed: 16261606]
20. Deaver CM, Miltenberger RG, Smyth J, Meidinger A, Crosby R. An Evaluation of Affect and Binge Eating. *Behav Modif.* Sep 1; 2003 27(4):578–99. [PubMed: 12971129]
21. Mintz LB, Betz NE. Prevalence and correlates of eating disordered behaviors among undergraduate women. *J Couns Psychol.* 1988; 35(4):463–71.

22. Mond J, Hay P, Rodgers B, Owen C, Beumont P. Validity of the Eating Disorder Examination Questionnaire (EDE-Q) in screening for eating disorders in community samples. *Behav Res Ther.* 2004; 42(5):551–67. [PubMed: 15033501]
23. Hoerr SL, Bokram R, Lugo B, Bivins T, Keast DR. Risk for disordered eating relates to both gender and ethnicity for college students. *J Am Coll Nutr.* Aug; 2002 21(4):307–14. [PubMed: 12166527]
24. Ackard DM, Croll JK, Kearney-Cooke A. Dieting frequency among college females: Association with disordered eating, body image, and related psychological problems. *J Psychosom Res.* Mar; 2002 52(3):129–36. [PubMed: 11897231]
25. Striegel-Moore RH, Bulik CM. Risk factors for eating disorders. *Am Psychol.* Apr; 2007 62(3): 181–98. [PubMed: 17469897]
26. Fairburn CG, Beglin SJ. Assessment of eating disorders: Interview or self-report questionnaire? *Int J Eat Disord.* 1994; 16(4):363–70. [PubMed: 7866415]
27. Cooper PJ, Taylor MJ, Cooper Z, Fairburn CG. The development and validation of the Body Shape Questionnaire. *Int J Eat Disord.* 1987; 6(4):485–94.
28. Zabinski MF, Pung MA, Wilfley DE, Eppstein DL, Winzelberg AJ, Celio A, et al. Reducing risk factors for eating disorders: Targeting at-risk women with a computerized psychoeducational program. *Int J Eat Disord.* 2001; 29(4):401–8. [PubMed: 11285577]
29. Watson, D.; Clark, LA. The University of Iowa; Ames, IA: 1994. The PANAS-X: Manual for the Positive and Negative Affect Schedule - Expanded Form.
30. Scott SB, Sliwinski MJ, Blanchard-Fields F. Age differences in emotional responses to daily stress: The role of timing, severity, and global perceived stress. *Psychol Aging.* 2013; 28(4):1076–87. [PubMed: 24364410]
31. Greeno CG, Wing RR, Shiffman S. Binge antecedents in obese women with and without binge eating disorder. *J Consult Clin Psychol.* Feb; 2000 68(1):95–102. [PubMed: 10710844]
32. Luce KH, Crowther JH, Pole M. Eating Disorder Examination Questionnaire (EDE-Q): Norms for undergraduate women. *Int J Eat Disord.* 2008; 41(3):273–6. [PubMed: 18213686]
33. Stice E. Modeling of eating pathology and social reinforcement of the thin-ideal predict onset of bulimic symptoms. *Behav Res Ther.* Oct; 1998 36(10):931–44. [PubMed: 9714944]
34. Crandall CS. Social contagion of binge eating. *J Pers Soc Psychol.* Oct; 1988 55(4):588–98. [PubMed: 3193348]

Table 1
Descriptive statistics for EMA-measured disordered eating behaviors

	<i>M (SD)</i>	% EMA behavior occurred	% EMA behavior did not occur
Ate large quantity	1.03 (1.58)	40	60
Loss of control over eating	1.91 (2.13)	55	45
Limited food intake	3.04 (2.00)	81	19
Skipped eating	2.63 (2.25)	68	32

Note. EMA = Ecological Momentary Assessment, M = mean rating, SD = standard deviation, % EMA behavior occurred = percent of assessments during which women reported engaging in the behavior at any level (i.e., value ≥ 1 on 7-point scale) at times, % EMA behavior did not occur = percent of assessments during which the behavior was reported as *not at all* occurring (i.e. value of 0 on 7-point scale). The *ate large quantity*, *loss of control over eating*, and *limited food intake* variables were only reported at times when women indicated they had eaten since the previous assessment and the *skipped eating* variables was reported when they had not eaten since the last assessment.

Table 2
Fixed effects from time-lag models estimating effect of NA at previous assessment on disordered eating behaviors

	Ate large quantity				Lost control of eating				Limited food intake				Skipped eating			
	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p
Intercept	0.66	0.20	3.29	.001	1.07	0.33	3.23	.002	2.65	0.28	9.43	<.0001	2.12	0.36	5.86	<.0001
NA	-0.01	0.02	-0.32	.751	-0.01	-0.01	-0.05	.957	-0.02	0.02	-1.18	.242	-0.01	0.02	-0.01	.989
Person MNA	0.05	0.03	2.40	.018	0.14	0.05	3.09	.002	0.05	0.04	1.22	.222	0.08	0.05	1.72	.089
Previous DE	-0.36	0.05	-6.54	<.0001	-0.28	0.05	-5.68	<.0001	-0.32	0.05	-6.50	<.0001	-0.18	0.06	-3.25	.002

Note. NA = negative affect, DE = disordered eating behavior, SE = standard error, M = mean.

Table 3
Fixed effects from time-lag models estimating effect of current NA on disordered eating behaviors occurring during previous 2-3 hours
(reported concurrently)

	Ate large quantity				Lost control of eating				Limited food intake				Skipped eating			
	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p	Estimate	SE	t	p
Intercept	0.78	.22	3.55	.001	1.29	.33	3.88	.001	2.82	.30	9.56	<.0001	2.08	.37	5.59	<.0001
NA	0.03	.02	2.01	.046	0.04	.01	3.09	.003	0.03	.01	2.25	.027	0.01	.01	0.32	.747
Person M NA	0.05	.03	1.74	.084	0.11	.05	2.31	.022	0.02	.04	0.50	.617	0.08	.05	1.67	.097
Previous DE	-0.36	.05	-7.15	<.0001	-0.30	.05	-6.10	<.0001	-0.33	.05	-6.72	<.0001	-0.18	.06	-3.21	.002

Note. NA = negative affect, DE = disordered eating behavior, SE = standard error, M = mean.