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Longitudinal Associations between Emotion Regulation Skills, Negative Affect, and Eating Disorder Symptoms in a Clinical Sample of Individuals with Binge Eating

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Abstract

Objective: Although deficits in emotion regulation have been implicated in the maintenance of binge eating, few prospective studies have examined longitudinal associations between emotion regulation and eating disorder symptoms, which are needed to test these theoretical models.

Method: Using a naturalistic design, the current study utilized longitudinal multilevel analyses to examine whether improvements in emotion regulation during treatment are associated with decreased binge eating frequency and eating disorder cognitions in a heterogeneous sample of adults with binge eating ($N=97$). Analyses also accounted for between- and within-person differences in negative affect to inform specific targets for intervention.

Results: Significant within-person associations between emotion regulation, negative affect, and eating disorder severity support hypotheses that emotion dysregulation and negative affect co-occur with eating disorder psychopathology. Only between-person differences in negative affect demonstrated associations with binge eating frequency over time.

Discussion: Data suggest that momentary interventions targeting negative affect and emotion regulation skills may decrease eating disorder cognitions, but not binge eating frequency, among adults with binge eating.

Keywords

binge eating; emotion regulation; negative affect; treatment

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Binge eating is a central feature of several eating disorders in the *DSM-5* (American Psychiatric Association, 2013) and is associated with significant psychiatric and medical morbidity (Bulik, Sullivan, Kendler, 2002). Although efficacious treatments exist, approximately half of individuals with binge eating remain symptomatic (Grilo, 2017). Research is needed to identify underlying processes of symptom maintenance, which could be harnessed to improve the effectiveness of interventions.

A substantial body of literature suggests that binge eating functions to mitigate aversive affect (e.g., Berg et al., 2015; Leehr et al., 2015); thus, poorer emotion regulation may influence vulnerability to binge eat. More specifically, various theoretical models have posited that high levels of negative emotionality may predispose individuals to engage in binge eating as a means of avoiding, suppressing, or alleviating aversive affect (Heatherton & Baumeister, 1991; Polivy & Herman, 1993). In turn, binge eating may be maintained through the inability to utilize more adaptive emotion regulation skills. Consistent with these hypotheses, individuals with binge eating demonstrate greater difficulties with emotion regulation compared to controls (e.g., Lavender et al., 2015). Moreover, greater deficits in specific emotion regulation skills (e.g., emotional awareness, emotional acceptance, impulse control, negative urgency, distress tolerance) are correlated with greater eating disorder symptomatology in both clinical (Gianini, White, & Masheb, 2013; Lavender et al., 2014; Pisetsky, Haynos, Lavender, Crow, & Peterson, 2017) and community-based samples (Juarascio et al., 2016; Pearson et al., 2012; Racine et al., 2013).

Despite evidence linking emotion regulation and binge eating, few longitudinal studies have examined associations between emotion regulation and eating disorder psychopathology particularly during treatment, which is important for testing these maintenance models and identifying appropriate interventions. In particular, Wallace and colleagues (2014) found that among a community-sample of men and women with binge eating disorder (BED) ($N = 60$), change in global emotion regulation from pre- to post- guided self-help dialectical behavior therapy for BED was related to binge eating abstinence at the end of treatment and follow-up. Similarly, Peterson and colleagues (2017) examined whether change in emotion regulation from treatment admission to mid- or end-of-treatment was associated with improvements in eating disorder psychopathology among individuals with bulimia nervosa (BN) ($N = 80$) in a randomized controlled trial comparing Integrative Cognitive-Affective Therapy and enhanced Cognitive Behavior Therapy. Regardless of which treatment participants received, improvements in emotion regulation by mid-treatment were associated with lower global eating disorder psychopathology, but not binge eating, at the end of treatment. In contrast, improvements in emotion regulation from baseline to end-of-treatment were associated with lower eating disorder cognitions and frequency of binge eating at four-month follow-up.

Although these preliminary studies suggest that emotion dysregulation may be an important treatment target in binge eating, several questions remain. First, neither study (Peterson et al., 2017; Wallace, Masson, Safer, & von Ranson, 2014) controlled for negative affect, which is high in individuals with binge eating (Cassin & von Ranson, 2005). It is unclear whether individuals with binge eating have difficulty regulating their emotions because they lack emotion regulation skills or because their negative affect is elevated to the point that

emotion regulation becomes nearly impossible. This distinction has clear implications for treatment, because it denotes which treatment target is more important: improving emotion regulation skills or decreasing negative affect (so that existing emotion regulation skills can be used effectively). Furthermore, both studies focused on global emotion dysregulation and did not examine whether specific emotion regulation skills were associated with eating disorder symptoms. Finally, these studies occurred in the context of treatment trials designed to target emotions, and it is unclear whether findings would generalize to “real-world” settings. Examining the impact of within-person changes in emotion regulation on his/her levels of eating pathology in treatment-as-usual may increase understanding of associations between emotional regulation and outcome and increase the generalizability of such findings.

Thus, the current study aimed to address these gaps in the literature by examining longitudinal associations between emotion regulation and eating disorder psychopathology in a naturalistic treatment setting of adults with binge eating. We hypothesized that better emotion regulation would be associated with decreased severity of eating disorder cognitions and binge eating frequency even after adjusting for between- and within-person differences in negative affect.

Methods

Participants and Procedure

Participants were 97 adults with binge eating being enrolled in in-person outpatient treatment (e.g., weekly individual or intensive outpatient) at a Midwestern United States eating disorders clinic. This specialty clinic utilizes a multidisciplinary team of therapists, dietitians, and medical staff who employ cognitive behavioral and dialectical behavioral therapy approaches. Specific treatment plans are tailored based on an individual’s needs and best practices in the field of eating disorders.

The mean body mass index (BMI; kg/m²) of participants at baseline (start of treatment) was 37.20 kg/m² ($SD = 11.26$; range = 19.1–66.8) and mean age was 38.42 years ($SD = 13.93$; range = 18.0–65). Most participants were women ($n = 89$; 91.8%) and White ($n = 85$; 91.4%). Exclusion criteria were age < 18; BMI < 18.5 kg/m²; inability to read, write, or understand English; no access to internet with email. To be eligible, participants must have endorsed binge eating at least once per week for the past 3 months and at least three associated features and distress. Endorsement of compensatory behaviors was not an exclusion criterion. Using the diagnostic algorithms established by Berg and colleagues (2012) from the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 2008), at baseline approximately 28% of participants ($n = 27$) met diagnostic criteria for BN, 69% ($n = 67$) met criteria for BED, and 3% ($n = 3$) had an other specified feeding or eating disorder (OSFED; subthreshold BN or BED).

All procedures for this study were approved by the University of Minnesota Institutional Review Board. All new patients were given an information sheet about the study in their intake packet, which gave them the option of consenting to be contacted about the study. If an individual consented to be contact, then they were contacted by the research team.

Interested participants were screened via telephone and if eligible, sent a link to a secure website to complete electronic consent forms and assessments. All assessments were self-report and completed by participants on-line. Participants completed a baseline assessment at the start of treatment and follow-up assessments at week two, week four, week six, and week 10 of treatment, generally representing “mid-treatment.” Participants received a \$10 gift card for completing the baseline assessment and a \$5 gift card for every follow-up assessment.

Measures

The EDE-Q (Fairburn & Beglin, 2008) assesses cognitive and behavioral symptoms of eating disorders, including frequency of binge eating. To measure binge eating frequency, participants indicate how many times over the past 28 days they had eaten an unusually large amount of food and experienced a sense of loss of control over eating. Severity of eating disorder cognitions was measured using the EDE-Q Global scale ($\alpha = .85-.92$).

Positive and Negative Affect Schedule-Expanded Form (PANAS-X; Watson & Clark, 1994). The negative affect scale assessed negative affect at each assessment. Alphas ranged from .88 to .92, consistent with prior studies implementing this subscale in participants with binge eating (Berg et al., 2015).

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). The DERS 36-items and yields a total score and six subscales representing facets of emotion regulation: Non-acceptance (problems with emotional acceptance), Strategies (limited access to adaptive emotion regulation skills), Goals (difficulty with goal-directed behavior when distressed), Impulse (difficulty controlling behaviors when upset), Clarity (poor emotional differentiation), and Awareness (limited emotional identification). Higher scores indicate greater emotion regulation problems. Although to our knowledge, no standardized norms for this measure exist, recent studies conducted in samples of individuals seeking treatment for an emotional disorder (Hallion, Steinman, Tolin, & Diefenbach, 2018) or BN (Anderson et al., 2018) noted the following means across subscales, respectively: DERS total (89.33; 115.62), Non-acceptance (14.67; 18.38), Strategies (19.67; 25.46), Goals (15.42; 18.58), Impulse (12.58; 18.61), Clarity (12.01; 15.20), and Awareness (15.55; 19.37). Internal consistencies for all subscales and total score were good (α 's > .80).

Height and weight were self-reported and used to calculate BMI (kg/m^2).

Statistical Analysis

Longitudinal multilevel models were conducted using SPSS version 24.0 to examine the effect of emotion regulation on eating disorder cognitions and binge eating frequency across treatment-as-usual (Singer & Willet, 2003). A random intercepts model specifying a linear growth process was used for analyses of eating disorder cognitions, and a mixed-effect model for count data was used for binge eating frequency, which specified a negative binomial distribution. Time was coded as 0, 2, 4, 6, and 10, consistent with the timing of assessments. Main effects for negative affect and emotion regulation were entered as both within- and between-subjects variables. Within-subjects variables were person-mean centered and included as time-varying predictors, with significant effects indicating the co-

variation of emotion regulation and eating disorder symptoms in time. For example, on occasions in which individuals experience better emotion regulation, they may experience lower eating disorder cognitions. In contrast, between-subjects variables were grand-mean centered and included as time-invariant predictors. Additionally, baseline BMI and age were included as covariates in models of eating disorder cognitions, given significant correlations between these variables. Separate models predicting eating disorder cognitions (EDE global score) and binge eating frequency were conducted for each facet of emotion regulation (DERS subscales) as well as global emotion dysregulation (DERS total score). To protect against Type I error, α was set at .01.

The percentage of participants who completed follow-up time points ranged from 95% ($n = 92$) at week 2 to 72% ($n = 70$) at week 10. Individuals who completed all assessments did not differ from individuals with missing data, so data were assumed to be missing at random. Expectation maximization (EM) procedure was used to impute missing data, which produces relatively unbiased population parameter estimates (Little & Rubin, 1989). Thus, the full sample was included in analyses ($N = 97$).

Results

Descriptive statistics for study variables across assessment points are included in Table 1. Participants exhibited significant decreases in binge eating frequency (estimate [SE] = $-.85[.11]$, $p < .001$) and eating disorder cognitions (estimate [SE] = $-.06[.01]$, $p < .001$) over the assessment period. Half of the participants ($n = 49$) demonstrated at least a 50% reduction in binge eating frequency by week 10.

Longitudinal Associations between Emotion Regulation, Negative Affect, and Eating Disorder Cognitions

While controlling for covariates, there was a significant within-subjects main effect for DERS total score on EDE global score such that when individuals exhibited fewer difficulties with emotion regulation (i.e., lower DERS), they reported fewer eating disorder symptoms (i.e., lower EDE global) (estimate [SE] = $.006[.002]$, $p = .01$). Additionally, there was a significant within-subjects main effect for impulse control (i.e., DERS Impulse subscale) on eating disorder cognitions such that fewer problems with impulse control was associated with lower eating disorder psychopathology across the assessment period (Table 2). Individual differences (i.e., between-subjects effects) in emotion regulation skills were not associated with eating disorder cognitions.

In contrast to results for emotion regulation, there were between- and within-subjects main effects for negative affect on eating disorder cognitions across all models (e.g., Table 2). Specifically, significant between-subjects effects indicated that individuals with higher levels of negative affect had higher eating disorder psychopathology, even after accounting for differences in each facet of emotion regulation. Furthermore, significant within-subjects effects for negative affect indicated that when an individual has lower levels of negative affect, s/he exhibited decreased severity of eating disorder cognitions across the assessment period.

Longitudinal Associations between Emotion Regulation, Negative Affect, and Binge Eating

Contrary to hypotheses, no significant between- or within-subjects main effects were found for the influence of any facet of emotion regulation on binge eating frequency. However, there was a significant between-subjects main effect of negative affect on binge eating frequency such that individuals with higher negative affect endorsed a greater frequency of binge eating across the assessment period.

Exploratory Analyses of Associations between Emotion Regulation and Negative Affect

Given more consistent findings of associations between negative affect and eating pathology and the possibility that emotion regulation skills use may be linked to negative affect, we also explored between- and within-subjects associations between the DERS total and subscales scores and negative affect over time. In general, bivariate correlations between the DERS total score and negative affect at each time point were moderate to high ($r = .34$ [baseline] to $.62$ [week 10], $p < .001$), with the strength of this correlation increasing at each subsequent assessment point. The strength of the correlations between negative affect and facets of emotion regulation ranged from $r_s = .02$ to $.63$ across time points, suggesting these are overlapping but distinct constructs. Furthermore, results from multilevel analyses indicated that after controlling for age and baseline BMI, there were significant within-subjects effects for DERS total score and all subscales except Clarity on negative affect (see Supplemental Table 1). Taken together, results suggest that emotion regulation skills/knowledge use and negative affect also co-vary within an individual.

Discussion

To our knowledge, the present study was the first to utilize multilevel longitudinal models to examine associations between specific emotion regulation skills and eating disorder symptoms during treatment-as-usual among adults with binge eating. Impulse control was the only facet of emotion regulation that demonstrated significant within-person associations with eating disorder cognitions. In contrast, both between- and within-subjects main effects of negative affect were associated consistently with eating disorder cognitions. Contrary to hypotheses, between-subjects differences in negative affect was the only significant correlate of binge eating; neither within-person levels of emotion regulation nor negative affect were associated with binge eating frequency. Notably, exploratory analyses revealed significant associations between nearly all facets of emotion regulation and negative affect. Thus, any effects of emotion regulation on eating disorder cognitions (or behaviors) may be indirect via changes in negative affect, which could explain the more consistent finding of associations between eating pathology and negative affect in the current study. Alternatively, whereas emotion regulation may represent an antecedent to eating disorder symptoms, negative affect may demonstrate a more bidirectional relationship such that it precipitates and results from an individual's continued difficulties with problematic eating. As such, the coupling between eating pathology and negative affect may be stronger than the coupling between eating pathology and emotion regulation. That being said, future research should be conducted to test these hypotheses and further delineate the roles of negative affect and emotion regulation on eating disorder symptoms in individuals with binge eating.

Clinical Implications

Overall, results somewhat replicate and extend those of Peterson et al. (2017) and Wallace et al. (2015) by demonstrating an association between decreased difficulties with global emotion regulation and impulse control and severity of eating disorder cognitions in a heterogeneous sample of adults receiving treatment-as-usual for binge eating. These results also are consistent with findings from Mallorquí-Bagúe et al. (2018), which found that greater decreases in DERS total scores differentiated individuals with “good” versus “bad” outcomes at post-treatment in a mixed sample of adults with eating disorders. Taken together, findings from the current study suggest that targeting emotion regulation (particularly impulse control) and/or negative affect may improve eating disorder cognitions, as these processes appear to be dynamically associated during treatment. In particular, several components of existing interventions (e.g., distress tolerance skills in Dialectical Behavior Therapy) may be effective in promoting changes in these domains and subsequent improvements in eating pathology.

In contrast to findings for eating disorders cognitions, the only predictor of binge eating frequency across treatment was average level of negative affect, such that individuals with higher negative affect had greater frequency of binge eating across time. These findings suggest that interventions for binge eating that specifically target negative affect may be most beneficial for individuals with higher than average negative affect. The finding that neither within-person differences in emotion regulation nor negative affect were associated with improvements in binge eating frequency is surprising, but may be interpreted in light of findings from Peterson et al. (2017). In this prior study, improvements in emotion regulation were not associated with frequency of binge eating at end-of-treatment, but were associated with frequency of binge eating at four-month follow-up. These data suggest that whereas improvements in emotion regulation skills may have a relatively immediate effect on eating disorder cognitions, they may have a relatively delayed effect on binge eating. Thus, it is possible that the present study’s failure to find a significant association between emotion regulation skills and binge eating frequency reflects its limited time frame rather than a true non-significant association. That being said, it is surprising that within-person changes in emotion regulation (impulse control) and negative affect were associated with eating disorder cognitions, but not binge eating, given greater decreases in binge eating and evidence that behavior change often precedes changes in cognitions (Fairburn, 2008). It is likely that other known processes (e.g., self-monitoring, regular eating) contributed to reductions in binge eating; thus, even greater differences in emotion regulation may be required to demonstrate associations with binge eating.

Limitations and Conclusions

Several limitations should be acknowledged. First, because our sample was predominantly Caucasian adult women, these results may not generalize to other demographic groups. Additionally, there were limitations associated with the naturalistic study design. For example, we could not assess symptoms at a standard discharge point or evaluate specific components of interventions, and attrition was difficult to avoid. Similarly, data were not systematically collected on the number of individuals who received information about the study but who did not consent to participate or on the number of clinicians that provided

treatment. Given the pilot nature of this study with limited resources, specific information regarding course of illness and treatment history that are generally derived from interview data were not collected. Additionally, this study relied on self-report data and future studies that use additional methods to measure emotion regulation (e.g., psychophysiology) are warranted. Lastly, causation cannot be established, and it is possible that changes in eating disorder symptoms facilitate change in negative affect or emotion regulation skills. Despite these limitations, there are inherent strengths to this naturalistic design, including the heterogeneous clinical population and treatment experiences, which enhance external validity and offset the aforementioned limitations. Thus, these data, though limited and preliminary, provide clinically useful information about potential mechanisms of change in treatment-as-usual for adults with binge eating.

In sum, the present study identified within-person associations between impulse control and negative affect and eating disorder cognitions in a heterogeneous sample of adults with binge eating receiving treatment-as-usual. Findings are consistent with those from randomized controlled trials and suggest that increasing momentary distress tolerance and decreasing negative emotionality may impact eating disorder cognitions in adults with binge eating regardless of treatment type or setting.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Specific facets of emotion regulation (i.e., impulse control) as well as negative affect may be associated with change in eating disorder psychopathology in naturalistic treatment settings.
- Targeting negative affect and emotion regulation deficits early in treatment may decrease eating disorder severity among adults with binge eating.

Table 1.

Descriptive Statistics for Study Variables among the Full Sample (N=97)

Variable	Baseline	Week 2	Week 4	Week 6	Week 10	Effect size (Partial η^2)	<i>p</i>
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
DERS Total	99.80 (14.09)	99.89 (15.78)	97.05 (13.81)	94.78 (12.5)	95.77 (14.5)	.06	<.001
DERS Nonacceptance	17.29 (6.81)	16.99 (6.34)	15.93 (5.72)	15.74 (5.24)	15.60 (5.63)	.04	.004
DERS Goals	15.40 (3.34)	15.59 (3.38)	14.66 (3.12)	14.54 (2.75)	14.50 (3.16)	.05	.001
DERS Impulse	14.17 (3.82)	14.39 (4.29)	13.99 (3.42)	13.37 (3.00)	13.64 (3.24)	.02	.07
DERS Strategies	21.46 (5.21)	21.52 (5.26)	20.94 (5.43)	20.24 (4.69)	20.33 (4.90)	.03	.015
DERS Clarity	13.76 (3.04)	13.98 (163)	13.70 (1.58)	13.73 (146)	13.64 (136)	.01	.60
DERS Awareness	17.71 (3.91)	17.42 (3.41)	17.52 (3.26)	17.18 (3.11)	18.03 (2.34)	.02	.10
PANAS Negative Affect	25.46 (8.30)	24.26 (9.23)	23.47 (8.04)	22.16 (7.10)	21.35 (7.07)	.09	<.001
Binge Eating Frequency	17.01 (11.44)	15.74 (13.65)	12.68 (13.67)	10.45 (8.98)	9.00 (8.65)	.15	<.001
Global EDE-Q	3.95 (.96)	3.87 (.97)	3.73 (.83)	3.52 (104)	3.29 (109)	.25	<.001

Notes. DERS= Difficulties with Emotion Regulation Scale; EDE-Q= Eating Disorder Examination Questionnaire; PANAS=Positive and Negative Affect Schedule; SD=standard deviation

Table 2.

Results of Longitudinal Multilevel Model Examining Relationship between Negative Affect and Emotion Regulation (Impulse Subscale) and Eating Disorder Symptoms

Variable	Estimate	SE	<i>p</i>	95% CI
Time	-.051	.006	<.001	[-.063, -.039]
Age	-.011	.005	.04	[-.021, -.000]
BMI (at admission)	-.023	.006	.001	[-.036, -.010]
Negative affect <small>between-subjects</small>	.081	.011	<.001	[.059, .104]
Negative affect <small>within-subjects</small>	.016	.005	<.001	[.007, .025]
DERS Impulse <small>between-subjects</small>	.028	.027	.300	[-.026, .083]
DERS Impulse <small>within-subjects</small>	.027	.009	.002	[.010, .045]

Notes. BMI = Body Mass Index; CI= confidence interval; DERS= Difficulties with Emotion Regulation Scale; SE= standard error