



Temporal associations between affective instability and dysregulated eating behavior in bulimia nervosa



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Prior research suggests that the construct of emotional instability may be salient to bulimia nervosa (BN), but no study to date has used ecological momentary assessment (EMA) to examine its temporal association with binge eating and purging. In the current study, 133 women with *DSM-IV* BN used portable digital devices to provide multiple daily negative affect (NA) and positive affect (PA) ratings and record eating disorder behaviors over 2 weeks. Two state-of-the-art indices quantified affective instability: probability of acute change (PAC), which represents the likelihood of extreme affective increases, and mean squared successive difference (MSSD), which represents average change over successive recordings. For extreme affective change, results revealed that on bulimic behavior days, extreme NA increases were less likely after bulimic behaviors than before them, and extreme increases in PA were more likely after bulimic behaviors than during the same time period on non-bulimic behavior days. However, average NA instability (i.e., MSSD) was (a) greater on bulimic behavior days than non-bulimic behavior days, (b) greater after bulimic behaviors than during the same time period on non-bulimic behavior days, and (c) greater after bulimic behaviors than before them. Results lend support to the notion that bulimic behaviors are negatively reinforcing (i.e., via post-behavior acute affective changes), but also indicate that these behaviors may exacerbate overall affective dysregulation. These findings may improve understanding of BN maintenance and inform the development of novel interventions or refinement of existing treatments.

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1. Introduction

Bulimia nervosa (BN) is characterized by recurrent episodes of binge eating, defined most saliently by a sense of “loss of control” over eating (Mond et al., 2010; Shomaker et al., 2010; Vannucci et al., 2013; Wolfe et al., 2009), and compensatory behaviors (e.g., self-induced vomiting, laxative misuse; American Psychiatric Association, 2013). The disorder is associated with significant medical complications, high rates of comorbid psychopathology, and substantial psychosocial impairment (American Psychiatric Association, 2013; Wonderlich and Mitchell, 1997). Recent studies

suggest that behaviors characteristic of BN and the development and persistence of the disorder may result, in part, from impairments in the ability to regulate cognitive and behavioral processes (i.e., self-regulatory control; e.g., Marsh et al., 2011, 2013, 2009; Wu et al., 2013).

One self-regulatory process, emotion regulation, may be a particularly relevant etiological and/or maintenance variable for BN. Self-reported affect-regulation impairments in BN are well-documented (Gilboa-Schechtman et al., 2006; Harrison et al., 2010; Svaldi et al., 2012), and may relate to BN symptoms (Gilboa-Schechtman et al., 2006; Harrison et al., 2010; Svaldi et al., 2012). Individuals with BN report poorer behavioral control when in distress (Harrison et al., 2010; Svaldi et al., 2012), and self-reported emotion regulation difficulties have been associated with eating disorder cognitions and compensatory behaviors in BN (Lavender et al., 2014, 2015).

Some evidence suggests that individuals engage in binge eating

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and purging as a means of regulating their affect (Bohon et al., 2009; Combs et al., 2011; Haedt-Matt and Keel, 2011; Pearson et al., 2015). Expectations of reduced negative affect (NA) after eating predict later development of binge eating (Combs et al., 2011), and the association of enhanced positive affect (PA) with eating (e.g., the belief that “eating is fun and enjoyable”) predicts a longer time to remission from BN (Bohon et al., 2009). Several studies using ecological momentary assessment (EMA), a method involving collection of momentary data in a participant’s natural environment, have demonstrated that trajectories of increasing NA and decreasing PA precede binge eating and purging (Alpers and Tuschen-Caffier, 2001; Berg et al., 2013; Hilbert and Tuschen-Caffier, 2007; Smyth et al., 2007). How NA changes after binge eating and purging, as well as the role of PA in bulimic symptoms, are less clear; however, results derived from a recent multilevel, autoregressive cross-lagged analysis of EMA data indicate that binge eating predicts subsequent decreases in NA at numerous time points across the day (Lavender et al., 2016). These results are consistent with those of within-day analyses that examined trajectories (i.e., temporal patterns of change) of NA and PA intensity ratings preceding and following eating disorder behaviors (Berg et al., 2015; Engel et al., 2007, 2013; Smyth et al., 2007) and suggest that binge eating reduces negative affect. Taken together, despite some remaining debate about post-binge eating and purging affective change (e.g., Haedt-Matt and Keel, 2011), these findings lend support to negative reinforcement models of bulimic behavior.

Previous studies of affect in BN have highlighted the importance of NA and PA intensity, but fluctuations in affective state, or affective instability, may align more closely with the construct of “emotional dysregulation” theorized to drive BN symptoms (Ebner-Priemer and Trull, 2009; Trull et al., 2008). Results of recent EMA research indicate that individuals with BN demonstrate increased overall affective instability relative to healthy controls: NA states occur more frequently, PA is unstable, and large drops from positive to negative affective states are frequent (Santangelo et al., 2014).

1.1. Current study

The current study uses a novel analytic approach in a large EMA dataset of women with BN to examine, for the first time, temporal associations between affective instability and bulimic behaviors. Previous analyses using this dataset that have examined affect before and after bulimic behaviors have focused on affective intensity (Berg et al., 2013; Engel et al., 2007; Lavender et al., 2016; Smyth et al., 2007). Two prior analyses of this dataset have examined affective instability in relation to bulimic behavior frequency, but over time spans that prevented examination of whether affective instability temporally relates to BN symptoms. Results of the first study suggest that total frequency of binge eating and purging over two weeks is inversely related to average stability of NA over the same two-week period of time (Anestis et al., 2010). In the second study, “daily emotional variability,” calculated as each individual’s standard deviation around their daily mean affect rating, was used to operationally define average daily NA and PA lability (Selby et al., 2012). NA was more variable on days with bulimic events (bulimic behavior days) compared with non-bulimic behavior days, and average daily PA variability on bulimic behavior and non-bulimic behavior days did not differ (Selby et al., 2012). These previous analyses did not address within-person, within-day changes in affective instability.

We adopted two advanced affective instability indices (Jahng et al., 2008; Santangelo et al., 2014) to replicate and extend prior findings. We examined, in both between-day and within-person, within-day models, the relationship of bulimic behaviors to

short-term average positive and negative affective instability (Mean Squared Successive Difference [MSSD]) and the likelihood of an extreme increase in NA or PA (Probability of Acute Change [PAC]). Higher MSSD indices reflect greater overall mean variance in affect, whereas higher PAC indices reflect more frequent severe shifts in affect. Both of these metrics have been used to document affective instability in individuals across a range of psychiatric disorders (Santangelo et al., 2014; Snir et al., 2016; Trull et al., 2008). Although Santangelo et al. (2014) used MSSD and PAC metrics to document increased affective instability in individuals with BN compared to healthy controls, the current study is the first to examine these two metrics of affective instability before and after bulimic behavior within a BN sample. This approach allowed us to examine affective instability as a potential momentary precipitant of bulimic behavior, as well as the possible reduction in affective instability following the behaviors (i.e., affective stabilization) as a potential reinforcer.

We were guided by the following hypotheses about both NA and PA: 1) The probability of acute affective increases (PAC) and mean affective instability (MSSD) would be greater on days that included a bulimic behavior than on non-bulimic behavior days; 2) the probability of acute affective increases (PAC) and mean affective instability (MSSD) would be greater prior to a bulimic behavior than during the same time period on a non-bulimic behavior day; 3) the probability of acute affective increases (PAC) and mean affective instability (MSSD) would be lower following a bulimic behavior than during the same time period on a non-bulimic behavior day; and 4) on bulimic behavior days, the probability of acute affective increases (PAC) and mean affective instability (MSSD) would be greater before the episode occurred than after.

2. Method

2.1. Participants

As previously described (Smyth et al., 2007), the full sample included 133 women who met diagnostic criteria for BN as defined by the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994)*. These women, all over the age of 18, medically stable, and with no changes in mental health treatment in the past 6 weeks, were recruited from the community, local clinics, and a university campus. The majority of the sample (95.5%) was Caucasian. Participants’ mean age was 25.3 ± 7.6 years and mean BMI was 23.9 ± 5.2 kg/m².

2.2. Procedure

The Institutional Review Boards of the University of North Dakota and MeritCare Hospital (Fargo, ND) approved this study. Participants completed an initial phone screen and then attended an informational session, where they learned more about the study and provided written informed consent. Baseline assessments and EMA training were completed during two, in-person visits. Participants completed two practice EMA days (data not used in current analyses) before beginning the two-week EMA protocol.

2.2.1. EMA protocol

Participants completed affect (i.e., PA and NA) and behavior ratings on a hand-held computer each time they engaged in an eating disorder behavior and in response to six semi-random signals throughout the day. In response to these signals, participants also reported any recent eating disorder behaviors that had not been previously recorded. Participants also provided end-of-day ratings.

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