



Latent profile analysis of eating episodes in anorexia nervosa



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ABSTRACT

Background: Despite being characterized primarily by disturbances in eating behavior, relatively little is known about specific eating behaviors in anorexia nervosa (AN) and how they relate to different emotional, behavioral, and environmental features.

Methods: Women with AN ($n = 118$) completed a 2-week ecological momentary assessment (EMA) protocol during which they reported on daily eating- and mood-related patterns. Latent profile analysis was used to identify classes of eating episodes based on the presence or absence of the following indicators: loss of control; overeating; eating by oneself; food avoidance; and dietary restraint.

Results: The best-fitting model supported a 5-class solution: avoidant eating; solitary eating; binge eating; restrictive eating; and loss of control eating. The loss of control and binge eating classes were characterized by high levels of concurrent negative affect and a greater likelihood of engaging in compensatory behaviors. The restrictive eating class was associated with the greatest number of concurrently-reported stressful events, while the avoidant and solitary eating episode classes were characterized by relatively few accompanying stressful events. Body checking was least likely to occur in conjunction with restrictive eating behaviors.

Conclusions: Results support the presence of discrete types of eating episodes in AN that are associated with varying degrees of negative affect, stress, and behavioral features of eating disorders. Loss of control and dietary restriction may serve distinct functional purposes in AN, as highlighted by their differing associations with negative affect and stress. Clinical interventions for AN may benefit from targeting functional aspects of eating behavior among those with the disorder.

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Anorexia nervosa (AN) is a serious psychiatric illness associated with significant medical and psychosocial comorbidities (Hudson et al., 2007; Pomeroy and Mitchell, 2002). AN is characterized primarily by disturbances in eating behavior, particularly restriction of energy intake relative to one's energy needs (American Psychiatric Association, 2013), yet relatively little is known about specific eating patterns in AN. With regard to typical eating behaviors in AN, evidence suggests that individuals with the disorder tend to consume fewer kilocalories and less fat than healthy controls when under observation in controlled laboratory conditions (Fernstrom et al., 1994; Gwirtsman et al., 1989;

Hadigan et al., 2000; Mayer et al., 2012; Sysko et al., 2005). However, results from one study that collected data via daily dietary recall based on ecological momentary assessment, or EMA (which addresses concerns about the artificial nature of the laboratory setting by collecting data in “real time” in the natural environment; Shiffman et al., 2008), suggest that the mean daily caloric intake of individuals with AN may be closer to nutritional recommendations than one might expect based on laboratory data (Burd et al., 2009). The extent to which this discrepancy is due to over-reporting in EMA, reactivity associated with laboratory conditions that results in reduced energy consumption, or some combination thereof is unclear. Nevertheless, given that existing psychological treatments of AN have thus far shown limited efficacy (Wilson et al., 2007), a better understanding of the context and associated features of eating episodes in AN could

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inform the development of more effective interventions for the disorder.

It has been proposed that eating disorder behaviors in AN are learned habits that become well-entrenched since they are persistently reinforced over time (Walsh, 2013). One hypothesized means of reinforcement may be via a reduction in negative affect that occurs subsequent to the behaviors. Self-report questionnaire data suggest that individuals with AN have difficulties tolerating negative emotions (Hambrook et al., 2011; Harrison et al., 2009; Wildes et al., 2010), and that such difficulties may play a role in the occurrence of eating disorder behaviors (Espeset et al., 2012; Racine and Wildes, 2014). Similarly, both laboratory data (Steinglass et al., 2010; Wildes et al., 2012) and previous EMA data reported by our group (Engel et al., 2005, 2013; Lavender et al., 2013a) have indicated that negative affect (and anxiety in particular) is associated with subsequent eating disorder cognitions and behaviors, including dietary restriction, binge eating and purging, and body checking. In spite of this apparent link between negative affect and eating patterns, it is currently unclear whether distinct emotional or behavioral cues are associated with different types of eating behaviors in AN.

The purpose of the current study was twofold: 1) to identify classes of eating episodes reported in the natural environment by women with AN using an empirical classification approach; and 2) to examine the emotional and behavioral context in which these classes of eating episodes occur. A secondary aim was to examine the extent to which AN diagnostic subtypes (i.e., restricting type vs. binge eating/purging type) differ with respect to self-reported frequencies of different classes of eating episodes. We hypothesized that distinct classes of eating episodes would be identified, characterized by varying combinations of loss of control while eating, overeating, eating by oneself, avoiding certain foods, and restricting food intake. In particular, we expected that classes of eating episodes involving loss of control and/or overeating would be associated with high levels of negative affect, consistent with the previous literature (Haedt-Matt and Keel, 2011). Conversely, classes of eating episodes involving restricted eating or food avoidance were expected to be associated with an increased likelihood of engaging in body checking and related behaviors (Lavender et al., 2013b), which may function as a method of reaffirming the effectiveness of restrictive behaviors. Finally, we expected that individuals with AN binge/purge subtype would be more likely to endorse the classes of eating episodes characterized by loss of control and/or overeating than individuals with AN restricting subtype.

1. Methods

1.1. Participants

Eligible participants were at least 18 years old, female, and met Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV; American Psychiatric Association, 1994) criteria for AN or sub-threshold AN. Sub-threshold AN was defined as meeting all of the DSM-IV criteria for AN except: (1) having a body mass index (BMI; m/kg^2) between 17.6 and 18.5; or (2) either amenorrhea or body image disturbance and intense fear of fat. Based on these criteria, 121 participants met eligibility criteria, consented, and were enrolled. Three participants had EMA compliance rates of less than 50% and their data were not included in the final analyses, resulting in a total of 118 participants. Participants were 25.3 ± 8.4 years old, on average (range = 18–58 years), with a mean body mass index of 17.2 ± 1.0 kg/m^2 (range = 13.4–18.5). Participants were predominantly Caucasian (96.6%), single (75.4%), and most (90.7%) had at least some college education. A total of 73 (61.9%)

participants met criteria for AN restricting subtype, while 45 (38.1%) met criteria for AN binge/purge subtype.

1.2. Procedures

Participants were recruited at three sites across the Midwest (Fargo, ND; Minneapolis, MN; Chicago, IL) from various clinical (e.g., mailings to eating disorder treatment professionals) and community sources (e.g., community and campus advertisements). Institutional review board approval for the study was obtained at each site.

Potential participants were initially screened by phone, and those appearing to meet eligibility criteria were invited to attend an informational meeting at which they received further information regarding the study and provided written informed consent. Participants were then scheduled for two assessment visits during which they were assessed for medical stability, and completed self-report questionnaires and structured interviews.

During one of the initial assessment visits, a research assistant trained participants on how to use the palmtop computers for the EMA protocol. Participants were instructed to complete assessments of mood and behavior for three types of recordings: 1) event-contingent recordings, in which they completed assessments after any eating episodes (including binge eating) or AN behaviors (i.e., vomiting, using laxatives for weight control, weighing oneself, exercising, skipping a meal, or drinking fluids to curb appetite) at the time of occurrence; 2) interval-contingent recordings, in which they completed assessments nightly before bedtime; and 3) signal-contingent recordings, in which they completed assessments in response to 6 semi-random prompts by investigators occurring every 2–3 h between 8:00 am and 10:00 pm (Wheeler and Reis, 1991). Participants carried the palmtop computer for two practice days to increase familiarity with the protocol and minimize reactivity. Participants then returned to the research center and provided the data recorded during their practice period, which were not used in analyses. A research assistant reviewed the practice data and gave participants feedback regarding compliance and data quality. Participants were then given the palmtop computer to complete EMA recordings over the following two weeks. Attempts were made to schedule 2–3 visits with each participant during this two-week interval to obtain recorded data and address any technical problems (e.g., a broken palmtop computer) or compliance issues. Participants were given feedback at each visit regarding their compliance rates and data quality. Participants were compensated \$100 per week for completing assessments, and received a \$50 bonus for a compliance rate of at least 80% responding within 45 min to random signals.

1.3. Measures

1.3.1. Baseline interviews

The Structured Clinical Interview for DSM-IV Axis-I Disorder, Patient Edition (SCID-I/P; First et al., 1995) is a semi-structured interview that was used to determine DSM-IV diagnostic criteria for AN and sub-threshold AN, as well as current and lifetime criteria for other Axis I disorders. Assessors were trained masters- or doctoral-level clinicians. SCID-I/P interviews were recorded and an independent assessor rated current eating disorder diagnoses in a random sample of 25% ($n = 30$) of these interviews. Inter-rater reliability for current AN diagnosis (full- vs. sub-threshold) was excellent ($kappa = 0.93$).

1.3.2. EMA measures

Participants were asked to report all eating episodes and to indicate whether the episode was a snack, a meal, or a binge eating

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