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A preliminary study of momentary, naturalistic indicators of binge-eating episodes in adults with obesity

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Abstract

Objectives—Binge-eating is common in adults with obesity. The Diagnostic and Statistical Manual for Psychiatric Disorders describes 5 indicators of binge-eating (eating more rapidly than usual; eating until uncomfortably full; eating large amounts of food when not physically hungry; eating alone due to embarrassment over how much one is eating; and feeling disgusted with oneself, depressed, or very guilty after overeating), but their validity is unclear.

Methods—We examined preliminary associations between the 5 indicators and binge versus non-binge episodes among 50 adults with obesity via ecological momentary assessment.

Results—Generalized linear models revealed that, relative to non-binge episodes, self-reported binge episodes were associated with lower pre-episode hunger ($p=.004$), higher post-episode fullness ($p<.001$), a greater likelihood of reporting moderate to extreme shame prior to eating in conjunction with eating alone ($p<.001$), and a greater likelihood of reporting moderate to extreme disgust, depression, and/or guilt after eating ($p<.001$), but not with eating more rapidly than usual ($p=.85$).

Conclusion—Results support the validity of most binge-eating indicators, although the utility of the rapid eating criterion is questionable. Future research should examine whether modifying these indicators in binge-eating interventions would reduce the occurrence of loss of control and/or overeating.

Keywords

Binge eating; indicators; loss of control; validity; classification; diagnosis

Binge-eating disorder (BED) involves recurrent objectively large overeating episodes accompanied by a loss of control (LOC), in the absence of regular compensatory behaviors (American Psychiatric Association, 2013). Binge-eating is commonly reported among individuals with obesity (French, Jeffery, Sherwood, & Neumark-Sztainer, 1999; Robertson & Palmer, 1997), even those who fail to meet size (objectively large), frequency (once a week), and/or duration criteria (three months) for BED (Goldschmidt et al., 2014; Greeno, Wing, & Shiffman, 2000; Le Grange, Gorin, Catley, & Stone, 2001). Indeed, some researchers argue that these criteria may be arbitrary, particularly the “objectively” large threshold which refutes evidence supporting the presence of LOC, rather than episode size, as the core feature of binge-eating (Goldschmidt, 2017).

The Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) describes five features of binge-eating episodes intended to assist diagnosticians in determining the presence and severity of LOC (American Psychiatric Association, 2013). These include eating more rapidly than normal; eating until uncomfortably full; eating large amounts of food when not hungry; eating alone because of embarrassment over how much one is eating; and feeling disgusted with oneself, depressed, or very guilty after overeating. Little research has investigated the validity of these indicators, and it is unclear whether they are associated with specific episodes of binge-eating in the natural environment. Although the indicators are embedded within BED's diagnostic criteria, the considerable prevalence of binge-eating in individuals with obesity marks this a relevant area for study in diagnostically heterogeneous samples.

In diagnosing BED, at least three of five indicators must “usually” be present during binge-eating episodes. Therefore, individuals evaluated for BED are required to characterize “typical” binge-eating episodes over the past three months, which may produce recall errors. Retrospective research suggests that the presence of DSM indicators predicts BED diagnostic status (White & Grilo, 2011), while other data suggest that the indicators have poor internal consistency and do not reliably predict eating-related distress in community samples (Klein, Forney, & Keel, 2016).

Assessing the indicators as defined in DSM does not address the question of whether they reflect the momentary experience of LOC as intended. This question would be better addressed using ecological momentary assessment (EMA) designs capturing emotional and behavioral experiences in real time and real-world settings. Thus, the current study evaluated associations between DSM-5 indicators of binge-eating, and self-reported binge-eating among adults with obesity via EMA. We hypothesized that variables reflecting each DSM-5 feature would be associated with momentary ratings of self-reported binge-eating (White & Grilo, 2011).

Methods

Participants

Participants were 50 adults with obesity [body mass index (BMI; kg/m^2) >30 ; $M=40.3\pm8.5$], aged 18-65 ($M=43.0\pm11.9$), with full-syndrome (10.0%; $n=5$) or sub-threshold DSM-IV BED (8.0%; $n=4$, of whom 2 met criteria for full-syndrome DSM-5 BED), or no current BED diagnosis (82.0%; $n=41$). Participants were 84% female ($n=42$) and 76% identified as Caucasian ($n=38$), 14% as African-American ($n=7$), 6% as Asian ($n=3$), and 4% as other ($n=2$). Participants were recruited through community advertisements targeting individuals with obesity. Exclusion criteria included previous gastrointestinal surgery; being pregnant or breastfeeding; receiving concurrent treatment for obesity; inability to read/understand English; and current or past diagnoses of anorexia nervosa or bulimia nervosa due to concerns that these disorders could confound current eating patterns (Uttinger et al., 2015).

Procedures

The study was approved by the University of Minnesota Institutional Review Board. Although we have previously published from this dataset on contextual factors associated with binge-eating (Berg et al., 2015; Berg et al., 2014; Goldschmidt et al., 2014), the current study was the first to assess DSM-5 indicators in relation to binge-eating. Participants were screened by phone to assess initial eligibility criteria, then attended an in-person evaluation during which they provided written informed consent, completed baseline assessments, and were trained in EMA procedures.

Participants were instructed to complete EMA recordings before and after any eating episodes (meals, snacks, binges); before bedtime; and after 6 semi-random investigator-initiated prompts occurring every 2-3 hours from 8:00am-10:00pm. During bedtime and semi-random prompts, participants were asked about any eating episodes for which they may have neglected to self-initiate a recording; therefore, eating episodes reported during all types of recordings were included in analyses. Participants completed a two-day trial to ensure understanding of EMA procedures; trial data were not included in analyses. After training, participants were instructed to complete EMA recordings for the next two weeks. During this period, participants attended two in-person visits during which data from the handheld computer were uploaded and reviewed for compliance, and research coordinators provided feedback to participants about data quality (e.g., encouragement to answer all questions accurately). Participants received \$150 for completing the two-week assessment period and an additional \$50 for completing 90% of assessments within 45 minutes of semi-random prompts.

Measures

The eating disorders module of the Structured Clinical Interview for DSM-IV Axis I Disorders/Patient Edition (SCID-I/P; First, Spitzer, Gibbon, & Williams, 1997) was administered by trained master's- or doctoral-level researchers to assess current binge-eating patterns and diagnose current/lifetime eating disorders.

Binge-eating was determined by self-report ratings for post-eating episode overeating (“To what extent do you feel that you overate?”) and LOC (“While you were eating, to what extent did you feel a sense of LOC?”), each rated on a 1- (“not at all”) to 5-point (“extremely”) Likert-type scale. Episodes in which both overeating and LOC were clearly present (i.e., rating of 4 on both constructs) were classified as binge-eating, consistent with previous studies (Goldschmidt et al., 2014). Although self-report assessment of overeating implies that binge-eating episodes likely encompassed objectively *and* subjectively large episodes, previous research suggests that LOC, rather than episode size, is the defining feature of binge-eating (Goldschmidt, 2017).

Eating rapidly was approximated using time-stamps for the beginning and end of each eating episode. Those that were ± 1 SD from each participant's average episode duration considered “more rapid than normal.” Eating until uncomfortably full was assessed using a continuous post-episode rating (“I feel full,” rated from “1--disagree strongly,” to “5--agree strongly”). Eating when not hungry was approximated using a continuous pre-episode rating (“I feel hungry,” rated from “1--disagree strongly,” to “5--agree strongly”). Although “eating large amounts of food” is also embedded in this indicator, we did not include the overeating construct in our proxy variable to ensure independence of the predictor and outcome variables. Eating alone because of embarrassment was approximated as a categorical variable using post-episode ratings of eating alone (“Did you eat alone/with other people?”) combined with pre-episode ratings of feeling moderately to extremely ashamed [rating of “3,” “4,” or “5” on the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) “ashamed” item]. Finally, feeling disgusted, depressed, or guilty was approximated as a categorical variable using post-episode ratings of feeling moderately to extremely disgusted, depressed, and/or guilty (rating of “3,” “4,” or “5” on one or more PANAS items assessing those constructs). Because the DSM-5 indicators are intended to reflect experiences in the immediate context of binge-eating, proxy variables were generated based on the data-point closest in time to each eating episode (i.e., pre-episode and post-episode ratings).

Statistical Analysis

Analyses were conducted in SPSS 22.0. Generalized linear models were used to compare binge-eating versus non-binge-eating episodes (dummy-coded as 1 or 0, respectively) in relation to DSM indicators. An additional model compared binge-eating episodes to overeating episodes without LOC on the “eating rapidly” construct, to address the possibility that rate of eating could be confounded by eating episode size (i.e., since both binge-eating and overeating involve large amounts of food). Although we considered including BED status in the models, this would have resulted in 12 additional main/interactive effects to interpret, thus, we elected not to do so because of low power, and to avoid inflation of Type I error. Instead, analyses adjusted for BED status (i.e., presence vs. absence of current full/subthreshold BED, dummy-coded as 1 or 0, respectively), as well as BMI. Gender and race/ethnicity were considered as covariates but did not contribute to any of the models and were removed from the analyses. Results presented henceforth include only BED status and BMI as covariates.

Results

Analyses included 1,309 non-binge-eating and 395 binge-eating episodes (193 reported by individuals with BED, and 202 by those without BED). Most participants (80%; $n=40$) reported at least one binge-eating episode. There was a significantly shorter lag between pre-episode and post-episode recordings for non-binge (M time difference = 32.0 minutes; $S.E.=1.2$) versus binge-eating (M time difference = 37.5 minutes; $S.E.=2.1$) episodes [$F(1,1687)=5.07$; $p=.03$]. Response rates were high (Goldschmidt et al., 2014) and most participants (92%) completed the two-week protocol, while 8% terminated early for personal reasons. Participants who terminated prematurely were included in all analyses. There were no differences between completers and non-completers on BMI, gender, race/ethnicity, or BED status (all $p>.05$).

Relative to non-binge-eating episodes, binge-eating episodes were associated with lower pre-episode hunger; higher post-episode fullness; a greater likelihood of reporting moderate to extreme shame prior to eating and eating alone; and a greater likelihood of reporting moderate to extreme disgust, depression, and/or guilt after eating (all $p<.01$; Table 1). Binge-eating was not associated with eating more rapidly than usual compared to non-binge-eating ($p=.85$) or overeating episodes ($p=.08$).

Discussion

This study investigated associations between DSM-5 indicators of LOC, and self-reported binge-eating in the natural environment among adults with obesity. Proxies for all DSM-5 indicators, with the exception of eating rapidly, were uniquely associated with self-reported binge-eating. Thus, future iterations of the DSM should retain the indicators to aid clinicians in inferring the presence or absence of binge-eating, though it is unclear whether eating rapidly should be retained as a binge-eating feature. Indeed, duration of binge-eating episodes can vary widely (Schreiber-Gregory et al., 2013), and binge-eating may overlap in some populations with “grazing” episodes (Conceição et al., 2014). However, the “eating rapidly” proxy was based on start and end times for eating episode recordings, and participants may have taken longer to report binge-eating versus non-binge-eating episodes (e.g., due to shame), resulting in less accurate time-stamps. Moreover, participants may perceive themselves to eat more rapidly during binge-eating episodes due to LOC, underscoring a need for future studies incorporating both objective and subjective perceptions of eating rate.

The current study was strengthened by EMA methodology, which enabled examination of the indicators in relation to binge-eating in real time while minimizing retrospective recall biases. Given the heterogeneous sample of adults with obesity, DSM-5 indicators may have utility in characterizing binge-eating episodes in broader populations beyond just those with BED. An additional strength was the fine-grained investigation of binge-eating features (e.g., ability to capture specific affective states after eating). However, there were several limitations. First, indicator variables were derived from available single- or multi-item self-report measures, which varied in terms of whether they were continuous or categorical (with the latter reflecting indicators derived from multiple individual EMA items), and whether

they were obtained before or after eating episodes. These proxies may not precisely reflect DSM-5 indicators (e.g., reporting moderate/extreme shame prior to eating *and* eating alone does not necessarily imply that a participant ate alone *because of* embarrassment). Similarly, binge-eating was categorized by self-report, and was not corroborated by objective measures of energy intake. Thus, results may not generalize to investigator-based definitions of DSM-5 binge-eating, and the categorization of binge-eating episodes may have included both objectively and subjectively large episodes. However, accumulating evidence suggests that LOC is the core feature of binge-eating, and that distinctions among binge-eating episodes based on quantity food eaten may be arbitrary (Uher & Rutter, 2012). Finally, the sample was small, demographically homogeneous, and included few participants with current BED and none without obesity.

Nevertheless, results provide support for DSM-5 binge-eating indicators across the diagnostic spectrum, which is valuable given the relatively high prevalence of binge-eating among individuals with obesity who do not meet BED criteria (Goldschmidt, 2017). Future studies should determine whether manipulating these features (e.g., reducing eating-related shame via cognitive restructuring) would reduce binge-eating frequency. Research should further explore the validity of DSM-5 indicators in samples better represented by individuals with BED, as well as other subsets of individuals with recurrent binge-eating.

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References

- American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 5th. Washington, D.C: 2013.
- Berg KC, Crosby RD, Cao L, Crow SJ, Engel SG, Wonderlich SA, Peterson CB. Negative affect prior to and following overeating-only, loss of control eating-only, and binge eating episodes in obese adults. *Int J Eat Disord*. 2015; 48(6):641–653. DOI: 10.1002/eat.22401 [PubMed: 25808854]
- Berg KC, Peterson CB, Crosby RD, Cao L, Crow SJ, Engel SG, Wonderlich SA. Relationship between daily affect and overeating-only, loss of control eating-only, and binge eating episodes in obese adults. *Psychiatry Res*. 2014; 215(1):185–191. DOI: 10.1016/j.psychres.2013.08.023 [PubMed: 24200217]
- Conceição EM, Mitchell JE, Engel SG, Machado PPP, Lancaster K, Wonderlich SA. What is “grazing”? Reviewing its definition, frequency, clinical characteristics, and impact on bariatric surgery outcomes, and proposing a standardized definition. *Surg Obes Relat Dis*. 2014; 10(5):973–982. doi:<http://dx.doi.org/10.1016/j.soard.2014.05.002>. [PubMed: 25312671]
- First, MB., Spitzer, RL., Gibbon, M., Williams, JBW. Structured Clinical Interview for DSM-IV Axis I Disorders, Research Version, Patient Edition With Psychotic Screen. New York, NY: Biometrics Research, New York State Psychiatric Institute; 1997.
- French SA, Jeffery RW, Sherwood NE, Neumark-Sztainer D. Prevalence and correlates of binge eating in a nonclinical sample of women enrolled in a weight gain prevention program. *Int J Obes Relat Metab Disord*. 1999; 23(6):576–585. DOI: 10.1038/sj.ijo.0800871 [PubMed: 10411230]
- Goldschmidt AB. Are loss of control while eating and overeating valid constructs? A critical review of the literature. *Obes Rev*. 2017; 18(4):412–449. DOI: 10.1111/obr.12491 [PubMed: 28165655]
- Goldschmidt AB, Crosby R, Cao L, Engel SG, Durkin N, Beach HM, et al. Peterson CB. Ecological momentary assessment of eating episodes in obese adults. *Psychosom Med*. 2014; 76(9):747–752. DOI: 10.1097/PSY.000000000000108 [PubMed: 25373891]

- Greeno CG, Wing RR, Shiffman S. Binge antecedents in obese women with and without binge eating disorder. *J Consult Clin Psychol*. 2000; 68(1):95–102. DOI: 10.1037/0022-006X.68.1.95 [PubMed: 10710844]
- Klein KM, Forney KJ, Keel PK. A preliminary evaluation of the validity of binge-eating disorder defining features in a community-based sample. *Int J Eat Disord*. 2016; 49(5):524–528. DOI: 10.1002/eat.22479 [PubMed: 26607858]
- Le Grange D, Gorin A, Catley D, Stone AA. Does momentary assessment detect binge eating in overweight women that is denied at interview? *Eur Eat Disord Rev*. 2001; 9:309–324. DOI: 10.1002/erv.409
- Robertson DN, Palmer RL. The prevalence and correlates of binge eating in a British community sample of women with a history of obesity. *Int J Eat Disord*. 1997; 22(3):323–327. DOI: 10.1002/(SICI)1098-108X(199711)22:3<323::AID-EAT12>3.0.CO;2-Z [PubMed: 9285270]
- Schreiber-Gregory DN, Lavender JM, Engel SG, Wonderlich SA, Crosby RD, Peterson CB, et al. Mitchell JE. Examining duration of binge eating episodes in binge eating disorder. *Int J Eat Disord*. 2013; 46(8):810–814. DOI: 10.1002/eat.22164 [PubMed: 23881639]
- Uher R, Rutter M. Classification of feeding and eating disorders: Review of evidence and proposals for ICD-11. *World Psychiatry*. 2012; 11(2):80–92. DOI: 10.1016/j.wpsyc.2012.05.005 [PubMed: 22654933]
- Utzinger LM, Mitchell JE, Cao L, Crosby RD, Crow SJ, Wonderlich SA, Peterson CB. Clinical utility of subtyping binge eating disorder by history of anorexia or bulimia nervosa in a treatment sample. *Int J Eat Disord*. 2015; 48(6):785–789. DOI: 10.1002/eat.22422 [PubMed: 25959549]
- Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: The PANAS scales. *J Pers Soc Psychol*. 1988; 54(6):1063–1070. doi:doi: 10.1037/0022-3514.54.6.1063. [PubMed: 3397865]
- White MA, Grilo CM. Diagnostic efficiency of DSM-IV indicators for binge eating episodes. *J Consult Clin Psychol*. 2011; 79(1):75–83. DOI: 10.1037/a0022210 [PubMed: 21261436]

Table 1
DSM-5 indicators in relation to self-reported binge-eating

Indicator variable	Binge episode (<i>n</i> =393)	Non-binge episode (<i>n</i> =1,296)	Test results
Rapid eating, <i>n</i> (%)	32 (8.1)	143 (11.0)	Wald chi-square=0.03; <i>B</i> =-0.04; <i>S.E.</i> =0.19; <i>p</i> =.85
BMI			Wald chi-square=0.19; <i>B</i> =0.01; <i>S.E.</i> =0.02; <i>p</i> =.66
BED status			Wald chi-square= 16.49; <i>B</i> =-1.92; <i>S.E.</i> =0.47; <i>p</i> <.001
Post-episode fullness	<i>M</i> =4.4; <i>S.E.</i> =1.0	<i>M</i> =3.7; <i>S.E.</i> =1.1	Wald chi-square=28.46; <i>B</i> =0.62; <i>S.E.</i> =0.12; <i>p</i> <.001
BMI			Wald chi-square=0.02; <i>B</i> =0.00; <i>S.E.</i> =0.02; <i>p</i> =.90
BED status			Wald chi-square=12.51; <i>B</i> =-1.99; <i>S.E.</i> =0.56; <i>p</i> <.001
Pre-episode hunger	<i>M</i> =3.8; <i>S.E.</i> =1.2	<i>M</i> =4.2; <i>S.E.</i> =0.9	Wald chi-square=8.37; <i>B</i> =-0.22; <i>S.E.</i> =0.08; <i>p</i> =.004
BMI			Wald chi-square=0.31; <i>B</i> =0.01; <i>S.E.</i> =0.02; <i>p</i> =.58
BED status			Wald chi-square=15.71; <i>B</i> =-1.92; <i>S.E.</i> =0.48; <i>p</i> <.001
Eating alone + pre-episode shame, <i>n</i> (%)	42 (72.4)	16 (27.6)	Wald chi-square=16.42; <i>B</i> =1.53; <i>S.E.</i> =0.38; <i>p</i> <.001
BMI			Wald chi-square=0.04; <i>B</i> =0.00; <i>S.E.</i> =0.02; <i>p</i> =.84
BED status			Wald chi-square=17.05; <i>B</i> =-1.92; <i>S.E.</i> =0.46; <i>p</i> <.001
Post-episode disgust, depression, guilt, <i>n</i> (%)	173 (48.3)	185 (14.1)	Wald chi-square=27.23; <i>B</i> =1.26; <i>S.E.</i> =0.24; <i>p</i> <.001
BMI			Wald chi-square=0.02; <i>B</i> =-0.00; <i>S.E.</i> =0.02; <i>p</i> =.89
BED status			Wald chi-square=20.56; <i>B</i> =-1.90; <i>S.E.</i> =0.42; <i>p</i> <.001

Note: BMI=body mass index (kg/m^2); BED=binge-eating disorder; rapid eating=eating episodes -1 SD from each participant's average eating episode duration; eating alone + pre-episode shame="very much" or "extreme" pre-episode shame + post-episode eating alone; and post-episode disgust, depression, and/or guilt post="very much" or "extreme" disgust, depression, and/or guilt. Post-episode fullness and pre-episode hunger were rated from 1-5, with lower scores reflecting lower levels of fullness and hunger, respectively.