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BRIEF REPORT

A characterization of binge planning behavior in individuals with binge-spectrum eating disorders

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Abstract

Objective Although binge eating is associated with impulsivity, clinical reports suggest that some individuals with bulimia nervosa (BN) and binge eating disorder (BED) plan binge episodes in advance. This study is the first to examine: (1) the frequency of binge planning (BP; defined as both advanced knowledge that a binge episode will occur and taking steps to facilitate the binge episode); (2) associations of BP with ED severity, and (3) whether BP serves a negative reinforcement function.

Method Patients with BN- and BED-spectrum eating disorders (EDs; $n = 111$) were administered semi-structured interview questions regarding BP.

Results Results indicate that a substantial minority of patients (27.8%) engage in BP. BP was significantly more common in BN versus BED-spectrum EDs (38.3% versus 20.6%, $p = 0.04$) and in those who did versus did not endorse self-induced vomiting (50.0% versus 21.3%, $p < 0.01$). Frequency of BP was positively associated with overall ED psychopathology ($r = 0.19$, $p < 0.05$). Exploratory analyses indicated that approximately two-thirds (67.7%) reported that BP served to distract from unpleasant experiences.

Discussion BP is present for a significant subset of patients and may play a critical role in the reinforcement cycles of binge eating. Future research should further elucidate the function of BP to inform treatment development.

Keywords Binge planning · Binge anticipation · Bulimia nervosa · Binge eating disorder · Compulsivity

Introduction

Outcomes from treatments for binge eating spectrum eating disorders (EDs) such as bulimia nervosa (BN) and binge eating disorder (BED) are suboptimal, with up to 60–70% of patients still symptomatic at post-treatment [1, 2]. A critical objective to improve existing interventions is to better understand the cognitive and emotional precipitants and reinforcers of binge eating so that intervention components can be designed to target such factors.

Binge eating is often characterized as a rash, impulsive behavior that can result from restricting dietary intake and/or a desire to relieve elevations in negative affect [3–5]. Although support for such models is strong, contemporary theoretical models have posited that binge eating can be initially impulsive, but transition to being compulsive or habitual [6] and is sometimes even planned in advance [7]. In fact, it is widely acknowledged in clinical settings that patients sometimes deliberately plan for binge episodes in advance (e.g., decide in advance to binge eat, obtain food specifically for a binge, and/or set aside time for the binge), which has critical clinical implications [7]. Specifically, forming a plan to binge eat may decrease a patient's motivation to try in-the-moment coping strategies. For example, a patient who plans binges may not be motivated to practice or try strategies such as "urge surfing" because there is not a strong desire to prevent the binge episode once it is close to occurring. As such, it is critical to understand the frequency and nature of binge planning (BP) behavior to inform treatment development efforts.

Few studies have investigated the phenomenon of BP (i.e., intentionally taking steps, in advance of a binge

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episode, to facilitate the occurrence of a binge) empirically. Two qualitative studies revealed that planning binge episodes in advance is common among those who engage in binge eating [7, 8]. In another small pilot study (described in Pearson et al. [7]), negative mood was induced in participants with BN while in a functional magnetic resonance imaging (fMRI) scanner. Participants were then tasked with planning a binge (by choosing foods) and planning a living room design (by choosing furniture). While planning binge food (but not while planning a living room), participants had decreased amygdala activity, suggesting a decrease in negative affect, and with increased caudate activity, suggesting negative reinforcement processes through distress reduction. Making plans to binge eat could thus serve the function of relieving negative affect. It is also possible that BP reduces urges to eat when there are restrictions (e.g., lack of food availability, social pressure) that prevent binge eating in the moment [7]. BP may be especially reinforcing in patients who use compensatory behaviors after binges because the salience of the reward derived from the prospect of binge eating may be increased when the potential consequences of binge eating are diminished. Thus, understanding the functions of planning may be as important as understanding the functions of binge eating itself.

The current study aimed to quantitatively characterize the frequency of BP in individuals with binge eating spectrum EDs. We also sought to explore whether BP was more frequent in certain subsets of patients (e.g., BN versus BED, those who endorse self-induced vomiting versus those who do not) and whether BP was associated with indices of ED severity (e.g., frequency of binge eating, compensatory behavior, and overall pathology). Last, we explored whether BP serves a negative reinforcement function.

Method

Participants

The current study represents a secondary analysis of adult (ages 18 +) participants ($N = 111$) from ongoing research studies, including a trial of guided self-help CBT for participants with BED-spectrum disorders ($n = 19$), two treatment trials for BN-spectrum disorders ($n = 34$), a trial of weight-loss treatment for overweight individuals with BED ($n = 44$), and an assessment-only study of continuous glucose monitoring in individuals with BED-spectrum disorders ($n = 15$). All participants were administered measures at the baseline assessment of the study, prior to randomization or initiation of treatment. For the current analyses, we included participants who engaged in binge eating (either objectively or subjectively large episodes) regularly (i.e., at least once a week over the past 3 months). Participants were excluded if underweight (i.e., body mass index below 18.5 kg/m^2). The study was approved by the Drexel University Institutional Review Board and all participants were provided informed consent.

For simplicity, all eligible participants were categorized into BN- or BED-spectrum based on the presence of compensatory behaviors. Participants who endorsed any self-induced vomiting or laxative use or regular (i.e., at least once a week) driven exercise were categorized as BN-spectrum, and the remainder were categorized as BED-spectrum (i.e., binge eating only).

Measures

ED pathology

The Eating Disorder Examination Interview 17.0D (EDE; [9]) is a widely used semi-structured diagnostic interview for EDs [10]. It has strong psychometrics [10, 11]. EDE measure yields four subscales (dietary restraint, eating concern, shape concern, and weight concern) and a Global score.

Binge planning

Because no measures of BP exist, we created semi-structured interview questions to assess BP. We conceptualized "planning" with two components: (1) anticipation, indicating advanced knowledge (i.e., > 1 h) of a binge episode and (2) facilitation, indicating taking steps either cognitively (e.g., setting aside time, planning foods to eat) or behaviorally (e.g., purchasing food for the binge) facilitate the binge episode. We modeled interview questions after the EDE and trained assessors administered them with the EDE. Binge anticipation was assessed with: "Over the past 4 weeks, have you known more than an hour in advance that a binge episode will occur?" If the participant endorsed this item, assessors scored the proportion of binge episodes anticipated in advance on a 0–6 frequency scale equivalent to other EDE items (i.e., 0 = *never*, 2 = *less than half of occasions*, 4 = *more than half of occasions,* and 6 = *all occasions).* Binge facilitation was assessed with "Over the past 4 weeks, when you have lost control over your eating, do you take steps beforehand to plan for, or to facilitate binge eating episodes to occur (e.g., grocery shopping specifically for food to eat during a binge)?", which assessors scored on the same 0–6 scale. We operationalized BP presence (yes/no) by having a rating > 0 on both anticipation and facilitation within the last month and created an index score by averaging anticipation and facilitation items.

To explore negative reinforcement function of BP, interviewers assessed BP as a means of distraction/avoidance. Specifically, participants with BP were asked to what extent BP distracted from unpleasant thoughts, feelings,

and responsibilities. Assessors explicitly asked how planning binges compared to planning other activities in terms of distraction from unpleasant experiences, rating 0 (i.e., no distraction) to 6 (i.e., marked distraction). When BP had similar or greater distracting effects than planning other activities, assessors rated ≥ 4.

Results

Descriptive statistics

Participants were 40.50 (SD 14.42) years old on average, mostly female (80.9%, $n = 93$) with a mean BMI of 33.20 (SD 7.63) kg/m^2. Of the 111 participants, 27.9%% ($n = 31$) met criteria for BN, 41.4% ($n = 46$) met criteria for BED, and 30.6% ($n = 34$) met criteria for other specified feeding and eating disorders (OSFED). Based on the definitions described in the Methods, we classified 40.5% ($n = 45$) BN-spectrum and 59.5% ($n = 66$) BED-spectrum. Consistent with the literature, those with BED-spectrum eating disorders were older ($M_{BED} = 44.94$, $SD_{BED} = 34.17$, $M_{BN} = 34.17$, $SD_{BN} = 14.18$, $t(113) = 4.02$, $p < 0.01$), of higher BMI ($M_{BED} = 36.44$, $SD_{BED} = 6.82$, $M_{BN} = 28.52$, $SD_{BN} = 28.52$, $t(113) = 6.34$, $p < 0.01$), and had lower EDE restraint, eating concern, shape concern, weight concern, and global psychopathology (all $ps < 0.05$) than BN-spectrum counterparts. The two groups did not statistically differ in the number of total binge episodes (objectively and subjectively large) in the past month ($M_{BED} = 21.13$, $SD_{BED} = 14.41$, $M_{BN} = 26.23$, $SD_{BN} = 20.29$, $t(113) = 1.58$, $p = 0.12$).

Frequency of BP

Over the past month, over half of participants (55.8%, $n = 62$) indicated anticipation at least some of the time (scores ≥ 1), and nearly half (48.6%, $n = 54$) endorsed facilitation at least some of the time (scores ≥ 1). Over a quarter of participants (27.8%, $n = 32$) endorsed BP (i.e., both anticipation and facilitation > 0) over the past month. Anticipation and facilitation were significantly correlated ($r = 0.47$, $p < 0.01$) (Table 1).

Frequency of BP by diagnosis and presence of purging behaviors

A Pearson's Chi-square revealed that BP was significantly more common among BN-spectrum (38.3%) versus BED-spectrum (20.6%) groups [Wald $\chi^2(1) = 4.23$, $p = 0.04$]. Results also indicated that half of individuals (50.0%) who endorsed self-induced vomiting engaged in BP, a significantly greater proportion than those who did not endorse self-induced vomiting [21.3%; Wald $\chi^2(1) = 8.23$, $p < 0.01$].

Table 1 Item distribution of binge anticipation and binge facilitation frequency ($N = 111$)

	Binge anticipation	Binge facilitation
M (SD)	1.85 (2.06)	1.56 (2.07)
Individual distribution, *N* (%)		
Rating = 0 (never)	49 (42.6%)	57 (49.6%)
Rating = 1	10 (8.7%)	15 (13.0%)
Rating = 2 (< half of binges)	12 (10.4%)	9 (7.8%)
Rating = 3	16 (13.9%)	5 (4.3%)
Rating = 4 (> half of binges)	5 (4.3%)	10 (8.7%)
Rating = 5	11 (9.6%)	5 (4.3%)
Rating = 6 (every binge)	8 (7.0%)	10 (8.7%)

Association of BP with ED psychopathology

We correlated BP index (average of Anticipation and Facilitation frequencies), anticipation frequency, and facilitation frequency with binge frequency, purging frequency, EDE subscales, and EDE global severity (Table 2). Greater BP frequency (BP index) was significantly associated with greater overall eating pathology (EDE Global), and, at trend level, EDE eating concern and weight concern. Greater anticipation frequency was significantly associated with greater purging frequency. Greater facilitation frequency was significantly associated with greater EDE eating concern, weight concern, and overall eating pathology.

When controlling for BN/BED-spectrum diagnosis to examine whether associations of BP with ED psychopathology could be explained by diagnosis, all correlations of BP, anticipation, and facilitation with ED pathology variables became very small ($rs = 0.083$–0.156) and non-significant (all $ps > 0.15$).

Function of BP

The mean distraction rating was 3.84 (SD 2.15). Approximately two-thirds (67.7%, $n = 21$) of binge planners reported using BP to distract from or avoid unpleasant thoughts, feelings or responsibilities similar to other activities (e.g., browsing the internet, calling a friend) as a distraction (i.e., distraction was rated ≥ 4).

Discussion

The current study is the first to examine frequency of BP in a sample of individuals with BN- and BED-spectrum EDs. We also explored the associations of BP with ED severity and negative reinforcement functions of BP.

We found over one-quarter (27.8%; representing a significant minority) of participants engaged in BP (i.e., had

Table 2 Correlations of BP with eating disorder severity

Variables	1	2	3	4	5	6	7	8	9	10
1. BP index	–									
2. Anticipation	0.857*	–								
3. Facilitation	0.858*	0.47*	–							
4. OBEs in past 28 days	0.081	0.084	0.028	–						
5. SIV in past 28 days	0.169†	0.216*	0.073	0.702*	–					
6. EDE dietary restraint	0.084	0.021	0.123	0.089	0.164†	–				
7. EDE eating concern	0.180†	0.114	0.195*	0.052	-0.012	0.387*	–			
8. EDE shape concern	0.125	0.085	0.130	– 0.006	0.050	0.295*	0.382*	–		
9. EDE weight concern	0.179†	0.096	0.210*	0.018	0.175†	0.299*	0.379*	0.753*	–	
10. EDE Global	0.189*	0.104	0.220*	0.073	0.130	0.691*	0.749*	0.771*	0.778*	–

BP binge planning frequency (average of anticipation and facilitation), *OBE* objective binge episode, *SIV* self-induced vomiting, *EDE* eating disorder examination

*$p < 0.05$, $^{\dagger}p < 0.10$

both advanced knowledge and took steps to facilitate binge episodes). Despite robust evidence for binge eating as an impulsive behavior [12, 13], the current study indicates that a subset of those with binge eating do not act impulsively when binge eating. Instead, some individuals complete pre-planned, intentional behavior. These individuals may be less likely to benefit from current interventions targeted at in-the-moment binge urges (e.g., urge surfing, alternative activities). In addition, with any behavior, establishing an intention and a specific plan (i.e., implementation intention) increases the likelihood of the behavior occurring [14]. Thus, individuals who plan binges may have decreased motivation to try any strategies to prevent binge eating after they have already decided to binge eat. With replication, it may be warranted to develop and evaluate intervention content around preventing the planning of binge episodes (e.g., adapting current interventions to apply to urges to binge plan). For example, interventions that target appetite awareness may be a good fit [15].

Interestingly, BP was more common in those with BN-spectrum EDs (38.3% of whom engage in planning) and those who endorse self-induced vomiting engage in BP (50.0% of whom engage in planning). One possible implication of these findings is that engaging in compensatory behavior (especially self-induced vomiting) mitigates the perceived consequences of binge eating (e.g., guilt, weight gain), thus increasing the anticipated negative reinforcement effects of binge eating. In other words, believing in advance calories from a binge will be negated by purging may temper hesitations about deciding to binge. Furthermore, it is possible that a dimension of binge planning also includes the planning of purging episodes, which should be measured in future investigations of binge planning. However, it is important to note that a significant minority (i.e., 21.0%) of those with BED-spectrum ED (i.e., those who do not engage in significant compensatory behaviors) engaged in BP, suggesting that even without a clear method for mitigating the consequences of binge eating, the prospective benefit (e.g., reducing negative affect) of binge eating is still salient for some patients.

We also explored relationships of BP with ED pathology. BP was marginally associated with eating and weight concerns, and significantly associated with overall eating pathology, suggesting BP could be a marker of illness severity. Interestingly, anticipation was associated with episodes of self-induced vomiting, while facilitation was associated with several indices of ED pathology. However, it is important to note that these associations became negligible in size when controlling for BN/BED-spectrum diagnoses, suggesting that greater levels of ED pathology in those with BN-spectrum eating disorders were driving these relationships. Consistent with the theory that BP could serve an affect regulatory function, the majority of patients who engaged in BP reported doing so as a distraction/avoidance method. Our results provide preliminary support for the theory that BP (in a subset of patients) may play a critical negative reinforcement function. As such, BP warrants further study as a potential factor to more deliberately intervene on in treatment.

The results of the current study should be interpreted within the context of numerous limitations. First, because of the paucity of research of BP, we created preliminary interview questions that have not been validated, were based on clinical experience, and were limited in scope. Future research should aim to develop and validate more detailed scales and/or interview questions that more thoroughly elucidate the nature of BP. For example, it is unknown how far in advance planning takes place, what specific planning behaviors patients tend to engage in, and what other functions BP could serve. Second, given the small number

of participants who endorsed binge planning ($n = 31$), we were unable to do more detailed subgroup analyses (e.g., full versus subthreshold BN/BED) that would have provided additional detail regarding for whom BP is most relevant. Third, there were several unmeasured variables that could help us further understand the nature of binge planning. For example, research has suggested that some individuals with binge eating display a high need to control their thoughts [16] and some individuals with binge eating also engage in high levels of secretive eating [17], both which could partially drive binge planning. Last, all interview questions relied on participants' ability to retrospectively report on BP and delineating between subtle possible functions of their behavior, which may not be accurate. As such, future study should aim to examine BP in real time (e.g., using ecological momentary assessment).

In sum, the current study was the first to preliminarily characterize BP behavior, an understudied phenomenon in EDs. Future research should aim to further elucidate the nature and characteristics of BP (e.g., how far in advance patients tend to plan) so that interventions can better target this potentially important behavior.

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Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest to disclose.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Drexel Institutional Review Board and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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