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Binge eating in binge eating disorder: A breakdown of emotion regulatory process?

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ABSTRACT

Current explanatory models for binge eating in binge eating disorder (BED) mostly rely on models for bulimia nervosa (BN), although research indicates different antecedents for binge eating in BED. This study investigates antecedents and maintaining factors in terms of positive mood, negative mood and tension in a sample of 22 women with BED using ecological momentary assessment over a 1-week. Values for negative mood were higher and those for positive mood lower during binge days compared with non-binge days. During binge days, negative mood and tension both strongly and significantly increased and positive mood strongly and significantly decreased at the first binge episode, followed by a slight though significant, and longer lasting decrease (negative mood, tension) or increase (positive mood) during a 4-h observation period following binge eating. Binge eating in BED seems to be triggered by an immediate breakdown of emotion regulation. There are no indications of an accumulation of negative mood triggering binge eating followed by immediate reinforcing mechanisms in terms of substantial and stable improvement of mood as observed in BN. These differences implicate a further specification of etiological models and could serve as a basis for developing new treatment approaches for BED.

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1. Introduction

The core feature of binge eating disorder (BED) comprises loss of control and consumption of large amounts of food (American Psychiatric Association (APA), 1994). Cognitive behavioral therapy (CBT) approaches in BED are traditionally based on corresponding models for bulimia nervosa (BN) and constitute the established treatment for the majority of BED patients (Vocks et al., 2009). In BN, negative mood has been shown to be an important antecedent by a number of studies (Polivy et al., 1984; Agras and Telch, 1998; Waters et al., 2001). According to the affect regulation model, individuals engage in binge-purge behavior to alleviate negative mood (Polivy et al., 1984) or by substitution of a less aversive mood state (trade off-theory, Kenardy et al., 1996). Masking theory suggests that rather than decreasing or substituting negative mood, binge eating serves as an attribution for negative mood that masks other problems (Herman and Polivy, 1988). In other words, negative affect can be blamed on binge eating, which seems to be more controllable to the person than the actual causes of distress. The escape theory (Heatherton and Baumeister, 1991) posits that binge eating represents an attempt to "escape" from distressing self-awareness and to narrow attention to the immediate physical surroundings or stimuli (e.g. food). As a secondary effect, the hypothesized shift in awareness impedes higher level

cognitive activities such as inhibition and thus results in the release of previously suppressed binge eating behavior (Engelberg et al., 2007).

Recent studies using ecological momentary assessment (EMA) to overcome known limitations of retrospective recall (for an overview, see Shiffman et al., 2008) convincingly demonstrate that, in line with the affect regulation model, negative mood increases and positive mood decreases before binge eating and vomiting, whereas after BN events, negative mood decreases and positive mood increases again. Binge-purge behavior in BN thus seems to be reinforcing itself by improving mood (Engel et al., 2006; Smyth et al., 2007; Engelberg et al., 2007). Another study from Crosby et al. (2009) investigating patterns of mood in daily lives of bulimic individuals corroborates that negative mood drives bulimic behavior.

Research regarding antecedents of binge eating in BED used to rely on models derived from BN, although there seem to be differences with regard to the binge cycle. For example, Hilbert and Tuschen-Caffier (2007), in a comparison of BED with BN patients using EMA for multiple assessments over a 2-days period found, that BED individuals not only reveal less dietary restraint, they also experience less intense negative mood than BN patients and tend to binge eat also when feeling only moderately negative. Further, BED in contrast to BN individuals turned out to be vulnerable to negative mood, in particular when they concurrently suffered from high levels of general psychopathology (Hilbert and Tuschen-Caffier, 2007). Together with another naturalistic study from Stein et al. (2007) assessing antecedents and consequences of binge eating at 7 intervals during 7 consecutive days, these findings underline that also in BED negative mood was increased on binge eating

days compared to non-binge periods, whereas there were no such differences for ratings of positive mood. On both studies, however, contrary to existing emotion regulation models, negative mood remained increased when measured *immediately* after binge eating in student and patient populations (Hilbert and Tuschen-Caffier, 2007; Stein et al., 2007). The cited studies shed light on possibly different mechanisms driving binge eating in BED, but their findings remain limited as they did not consider longer time intervals than one measurement immediately after binge eating. As a consequence, the time course of mood factors after binge eating in BED remains open. Further limitations of the earlier studies concern the application of solely the time-contingent sampling method of the Stein et al. study as well as the short observation method of 2 days in the Hilbert et al. study.

In summary, current research about the preceding and maintaining factors of binge eating in BED indicates distinct processes such as less pronounced negative mood and a lack of immediate reinforcement in terms of a fast and pronounced decrease of aversive mood states after binge eating in BED. Thus, research on the concrete cues and reinforcing mechanisms of binge eating in BED may help to further specify etiological models and to engage in developing specialized and individualized treatment options for BED patients.

The present study aims at extending findings of current naturalistic studies regarding binge cycles in BED and sets out to investigate in more detail the binge cycle in BED. Besides negative mood, we additionally included potentially meaningful mood factors such as positive mood and tension. We followed the temporal course of these characteristics before, during, and after binge eating on binge and, for comparison, on non-binge days in a small sample of overweight to obese female BED individuals randomized for participation in a treatment trial for BED. To minimize influences of retrospective memory recall, participants were investigated using ecological momentary assessment (EMA). Relative to traditional questionnaire-based methods, EMA reduces biases associated with retrospective recall by shortening the interval between an experience and its recall. Further the EMA method is thought to enhance ecological validity as it is carried out within the naturalistic environment of the participant (Shiffman et al., 2008).

The following research questions were investigated: First, we examined whether the daily courses of the different aspects of mood varied between binge and non-binge days. Second, to shed light on binge cycles in BED, we not only examined the pre- but also the post-binge phase. To our knowledge, we are the first to examine consequences of binge eating not only immediately after but during a prolonged time span during the day after binge eating. Third, according to Smyth and colleagues, we further acknowledge that the binge eating event itself is affect-laden and probably influences estimates recalled immediately after binge eating. Therefore, we analyzed the trajectories of mood and tension by including or excluding the 30 min immediately prior to and the 30 min following the binge episode (Smyth et al., 2007). Fourth, to account for findings in the current literature (e.g., Hilbert and Tuschen-Caffier, 2007), we additionally included specific participant characteristics related to eating disorder and clinical features, i.e. comorbidity status, body-mass index (BMI), duration of the disorder, degree of depressiveness and severity of eating disorder pathology, which may all potentially moderate the temporal trend of negative mood, positive mood, and tension on binge eating days.

2. Methods

2.1. Participants

Data were collected from obese individuals with BED presenting for participation in a treatment trial to evaluate the efficacy of a short version of a cognitive behavior therapy (CBT) trial at the Department of Clinical Psychology and Psychotherapy of the University of Basel (Switzerland) (Schlup et al., 2009). The study was approved by the local ethics committee of the University Hospital of Basel. Inclusion criteria for the clinical trial included being aged between 18 and 70 years, having a BMI between 27 and 40 kg/m², being free from severe medical conditions such as diabetes, heart disease, or endocrine disorders and meeting full *DSM-IV-TR* criteria for BED (American

Psychiatric Association (APA), 2000) according to a specialized eating disorder interview (see diagnostic assessment below). Of the 136 individuals who were initially contacted, 28 female obese individuals with BED fulfilled these inclusion criteria. As individuals participated in a randomized trial to evaluate treatment efficacy of a short-term CBT approach, individuals were excluded if they were pregnant, participated in a diet or psychotherapy, received weight loss medications (currently or during the last 3 months), had previous surgical treatment of obesity, or met DSM-IV-TR (American Psychiatric Association (APA), 2000) criteria for mental disorders warranting immediate treatment, as those factors might have influenced treatment response. As patients who never exhibited a binge during the entire week were excluded from all analyses (see results section), the final sample consisted of 22 female obese individuals with an average age of 45.5 years (S.D. = 12.0, range = 21–65), a BMI (kg/m²) of 33.4 (S.D. = 6.8, range = 24.4–55.5), a Beck Depression Inventory score of 12.8 (S.D. = 8.7, range = 3–32), an Eating Disorder Examination (EDE) total score of 2.43 (S.D. = 0.86, range = 0.93–4.22), an average number of binges according to EDE of 15.6 (S.D. = 8.0, range = 4–30), and an average age of first manifestation of BED of 16.6 (S.D. = 12.2, range = 2–40). Six (27%) participants suffered from an additional affective or anxiety disorder and one patient (3.6%) from a comorbid mental disorder on axis-II. As only one male participant could be recruited, we excluded these data from our analyses.

2.2. Measures and procedure

2.2.1. Diagnostic assessment

BED diagnosis and associated eating disorder pathology were assessed using the Eating Disorder Examination (EDE, Fairburn and Cooper, 1993; Hilbert et al., 2004). The German language screenings for mental disorders on axis-I (*Mini-DIPS*) (Margraf, 1994) and axis-II (*SKID-II*) (Wittchen et al., 1997) were administered to assess current and lifetime mental disorders. Interviewers were trained by the principal investigator (S.M.). In cases of discordance of interviewers regarding the diagnoses, the diagnostic process was reevaluated using video tapes of the diagnostic interviews.

2.2.2. Daily electronic diary, ecological momentary assessment (EMA)

All patients gave written informed consent and were offered free treatment. Data were collected for 7 days before treatment onset using a personal digital assistant (PDA, Palm Tungsten E). According to Smyth et al. (2007), time-contingent assessment intervals were decreased during the day to adjust for an increased likelihood of binge eating in the evening. Time intervals were scheduled as follows: The first alarm was preset individually at 1.5 h after awakening, the second alarm 5 h after the first, the third alarm 4 h after the second, the fourth alarm 3 h after the third and the fifth alarm 2 h after the fourth. For event-contingent monitoring, participants were instructed to fill in the questionnaire whenever binge eating occurred. Participants were asked to fill in the questionnaire within a 30-min interval. Please refer to Munsch et al., (2009) for further details including test-theoretical characteristics of the questionnaires used in this study. Questions were either dichotomous, suggesting a yes or no response, e.g., item 1 "Did you experience binge eating since your last entry?", or corresponded to a computerized Likert-type or visual analogue scale (VAS) scale. Questionnaires were programmed and displayed using Pendragon Forms software (Pendragon Software Corporation, Libertyville, IL, USA; unpublished questionnaire available from the authors). Feasibility of EMA, i.e. practicability ("Did you experience any difficulties in filling in the electronic diary?"), acceptability ("How did you feel during the week with the electronic diary entries?", "Did the electronic diary alarm go off too often?", "Was your daily routine disturbed?"; correlations were between items were between 0.47 and 0.72; mean = 7.19, S.D. = 2.24, N = 20), representativeness ("Did the previous week correspond to your usual weekly routine?"; mean = 7.21, S.D. = 2.55, N = 17), and signal-compliance ("Was it possible for you to fill in the electronic diary 30 min after the signal?"; mean = 7.05, S.D. = 2.28; Fahrenberg (2006)) were all measured on an 11-point Likert-type scale from 0 ("not at all") to 10 ("yes, exactly") according to a self-developed exit questionnaire, EXQ (Munsch et al., 2009). EMA-based signal-compliance (filling in of the electronic questionnaire within 30 min after being alarmed) and recording compliance (rate of overall responses to time-contingent signaling) were all assessed by EMA. Reactivity was registered according to the EXQ ("Did the frequency of binge eating change during the diary period?", "Did you focus more on your psychological well-being?", "Did you benefit from filling in the diary?", "Did the previous week correspond to your usual weekly routine?"; correlations among items were between 0.48 and 0.70; mean of averaged items = 5.72, S.D. = 3.29, N = 16; for detailed information see Munsch et al., 2009). EMA-based signal-compliance, i.e. the proportion of the number of recordings starting within 30 min after the signal to the total number of recordings was 0.87. Participants' mean absolute deviation of entry from the scheduled alarms (in min) was 16.0 (median = 1.0, S.D. = 34.8, N = 722).

2.2.3. EMA of binge eating, negative and positive emotions

After answering the electronically administered entry question ("did you experience a binge episode") with yes, exclusively *objective binge eating* (OBE, i.e. binge eating defined as consuming unusually large quantities of food with a subjective sense of loss of control) was assessed according to the German version of the EDE (Hilbert et al., 2004; Munsch et al., 2009) (for a critical discussion of concordance rates of EMA-based and self-report-based measures in order to assess binge eating in BED, please see Munsch et al., 2009). *Daily course of negative mood, positive mood, and tension* were assessed on a scale between 1 and 10 using the Mood Assessment Inventory (MAI,