PERCEIVED EXPRESSED EMOTION IN ADOLESCENTS WITH BINGE-EATING DISORDER

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ABSTRACT

A sizeable body of research has documented Expressed Emotion (EE) to predict clinical outcomes in various psychiatric disorders, including eating disorders. Patients' perceptions of relative's EE, however, were found to play an important role in the processing of EE. This study aimed to examine the level of perceived EE in adolescent binge-eating disorder (BED) and its impact on eating disorder psychopathology.

Adolescents (12 – 20 years) seeking treatment for BED (n = 40) were compared to adolescents without current or lifetime eating disorder (CG; n = 40). Both groups were stratified according to age, sex, body mass index (BMI, kg/m^2), and socio-economic status. The Five Minute Speech Sample (FMSS) and the Brief Dyadic Scale of EE were administered to assess patients' perceived maternal EE. Additionally, adolescents and mothers completed questionnaires on eating disorder and general psychopathology.

On the FMSS, 37.5% of patients with BED perceived their mothers as high EE (vs. 12.5% in the CG). On the Brief Dyadic Scale of EE, patients with BED reported significantly higher levels of perceived maternal criticism, emotional overinvolvement, and lower levels of perceived warmth than controls. After controlling for the diagnosis of BED, perceived criticism and warmth, as assessed by questionnaire, significantly explained adolescents' global eating disorder psychopathology.

Negative perceptions of maternal behavior and emotional atmosphere towards the child are characteristic of adolescent BED. As documented for other eating disorders, family factors are likely to have substantial implications for the maintenance and treatment of adolescent BED.

Keywords: expressed emotion, binge-eating disorder, perceived criticism, family functioning

Expressed emotion, defined as how much criticism, emotional overinvolvement and warmth a close relative expresses when speaking about the patient, is a valuable predictor of clinical outcome in eating disorders. Although binge-eating disorder (BED) is prevalent among adolescents, the level of expressed emotion in relation to BED and subsequent implications for eating disorder psychopathology have never specifically been explored. In this study, perceived maternal expressed emotion was examined in adolescents with BED, using questionnaire- and speech-based instruments.

BED, recently established as an eating disorder on its own (American Psychiatric Association (APA) 2013), presents in about 1.6% of 13-18-year-old adolescents from the community (Swanson, Crow, Le Grange, Swendsen and Merikangas 2011) and in up to 25% of overweight treatment-seeking adolescents (Bishop-Gilyard et al. 2011; Goldschmidt et al. 2008). The main definitional feature of BED is recurrent binge-eating without regular use of inappropriate compensatory behaviour. For diagnosis, the fifth revision of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA 2013) requires an occurrence of binge-eating episodes on at least 1 day per week over the past 3 months and presence of at least three out of five behavioral symptoms (e. g., eating in the absence of hunger), as well as marked distress. The feeling of loss of control over eating rather than objective binge-eating (loss of control over eating an unambiguously large amount of food; APA 2013), is the most salient marker of adolescent BED (Bravender et al. 2010; Goldschmidt et al. 2008; Shomaker et al. 2010). Indeed, adolescents who endorse subjective binge-eating (loss of control over eating a subjectively large amount of food) were found to exhibit similar levels of eating disorder and general psychopathology to those with objective binge-eating (Goldschmidt et al. 2008; Shomaker et al. 2010). Additionally, adolescents with subthreshold BED are at increased risk to progress to full threshold BED (Stice, Marti, Shaw and Jaconis 2009).

During the 1950s and 60s, Brown and colleagues developed expressed emotion (EE) as a complex family construct which was reliably associated with clinical outcome in schizophrenic patients (Brown, Birley, and Wing 1972). Henceforth, intensive research on this construct established its predictive value for psychiatric relapse, treatment outcome, and compliance in various psychiatric disorders, including eating disorders (Anastasiadou, Medina-Pradas, Sepulveda, and Treasure 2014; Butzlaff and Hooley 1998; Duclos, Vibert, Mattar, and Godart 2012). Assessed through the spontaneous speech of a key relative of the patient, EE is thought to reflect the affective quality of the patient-relative relationship. Traditionally, EE is expert-rated following an audiotaped interview. A relative showing high levels of EE is characterized by expressing critical comments about the patient, about their relationship and/or expressing excessive emotional overinvolvement (EOI) or self-sacrifice. While EE has been thoroughly studied in adolescent anorexia nervosa (AN) and bulimia nervosa (BN), evidence on EE in BED in adolescent samples is lacking (Anastasiadou et al. 2014; Duclos et al. 2012).

In addition to the objective measurement of relative-reported EE, cognitive appraisal models assume that patients' perception of the relatives' EE affects patients' psycho-pathogenesis (Hooley and Gotlib, 2000). In an early study, Hooley and Teasdale (1989) suggested that depressed patients living within a high EE environment might be at risk for relapse only if patients were aware of the relatives' critical behaviour and perceived the relatives' high EE. Studies in schizophrenia (Medina-Pradas, Navarro, Pousa, Montero, and Obiols 2013; Scazufca, Kuipers and Menezes 2001; Tompson et al. 1995) provided further evidence on the psychopathological relevance of perceived EE. In adult eating disorders, two previous studies examined the level of EE from the patients' perspective (perceived EE). In a sample of 77 adult patients with AN, BN, and eating disorders not otherwise specified (EDNOS), including BED (APA 2000), patients with EDNOS reported significantly higher levels of perceived EE than patients with AN (Medina-Pradas, Navarro, López, Grau, and

Obiols 2011a). Di Paola, Faravelli, and Ricca (2010) examined perceived EE in AN, BN, BED, and healthy adults. Overall, 89% of patients with eating disorders reported a high level of perceived EE, while healthy controls had significantly lower levels of perceived EE (Di Paola et al. 2010).

These studies indicate that higher levels of perceived EE are characteristic of adult eating disorders. Apart from this evidence, the impact of perceived EE on eating disorder psychopathology has not been explicitly researched. Patients with BN who refused to involve their parents in eating disorder therapy were found to perceive higher levels of maternal EE than patients who did involve their parents (Perkins et al. 2005). With respect to eating disorder psychopathology, Medina-Pradas et al. (2011a) showed that perceived EE was more correlated to disordered eating behaviors than the relative's measure of EE. However, the relative contribution of perceived EE to the prediction of eating disorder psychopathology remains poorly understood. In this context, the application of self-report questionnaires (e. g., Brief Dyadic Scale of Expressed Emotion; Medina-Pradas, Navarro, López, Grau, and Obiols 2011b) might be very valuable when briefly assessing the patient's perspective of family climate, in addition to the EE original speech-based format. In an earlier study on schizophrenia, Tompson et al. (1995) applied a rating system on patients' speech-based perceptions of the relative's EE, and found that high perceived critical behaviour predicted psychotic exacerbation one year later, while the objective speech data of the relative did not.

In addition to the predictive validity in adult mental disorders, perceived EE appears to be a clinically relevant construct in childhood and adolescent disorders, such as BN (Perkins et al. 2005; Winn et al. 2007); however, perceived EE in adolescent BED and its implications for psychopathology have not yet been studied. In this context, the current study sought to (1) compare the level of perceived maternal EE between adolescents with BED and weight- and sociodemographically matched adolescents without any history of eating disorder, using a combined assessment of speech-based data and a self-report questionnaire. Furthermore, this

study sought to (2) examine the predictive value of perceived EE on adolescents' eating disorder psychopathology, thereby identifying the most powerful predictor of perceived EE (speech- or questionnaire based). Based on the literature, we hypothesized that adolescents with BED would report higher levels of perceived EE than controls. We also expected perceived EE, specifically perceived criticism, to be predictive of eating disorder psychopathology.

Materials and Methods

Participants and Procedure

A consecutive sample of 40 patients meeting diagnostic criteria of BED (full-syndrome or subthreshold), according to DSM-5 (APA 2013) or DSM-IV-TR (APA 2000), was recruited at the time of admission to outpatient cognitive-behavioral therapy for adolescents between 12 and 20 years with BED (see Hilbert 2013). In light of its specific presentation in adolescents, BED was diagnosed based on objective and/or subjective binge-eating episodes. The German translation of the Eating Disorder Examination (EDE; Hilbert and Tuschen-Caffier 2006a), a well-established eating disorder interview, was used to ascertain BED diagnosis. Patients were excluded if they had current BN, current psychotherapy, current weight loss treatment, substance abuse, suicidal ideation, psychotic or bipolar disorder, and serious unstable medical problems or current intake of antipsychotic or weight-affecting drugs. Adolescents' psychiatric status was determined through a structured clinical interview that has good to excellent interrater-reliability with respect to lifetime and primary psychiatric diagnoses (K-DIPS; Schneider, Unnewehr and Markgraf 2009).

The population-based sample control group (CG) was stratified to the BED group on age, gender, standard deviation score of the Body Mass Index (BMI-SDS), and socio-economic status (SES). Inclusion criteria for the CG required the absence of current or lifetime eating disorder diagnoses, ascertained by diagnostic questions of the EDE. Other exclusion criteria were the same for the BED group. CG participants were recruited via

schools, internet-based advertisements, and clinical settings and were offered 8€/hour for study participation.

For recruitment, adolescents ≥ 18 years and parents of individuals < 18 years were contacted by phone or e-mail and asked for their agreement to participate before adolescents were screened by phone. When meeting inclusion criteria, the adolescent and his/her mother were invited to an on-site diagnostic session. Written informed consent was obtained from the adolescent and, in case of participants < 18 years, from the parents, too. The study was approved by the Ethical Committee at the University of Leipzig Medical Center.

Measures

Five Minute Speech Sample (FMSS). To assess perceived speech-based EE, patients were given the following standardized FMSS instruction: "I'd like to hear your thoughts about your mother in your own words and without my interrupting you with any question or comments. When I ask you to begin, I would like you to speak for 5 minutes, telling me what kind of a person your mother is and how the two of you get along together. After you have begun to speak, I prefer not to answer any questions. Are there any questions you would like to ask me before we begin?" (Magaña et al. 1986). All FMSS interviews were audiotaped and all records were analysed independently by two trained raters, RS and a student in MSc Psychology, who were blind to group allocation. We applied a supplementary rating system for the FMSS, similar to Tompson et al. (1995). Consistent with original FMSS dimensions of EE, and in accordance with the conceptualization of the Brief Dyadic Scale of Expressed Emotion (BDSEE; Medina-Pradas et al. 2011b), two dimensions of perceived EE were rated on the basis of specified coding criteria consisting of a frequency count of the number of statements the patient made. Participants' FMSS was rated with respect to (1) perceived maternal criticism, indicating that the adolescent found the mother to be critical of, disapproving of, annoyed by, or angry toward him/her (e.g. "My mother disapproves of what I am doing"); and to (2) perceived EOI, indicating that the child found the mother to be

intrusive, excessively involved, or overprotective (e.g. “I feel controlled by her quite often”). Consistent with original categories, each FMSS was classified as high perceived EE (≥ 2 statements of perceived criticisms, ≥ 1 statement of perceived EOI) or low perceived EE. For reliability coding, all interviews were analysed. Kappa statistics for FMSS perceived criticism ($\kappa = .96$) and perceived EOI ($\kappa = 1.00$) indicated almost perfect agreement between raters.

Brief Dyadic Scale of Expressed Emotion (BDSEE). To further assess maternal EE from the patients’ perspective, we applied the BDSEE (Medina-Pradas et al. 2011b), consisting of 14 items allocated to the three subscales of perceived criticism, EOI, and warmth. Participants were asked to evaluate the extent to which they perceived their mother as critical, emotionally overprotective or overreactive, and warm toward them on a 10-point Likert scale. Except for sum scores on perceived warmth, higher sum scores on criticism and EOI indicate higher levels of perceived EE. For the purpose of this study, the English version of the BDSEE was translated into German through the first author and back-translated through a licensed translator. In this study, internal consistencies for all subscales were good, with $.82 \leq$ Cronbach’s $\alpha \leq .89$.

Eating Disorder Psychopathology. Participants and their mothers completed the Eating Disorder Examination-Questionnaire (EDE-Q; Hilbert and Tuschen-Caffier 2006b), a self-report instrument assessing the specific psychopathology and key behaviors of eating disorders. Beyond six items on key behaviors, the EDE-Q includes 22 items allocated to the subscales of restraint and eating concern, both describing abnormalities in eating behavior, and weight concern and shape concern, both assessing aspects of a negative body image. Based on these four subscales, a mean global score was calculated, ranging from 0 to 6, with higher values indicating greater psychopathology ($\alpha = .84$ for adolescents; $\alpha = .81$ for mothers).

General Psychopathology. Adolescents’ severity of depression was assessed by the Beck Depression Inventory (BDI-II; Hautzinger, Keller, Kühner, and Bürger 2006), a

commonly used self-report instrument, consisting of 21 items to be scored on a 4-point Likert scale. A global sum score, ranging from 0 to 63, was calculated, with higher scores indicating more severe depression ($\alpha = .92$).

The Patient Health Questionnaire (PHQ-4; Kroenke, Spitzer, Williams, and Löwe 2009), an ultra-brief self-report screening instrument for depression and anxiety was used to assess mothers' psychopathology. A total sum score, ranging from 0 to 12, was calculated, with higher scores indicating greater distress ($\alpha = .91$). Mothers were also asked to document the amount of time they spent with the adolescent, mental and physical disorders with which they had been diagnosed, and if they were currently undergoing or ever had undergone psychotherapy.

Other Measures. Adolescents' weight and height were measured at the clinical site and the BMI was calculated. BMI-SDS was determined according to age- and sex-specific German reference data (Kromeyer-Hauschild et al. 2001). Based on mother-report, SES was calculated as indicated by the Winkler composite index (Winkler and Stolzenberg 1999) that aggregates parental education, occupation, and family income (range 0 to 21).

Statistical Analysis

Regarding FMSS data, χ^2 analyses were used to compare rates of perceived EE (high vs. low) and subtypes of perceived EE (criticism and EOI) between BED and CG. The magnitude of association was estimated using Cramer's Phi and interpreted as small ($\varphi_c = .10$), medium ($\varphi_c = .30$), or large ($\varphi_c = .50$; Cohen 1988). The continuous BDSEE data were analysed using a multivariate analysis of variance (MANOVA, factor: BED vs. CG). Partial η^2, describing the proportion of total variability attributable to the group, was reported for estimation of effect size, with small ($\eta^2 = 0.01$), medium ($\eta^2 = 0.06$), and large ($\eta^2 = 0.14$) effects (Cohen 1988). Finally, hierarchical multiple regression analyses were run to assess the impact of perceived EE on global eating disorder psychopathology of adolescents (EDE-Q global score) and to compare the relative predictive values of FMSS (Model 1, dummy coded

with low perceived EE as reference group), BDSEE perceived criticism (Model 2), EOI (Model 3), and warmth (Model 4). To evaluate the impact of perceived EE on global eating disorder psychopathology over and above BED diagnosis, group (BED vs. CG, CG as reference group) was entered in the first block. As the FMSS and subscales of the BDSEE represent different constructs of EE, it was necessary to conduct separate regressions to determine the relative contributions on global eating disorder psychopathology of these constructs. Therefore, the entry of the FMSS and BDSEE subscales was systematically changed in the second block of regression.

Based on evidence for a strong association between eating disorder psychopathology and depression (Swanson et al. 2011), and the fact that patients with BED and the CG significantly differed in the level of depression (Table 1), the BDI-II sum score was entered in the third block of regression. Given that the BDI-II sum score was significantly associated with the outcome (EDE-Q global score; $r = .587$, $p < .001$), and with predictor variables (BDSEE subscales, $.342 < r < .459$, $p < .01$; FMSS status; $r = .399$, $p < .001$), we tested whether the relationship between predictor variables and outcome was significantly reduced after controlling for depression, suggesting depression to have a mediating effect on perceived EE's impact on eating disorder psychopathology.

Effect sizes were interpreted as small ($R^2 = .02$), medium ($R^2 = .13$), or large ($R^2 = .26$; Cohen 1988). A two-tailed $\alpha < .05$ was applied for significance.

Results

Sample Characteristics

Adolescent and maternal sociodemographic and anthropometric characteristics did not differ by study group ($p > .05$). As expected, patients with BED showed significantly higher mean scores on eating disorder psychopathology and depression than controls (see Table 1). During the last 28 days, patients with BED reported 6.55 ($SD = 6.83$, range 0 to 26) objective and 4.04 ($SD = 6.12$, range 0 to 20) subjective binge-eating episodes with 20 (50.0%) patients

endorsing objective binge-eating only, 7 (17.5%) patients reporting subjective binge-eating only, and 12 (30.0%) patients endorsing both; 1 patient did not report binge-eating episodes during the last 28 days. A minority of patients with BED reported subjective binge-eating only according to DSM-IV-TR (n = 3; 7.5%) and DSM-5 (n = 5; 12.5%). Most patients met criteria for BED according to DSM-IV-TR (n = 14; 35.0%), DSM-5 (n = 11; 27.5%), and DSM-5 subthreshold (n = 7; 17.5%). The average illness duration was 22.65 months (SD = 24.38). The overall study sample consisted of 68 female and 12 male adolescents with a mean age of 15.00 years (SD = 2.62). The sample was predominantly overweight with a mean BMI-SDS of 1.85 (SD = 0.97), and was from middle class (M = 11.95, SD = 4.36). Most adolescents lived with both parents (n = 37; 46.3%) or with mothers only (n = 21; 26.3%). About one third of mothers (n = 27; 33.8%) reported that they currently suffered or had ever suffered from physical or mental illness; only a minority of mothers were currently undergoing psychotherapy (n = 7; 8.8%).

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Perceived Expressed Emotion

On the FMSS, significantly more patients with BED than participants in the CG met criteria for high perceived maternal EE (37.5% vs. 12.5%, p = .010; Table 2). Subtypes of high perceived maternal EE did not differ between groups (p > .05). In both groups, high perceived maternal EE was predominately related to perceived criticism (86.7% vs. 80.0%); few adolescents in either the BED group or CG reported perceived EOI (13.3% vs. 20.0%). Similarly, multivariate analysis of the BDSEE revealed a significant main effect of group (MANOVA; F(3, 76) = 4.41, p = .006). Patients with BED perceived significantly less maternal warmth, more EOI, and more criticism than the CG, with medium effect sizes (all p < .05).

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Impact of Perceived Expressed Emotion on Global Eating Disorder Psychopathology

Results of the full regression models accounted for 22 to 29% of variance in global eating disorder psychopathology, indicating medium- to large-size prediction effects (Table 3). Entered as a covariate, group status explained significant variance of the outcome ($p <$ .001). When entered in the second block, regression analyses revealed perceived criticism and warmth (BDSEE) to be significant predictors of global eating disorder psychopathology (both $p < .01$) over and above group status, with each subscale explaining approximately 9% of the total variance in patients' outcome. Perceived EE, as assessed with FMSS (Model 1), explained 4% of variance in adolescents' eating disorder psychopathology ($p < .06$) over and above group status, while the BDSEE subscale EOI (Model 3) predicted only additional 2% of the outcome variance ($p > .05$).

In order to estimate the impact of depression on the association between perceived EE and eating disorder psychopathology, the BDI-II sum score was entered in a final step. Depression additionally explained 13 to 19 % of the outcome variance (all $p < .001$), leaving the effect of perceived criticism ($p = .220$), EOI ($p = .931$), warmth ($p = .129$), and FMSS status ($p = .672$) on the EDE-Q global score non-significant.

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Discussion

Many investigators have documented the relationship between maternal EE and patient psychopathology in AN, BN, and EDNOS (Anastasiadou et al. 2014; Duclos et al. 2012). The present study, for the first time, focused on perceived maternal EE in adolescent BED. Our findings indicate that adolescent patients with BED were more likely than weight-matched controls to perceive their mothers to be high in EE. Both speech- and questionnaire-based measures of perceived EE showed similar results. This study also provides converging evidence on the relevance of the construct of perceived EE on patients' mental health: perceived EE, specifically perceived criticism and warmth, was identified as a significant predictor of adolescent global eating disorder psychopathology.

The fact that adolescents with BED reported higher levels of perceived EE than controls is consistent with a previous study on adult EDNOS using the Level of Expressed Emotion scale (Di Paola et al. 2010). Given that the adult sample by Di Paola et al. (2010) was compared to population-based controls not matched according to age and BMI, the interpretation of group differences in the level of perceived EE remained vague. The present study allows for more specific interpretation because a matched control group was used. Hence, greater perceived EE might be primarily related to the eating disorder diagnosis rather than to co-morbid overweight or obesity, although a normal-weight control group was not examined. Higher levels of perceived criticism and EOI and lower levels of perceived warmth in adolescent BED also confirm findings by Medina-Pradas et al. (2011a), which showed higher levels of perceived EE in adult EDNOS vs. AN and BN.

One of the most powerful predictors of adolescent global eating disorder psychopathology in this study was BDSEE perceived maternal criticism. This is consistent with the literature showing criticism to be related to diverse forms of psychopathology in adolescents from clinical samples (Asarnow, Tompson, Woo, and Cantwell 2001; Przeworski et al. 2012; van Furth et al. 1996). In this study, adolescents who tended to perceive their mothers as more critical, independent from the diagnosis of BED, reported greater global eating disorder psychopathology. Considering criticism as a "tangible expression of a wish for a person to behave differently" (Hooley and Gotlib 2000, *p.* 138), we might hypothesize that patients with BED are vulnerable to expressed maternal negative statements or feelings.

Quite recently, the research on EE also focused on positive dimensions of EE and found warmth to predict better outcome in AN (Le Grange, Hoste, Lock, and Bryson 2011), schizophrenia (Lopez et al. 2004), and conduct disorder (Vostanis and Nicholls 1995). Our results were in line with these findings, as lower levels of perceived warmth (BDSEE) were predictive of greater global eating disorder psychopathology. We cannot make conclusions on the warmth actually expressed by mothers but given the relatively high prevalence of

separated families in our sample, it seems plausible to suggest that family relations might play a central role for the development or maintenance of adolescent BED. In this context, a study on a non-clinical preadolescent sample demonstrated that an insecure attachment towards mothers was positively associated with disordered eating attitudes and binge-eating episodes (Goossens, Braet, Van Durme, Decaluwé, and Bosmans 2012).

In the present study, the level of perceived EOI was much lower than that reported by adult patients with EDNOS (mean score 19.5 vs. 32.3; Medina-Pradas et al. 2011a). Considering that adolescents who perceived their mothers as more emotionally overinvolved (BDSEE) were not more likely to show greater eating disorder psychopathology, the construct of perceived EOI may play a minor role in adolescent BED. As only a minority of adolescents with and without BED reported perceived maternal EOI (FMSS, in total $n = 3$), speech-based data of EOI in this study support this suggestion. Some recent studies concluded that the construct of EOI lacks validity in adolescent samples and might be less developmentally appropriate than in adult samples (McCarty and Weisz 2002; Vostanis and Nicholls 1995). Medina-Pradas et al. (2011a) also found that adult patients with EDNOS felt less stressed due to EOI of a key relative than to his/her criticism. Thus, adolescents may have perceived EOI relatively rarely because they experienced little distress related to it.

Confirming previous evidence (Hilbert et al. 2011; Swanson et al. 2011), patients with BED had higher levels of depression than the CG. Because the cognitive profile of individuals with depressive disorders is characterized by negative thinking, depression likely biases the individual's perception. Our results indicated that depression could represent a mechanism through with perceived EE exerts its effects on the individual's psychopathology, including eating disorder psychopathology. Otherwise, the change in behavior in youth with depression, e. g., increased irritability, loss of interest in activities or refusal to attend school, might be suggested to increase the risk for high EE behaviors in parents (Asarnow et al. 2001). Further research is needed to clarify boundaries between perceived EE and depression.

For the first time, this study used a combined assessment of speech- and questionnaire based measures of perceived EE. Patients with BED reported more perceived EE in both the FMSS and BDSEE than controls, indicating the concurrent validity of both measures. However, metrically scaled BDSEE data were more powerful predictors of eating disorder psychopathology than FMSS categorical data. As both the EDE-Q global score and BDSEE are based on the same data source, their correlation might be innately better than the EDE-Q global score and FMSS data that rely on different data sources. Diagnostic categories of perceived EE (FMSS) are also mutually exclusive and assign patients to either high or low status, thereby likely losing relevant psychopathological information. The result that FMSS ratings, in contrast to BDSEE data, were only marginally associated with adolescents' eating disorder psychopathology, may to some degree reflect a general tendency of the FMSS to underestimate rates of high EE in relatives (Leeb et al. 1991) and to reflect self-preserving bias in speech-samples, as adolescents possibly rated their mothers in a socially acceptable way.

This study had several special strengths. On the basis of a relatively large clinical sample of adolescent BED, ascertained by a validated clinical interview, patients with BED were compared to a well-controlled adolescent sample using a series of standardized measurements to assess patient and maternal factors. Additionally, we assessed perceived EE using a multi-methodological approach.

Despite these strengths, limitations of the current study should be noted. This study only focused on perceived maternal EE. We cannot extrapolate on perceived paternal EE and its associations with children's psychopathology. Additionally, we examined a sample of patients with BED seeking treatment for cognitive-behavioral therapy, which might limit generalizability of findings. In this context, it should be considered that adolescents with BED who were brought for therapy by the mother may have been more likely to perceive their mothers as being critical. Nevertheless, a substantial proportion of patients with BED sought

therapy on their own, and admission to treatment required sufficient therapy motivation. Finally, due to the cross-sectional design it remains unclear whether high perceived EE preceded or followed BED onset.

Based on questionnaire- and speech-based data, adolescent patients with BED displayed higher levels of perceived EE than demographically matched controls. Perceived EE was found to explain a significant amount of variance in global eating disorder psychopathology. Therefore, our study suggests several directions for future research and practice. Until recently, we know little about associations between actual and perceived EE in patients with BED and other psychiatric disorders. Further studies should focus on the predictive value of perceived EE on treatment outcome. In the context of high efficacy of family-based treatment in adolescent AN and BN, treatment of adolescent BED might also profit from the integration of a family perspective, particularly in patients who perceive negative emotions by family members and in families that often express negative feelings, respectively.

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Table 1 Sociodemographic, anthropometric, and clinical characteristics

	BED (n = 40)		CG (n = 40)		Test
Adolescent	*M*	*SD*	*M*	*SD*	
Age (y)	15.15	2.64	14.85	2.64	$F(1, 78) = 0.26$
BMI (kg/m²)	29.54	6.51	28.33	6.27	$F(1, 78) = 0.71$
BMI-SDS	1.93	0.91	1.77	1.03	$F(1, 78) = 0.59$
SES (0-21)	12.70	4.09	11.21	4.58	$F(1, 78) = 2.17$
Sex	*n*	*%*	*n*	*%*	
Female	34	85.0	34	85.0	$\chi^2(1) = 0.01$
Psychopathology	*M*	*SD*	*M*	*SD*	
EDE-Q global score	2.69	0.91	1.52	1.13	$F(1, 78) = 20.15$***
BDI-II sum score	14.46	9.73	7.53	7.92	$F(1, 78) = 12.11$***
Mother					
Age (y)	45.61	5.67	44.56	5.93	$F(1, 78) = 0.52$
Family structure[a]	*n*	*%*	*n*	*%*	
Married	18	47.4	21	52.5	$\chi^2(3) = 4.19$
Unmarried	2	5.3	3	7.5	
Separated/ divorced	18	47.4	13	32.5	
Widowed	0	0	3	7.5	
Psychopathology	*M*	*SD*	*M*	*SD*	
EDE-Q global score	1.53	1.19	1.53	1.20	$F(1, 78) = 0.01$
PHQ-4 global score	2.59	2.82	2.41	3.93	$F(1, 78) = 0.06$

Note. BED binge-eating disorder group; BDI-II Beck Depression Inventory; BMI body mass index; CG control group; EDE-Q Eating Disorder Examination-Questionnaire; PHQ-4 Patient Health Questionnaire; SES socioeconomic status (Winkler Index).

[a] missing data $n = 2$ in the BED group.

*** $p < .001$.

Table 2 Five Minute Speech Sample and Brief Dyadic Scale of Expressed Emotion: Classification of perceived expressed emotion (EE) by group

	BED (n = 40)		CG (n = 40)		Test	
FMSS	*n*	%	*n*	%		φ
Perceived EE status					$\chi^2(1) = 6.67^{**}$	.29
Low perceived EE	25	62.5	35	87.5		
High perceived EE	15	37.5	5	12.5		
Subtype of high perceived EE					$\chi^2(2) = 0.13$	.08
Criticism	13	86.7	4	80.0		
EOI	2	13.3	1	20.0		
Criticism and EOI	0	0	0	0		
BDSEE	*M*	*SD*	*M*	*SD*		η^2
Warmth	32.33	9.09	36.63	4.36	$F(1, 78) = 7.28^{**}$	0.09
EOI	19.52	10.03	13.03	7.58	$F(1, 78) = 10.69^{**}$	0.12
Criticism	18.60	7.86	14.65	7.35	$F(1, 78) = 5.39^{*}$	0.07

Note. BED binge-eating disorder group; BDSEE Brief Dyadic scale of Expressed Emotion; CG control group; EE Expressed Emotion; EOI Emotional overinvolvement; FMSS Five Minute Speech Sample.

* $p < .05$; ** $p < .01$

Table 3 Prediction of global eating disorder psychopathology (EDE-Q) by the level of perceived expressed emotion according to the Five Minute Speech Sample (Model 1) and Brief Dyadic Scale of Expressed Emotion subscales perceived criticism (Model 2), EOI (Model 3), and warmth (Model 4)

		B	SE	β	*p*	ΔR^2
Model 1						
Step 1	Constant	1.52	0.17			
	Group (BED)	1.06	0.25	0.45	< .001	.20***
Step 2	Constant	1.45	0.17			
	Group (BED)	0.93	0.25	0.39	< .001	
	FMSS perceived EE (high)	0.57	0.29	0.20	.059	.04†
Model 2						
Step1	Constant	1.52	0.17			
	Group (BED)	1.06	0.25	0.45	< .001	.20***
Step 2	Constant	0.83	0.28			
	Group (BED)	0.88	0.24	0.37	< .001	
	BDSEE criticism	0.05	0.02	0.30	.004	.09**
Model 3						
Step 1	Constant	1.52	0.17			
	Group (BED)	1.06	0.25	0.45	< .001	.20***
Step 2	Constant	1.30	0.25			
	Group (BED)	0.95	0.26	0.40	< .001	
	BDSEE EOI	0.02	0.01	0.14	.219	.02
Model 4						
Step 1	Constant	1.52	0.17			
	Group (BED)	1.06	0.25	0.45	< .001	.20***
Step 2	Constant	3.48	0.67			
	Group (BED)	0.85	0.24	0.36	.001	
	BDSEE warmth	-0.05	0.02	-0.31	.003	.09**

Note. BDSEE Brief Dyadic scale of Expressed Emotion; BED binge-eating disorder group; EE Expressed Emotion; EOI Emotional Overinvolvement; FMSS Five Minute Speech Sample; Total R^2 Model 1 = .24, Model 2 = .29, Model 3 = .22, Model 4 = .29.

† $p < .10$; ** $p < .01$; *** $p < .001$.