



Links between traumatic experiences in childhood or early adulthood and lifetime binge eating disorder



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ABSTRACT

Objectives: To evaluate the association between childhood or early adulthood traumatic experiences and adulthood binge eating disorder (BED) in 326 male and 1158 female patients. A structured clinical interview for the DSM-IV (SCID-I/P)–adapted to lifetime exploration for the diagnosis of BED and for DSM-IV Childhood Disorders was conducted by the psychiatrist.

Results: Emotional neglect was the most frequent event experienced (77.8% of females vs. 63.5% of males, $p < 0.0001$), ahead of physical abuse (23.3%), witnessed domestic violence (17.7%) and sexual abuse (11.8% of females vs. 2.8% of males ($p < 0.0001$)). The prevalence rate for BED in the whole population was 34.9%. The independent predictors for BED were emotional neglect in male obese patients (OR = 3.49; IC95% (1.94–6.29); $p < 0.0001$) and physical abuse (OR = 1.56; IC95% (1.14–2.12); $p = 0.0047$), emotional neglect (OR = 1.83; IC95% (1.37–2.44); $p < 0.0001$), and sexual abuse (OR = 1.80; IC95% (1.22–2.65); $p = 0.0029$) in female patients. With a cut-off value of 17, the sensitivity of the Binge Eating Scale for BED during lifetime was 50.8% with 74.7% specificity.

Conclusions: This study shows that early psychological events are independent predictors of BED in obese female and male adults. The BES questionnaire is a poor predictor of BED during lifetime and a structured clinical interview should be recommended.

1. Introduction

Adult obesity can be a delayed consequence of certain severe psychological traumas experienced during childhood (Allison et al., 2007; Shin and Miller, 2012; Thomas et al., 2008; Lissau and Sorensen, 1994; Hemmingsson et al., 2014). Moreover, relative to men, women more often fall victim to adult obesity due to such causes (Connors and Morse, 1993; Fosse and Holen, 2006; Rayworth et al., 2004; Wonderlich et al., 2001; Yellowlees, 1985). The association between childhood maltreatments and obesity later in life has recently been confirmed in a large-scale meta-analysis of 41 studies (190,285 participants) which excluded the involvement in this correlation of possible confounding factors such as differences in definitions and measurements used for childhood maltreatment and obesity, socioeconomic status, age, educational and income level, smoking, alcohol intake, physical activity, race and gender (Danese and Tan, 2014). Interestingly, a similar positive correlation between adverse childhood experiences and adulthood obesity has also been observed in non-human

primates (Kaufman et al., 2007; Conti et al., 2012). The underlying mechanisms linking childhood abuse to higher than normal body mass index in adulthood are not known. Some studies have suggested that impulsivity may play a part in this phenomenon (Fox et al., 2010). Impulsivity has also been shown to be associated with both child maltreatment (Brodsky et al., 2001) and body mass index (Thamotharan et al., 2013; Brown et al., 2017). Other hypotheses revolve around emotional mediators such as anxiety, depression and posttraumatic stress (Francis et al., 2015) or related to leptin metabolism (Danese et al., 2014). Despite these advances, few studies have actually evaluated the relationship between early-age psychological traumas (childhood or early adulthood) and eating disorders in adult obese patients (Hemmingsson et al., 2014). In addition, these previous studies were often limited by low statistical power due to the small number of patients recruited for study (Hemmingsson et al., 2014).

Binge eating disorder (BED) is a frequent occurrence in obese patients (Dawes et al., 2016; Kalarchian et al., 2007; Fichter and Quadflieg, 2000) although it can be found in the general population

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(3.5% in women and 2.0% in men, Hudson et al., 2007). Interestingly, surveys via self-questionnaires in patients scheduled for bariatric surgery showed that BED occurred in 2% to 49% of the patients while subclinical binge eating behavior occurred in 6–64% of the patients (Niego et al., 2007). The use of different diagnostic tools and criteria for characterizing binge eating (BE) and binge eating disorder (BED) in these studies could explain this very wide range. The Binge Eating Scale (BES) questionnaire (Brunault et al., 2016) has been proposed as a screening tool for the diagnosis of BED. However, self-questionnaire-based surveys underestimate the true involvement of BED since part of the BES questionnaire as well as structured interviews (the SCID-I/P; First, 2002 and Eating Disorder Examination (EDE); Fairburn and Waller, 2008; Fairburn et al., 2009) used in these previous studies focused only on the experiences of the last four weeks to three months. Importantly, several studies have shown that patients having experienced a period of BED in the past have a high risk of relapse, especially after bariatric surgery (Meany et al., 2014; White et al., 2010; Kofman et al., 2010).

Consequently, in the present study, the Binge Eating Scale (BES) (Brunault et al., 2016) and structured clinical interviews (First, 2005) adapted for lifelong experiences were also included for comparison purposes.

Several studies report a positive association between adverse life experiences and adult obesity. However, few authors have studied the link between trauma and BED. Therefore, the goal of the present study was to assess the association between early adverse psychological events and later adulthood BED in a large cohort of obese patients scheduled for bariatric surgery and to identify the risk factors for BED in this population. To our knowledge, this is the first study to use a semi-structured interview to analyze eating disorders during lifetime.

2. Methods

2.1. Participants

All morbidly obese patients considered for bariatric surgery at the CHU Nancy (multidisciplinary bariatric surgery unit) between February 1998 and December 2013 were included in this study. The criteria for bariatric surgical indications adapted herein were based on the French (Haute-Autorité-de-Santé, 2010) and European guidelines (Fried et al., 2014), which included a body mass index exceeding 40 kg/m², or > 35 kg/m² with at least one severe obesity-related comorbidity associated with failure of previous conservative attempts to lose weight. Prior to the surgical intervention, all recruited patients underwent, over the span of approximately 1 year, three preoperative multidisciplinary evaluations carried out by a team of medical specialists comprised of dietitians, psychologists, medical nutritionists, bariatric surgeons and, if needed, other specialists such as cardiologists and endocrinologists. The purposes of these meetings were to collect the comprehensive description of surgical indications, to assess the risks/benefit ratio for each bariatric procedure, and to devise long-term follow-up procedures focusing on eating behaviors, self-image and expectations after surgery. This observational retrospective study complied with French National Health guidelines on research involving human subjects. This cohort was approved by the CNIL (National Committee for Data Protection, authorization number CNIL 2015-25). Signed informed consent to participate in this observational study was obtained from all patients and patients are informed regarding their right to withdraw their data from the cohort. The research described in paragraph 3 of Article L. 1121-1 of the Public Health Code, also referred to as "observational research" or "non-interventional", relating to retrospective data is the sole opinion of the CNIL.

A structured clinical interview was conducted by the same psychiatrist with all included patients to investigate the prevalence of childhood and/or early adulthood traumatic experiences and BED.

The first 340 patients were also asked to complete the French

version of the BES questionnaire prior to the psychiatrist's interview.

2.2. Structured clinical interview

(1) Structured clinical interview for the DSM-IV–adapted to lifetime exploration for the diagnosis of BED

Diagnosis of current and lifetime BED was established with structured interviews (the SCID-I/P; First, 2002 and Eating Disorder Examination (EDE); Fairburn and Waller, 2008 based on the exploration of 25 items exploring restraint, eating concerns, body shape concerns and weight concerns; First, 2005). The DSM IV TR criteria were used since patients participated in a treatment study that began prior to the release of DSM-5 (DSM-IV-TR, 2000). The psychiatrist did not solely focus on the preceding four weeks (28 days or the previous three months for some items) but rather on the entire lifetime period. Focus was especially placed on periods with significant weight gain (or even weight loss, looking for anorexia), particularly during or after difficult life events in childhood or early adulthood (divorce, death, pregnancy, separation of parents, removal, immigration, violence, emotional deprivation, depression, etc.). This interview was used for the diagnosis of BED.

(1) Structured clinical interview for childhood and early adulthood traumatic experiences

During the same consultation, a structured clinical interview was conducted for the identification of childhood and early adulthood traumatic experiences. For each patient, with the help of the Structured Clinical Interview for DSM-IV Childhood Diagnoses, the psychiatrist evaluated emotional neglect, physical and sexual abuse. We found that the prevalence of patients who had witnessed domestic violence was high in our present cohort and these patients were thus defined specifically. Physical abuse corresponds to history of physical violence during childhood and/or early adulthood. Emotional neglect parameters include history of abandonment, parentification (role reversal where a child is forced to act as a parent for his/her own parents or siblings) and depreciation. In extreme cases, the child is used to fill the void of the parent's emotional life due to, for example, a divorce with parental separation, a familial upheaval, a mourning during childhood, and other severe emotional maltreatment.

2.3. Binge eating scale

The first 340 patients were asked to complete the French version of the BES (Brunault et al., 2016). This questionnaire has been proposed as a screening tool for the diagnosis of BED.

Each of the 16 items of the BES contains 3–4 response options, reflecting a range of severity for each measured characteristic. The possible total scores range from 0 to 46, with higher scores indicating more severe binge eating symptoms. The scores are categorized as absent or minimal binge eating (score ≤ 17), mild to moderate binge eating (score 18–26), and severe binge eating (score ≥ 27). This questionnaire correctly identified 78% of patients with BED using a cut-off value of 17 (Brunault et al., 2016; Greeno et al., 1995; Ricca et al., 2000). Procedure: Patients completed a preoperative psychological evaluation with a clinical psychologist.

The instructions were: "Below are a group of numbered statements. Read all the statements in each group and circle the one that best describes how you feel about the problems you have controlling your eating behavior." The BES questionnaire does not specify whether the questions address current or past symptoms and is not intended for the purpose of measuring the possibility of past BED.

2.4. Statistical data

Student's *t* and chi-square tests were used to independently determine the presence of gender effects and their relationship for normally distributed continuous variables pertaining to the characteristics of the study population and adverse psychological events variables. Comparisons of normally distributed continuous variables between female and male patients and presence or not of BED, were performed by ANOVA (2 × 2 factors) while the chi-square test was used for categorical variables. The Bonferroni correction was applied for multiple comparisons in males and females (α after Bonferroni correction = 0.05/2 = 0.025). The same tests were used to assess the associations between the adverse psychological events and BED. Logistic regression models were carried out to examine the factors associated with BED status. Both univariate and multivariate linear regression analyses were used for the tests performed between individual psychological events (0 vs. 1) and BED (absent vs. present).

Reliability of the BES questionnaire was assessed using Cronbach's alpha. Sensitivity, specificity and predictive values were estimated in order to evaluate the concurrent validity of the French version of BES as a screening instrument for BED. For these analyses, BES, at the cutoff value of 17, was compared with SCID-I/P adapted for lifetime.

All statistical analyses were performed using the BMDP statistical software package (Berkeley, CA, University of California press, 1992). A *p* value < 0.05 was considered as statistically significant.

3. Results

3.1. Subjects (Table 1)

This study included 1484 obese patients (326 males and 1158 females) with a mean ± SD BMI of 46.3 ± 7.4 kg/m². All were candidates for bariatric surgery. More than half of the patients (68.7%) lived with their partner and had at least one child (75.8%). More than half also worked professionally (58.7%). Of note, male patients were slightly older than female patients (43.6 years ± 11.2 vs. 41.1 ± 11.1 years; *t* = 3.63; *p* = 0.0003) along with a significantly higher mean BMI (47.7 ± 8.3 kg/m² vs. 45.9 ± 7 kg/m²; *t* = 3.53; *p* = 0.0004).

3.2. Prevalence of adverse psychological events in male and female patients (Table 2)

Overall, 77.9% (*n* = 1156) of the patients examined in this study reported at least one of the types of adverse psychological events during either childhood or early adulthood. Among these, emotional neglect appeared as the most frequent event experienced by the patients (74.7%), with a higher prevalence in female than in male patients (77.8% in females vs. 63.5% in males, Chi² = 27.6; d.f. = 1; *p* < 0.0001). Physical abuse also occurred more frequently in female (24.8%) than in male (14.5%) patients (Chi² = 17.1; d.f. = 1; *p* < 0.0001). Some of these patients also suffered childhood sexual abuse, occurring particularly more often in female (11.3%) than in male (2.8%) patients (Chi² = 21.0; d.f. = 1; *p* < 0.0001). The prevalence of various types of psychological trauma in males and females is summarized in Table 2.

3.3. Prevalence of binge eating disorder (BED) in male and female patients

In all patients (*n* = 1484), the overall (lifetime) prevalence for past or current BED was estimated to be 34.9% (*n* = 518) on the day of the interview (Table 3). This prevalence was found to be higher in female than in male patients (37% vs. 27.3%, Chi² = 10.63; *p* = 0.0011). Patients with BED were younger (*F* = 3.42, *p* = 0.001). Corpulence (BMI) was higher in males (*F* = 3.652 *p* < 0.0001) with no significant effect of BED (*F* = -1.459 *p* = NS).

The frequency of childhood psychological trauma also appeared to

be correlated with adulthood BED since significantly more frequent traumatic episodes were associated with patients with BED than patients without BED (Table 3 and Fig. 1). In addition, 81% of males with BED vs. 58% of males without BED (Chi² = 14.70, *p* < 0.0001) reported a previous history of psychological trauma. Similarly, 88% of females with BED vs. 78% in females without BED (Chi² = 20.16, *p* < 0.0001) reported a previous history of psychological trauma. The proportion of BED patients increased with the number of psychological traumas encountered by the patients (Fig. 1).

Multivariate analysis (logistic regression) (Table 4) showed that physical abuse (OR = 1.56 ; IC95% (1.14–2.12) ; *p* = 0.0047), emotional neglect (OR = 1.83; IC95% (1.37–2.44) ; *p* < 0.0001), and sexual abuse (OR = 1.80 ; IC95% (1.22–2.65) ; *p* = 0.0029) were independent predictors for BED in female obese patients, while emotional neglect (OR = 3.49 ; IC95% = 1.94–6.29; *p* < 0.0032) was the sole independent predictor for BED in male obese patients.

3.4. The interest of BES as a predictor of BED during lifetime tested in a subgroup population of 340 subjects (Table 5)

The overall internal consistency of the BES measured by Cronbach's alpha coefficient yielded 0.84.

In this subgroup, SCID- I/P identified 38.2% (*n* = 130) of the sample with a past or current BED. According to the French version of the BES, 35% (*n* = 119) of the sample were classified as having a binge eating disorder. While the prevalence appeared similar, the patients involved were not the same. The results of the validity study are summarized in Table 5. The mean BES score in the BED group was 17.8 ± 9.1 and 12.2 ± 7.7 in the non-BED group (*p* < 0.0001). With a cutoff value of 17, the sensitivity (measures the proportion of positives that are correctly identified as such) was 50.8% and the specificity (measures the proportion of negatives that are correctly identified as such) was 74.7%. The positive predictive value (PPV) was 55.4% and the negative predictive value was 71.1%. Hence, the false positive rate (FPR) was 44.5% while the false negative rate (FNR) was 29%.

Of note, 17.5% of these patients reported a past history of BED but no current BED. In this group of patients with past BED without current BED, the sensitivity was lower (33.9%) suggesting that the patients completed the questionnaire by considering the current period and not the past

4. Discussion

This study revealed that: (1) over 80% of patients scheduled for bariatric surgery reported at least one adverse psychological event during their childhood or early adulthood; (2) the lifetime prevalence for BED was approximately 35% of all patients selected; (3) patients with BED reported significantly higher incidences of adverse psychological events during childhood and early adulthood in comparison with patients without BED; and (4) the relationship between psychological traumas or maltreatments and BED was predominantly associated with emotional neglect or abuse in both males and females with an odds ratio reaching as high as 3. These relationships remained significant even after controlling for factors related to other histories of maltreatment and demographic variables.

Our results highlight a high prevalence of childhood and early adulthood maltreatments in obese males especially in cases when obesity was associated with BED. Our data indicated that 71.9% of the male patients with BED described a history of emotional neglect or abuse, 20.2% physical abuse, and 23.6% witnessed domestic violence. Sexual abuse was also present in this population (4.5%). The high prevalence of our population (17%) having witnessed domestic violence documented in both males and females and even more frequent in obese patients with BED (odds ratio = 1.93, 95% CI: 1.04–3.57; *p* = 0.0366 in males and 1.74, 95% CI: 1.28–2.35; *p* = 0.0004 in females, in univariate analyses) is in accordance with a previous finding

Table 1
Characteristics of the study population (Mean \pm SD, and %).

	Total (n = 1484) n (%)	Males (n = 326) n (%)	Females (n = 1158) n (%)	t/ Chi ²	p
Age	41.7 \pm 11.2	43.6 \pm 11.2	41.1 \pm 11.1	3.63	0.0003
Height (m)	1.66 \pm 0.09	1.76 \pm 0.07	1.63 \pm 0.06	30.10	<0.0001
Weight (kg)	127.5 \pm 24.3	147.9 \pm 27.2	121.5 \pm 19.3	18.45	<0.0001
BMI (kg/m²)	46.3 \pm 7.4	47.7 \pm 8.3	45.9 \pm 7	3.53	0.0004
Marital status				21.09 (df = 3)	0.0001
Single	266 (18.1%)	85 (26.6%)	181 (15.8%)		
In couple	1008 (68.7%)	196 (61.2%)	812 (70.8%)		
Separated or divorced	148 (10.1%)	33 (10.3%)	115 (10.0%)		
Widowed	44 (3.0%)	6 (1.9%)	38 (3.3%)		
Professional situation				23.06 (df = 3)	<0.0001
active	847 (58.7%)	196 (62%)	651 (57.8%)		
inactive	190 (13.2%)	50 (15.8%)	140 (12.4%)		
unemployment	315 (21.8%)	41 (13.0%)	274 (24.3%)		
retired	90 (6.2%)	29 (9.2%)	61 (5.4%)		
Number of children				18.94 (df = 4)	0.0008
0	355 (24.2%)	104 (32.5%)	251 (21.9%)		
1	260 (17.7%)	50 (15.6%)	210 (18.3%)		
2	389 (26.5%)	85 (26.6%)	304 (26.5%)		
3	307 (20.9%)	58 (18.1%)	249 (21.7%)		
≥ 4	157 (10.7%)	23 (7.2%)	134 (11.7%)		

BMI = Body Mass Index ; df: degree of freedom.

reported in 147 adolescents (aged 13–17 years) who had witnessed domestic violence. These youngsters had almost 6 times the odds of being overweight or obese (95% CI: 1.09–30.7, after adjustment for potential confounders) (Gooding et al., 2015). These findings highlight the importance of screening for signs of psychological disturbances in pediatric patients and of providing obesity prevention counseling for youths (Gooding et al., 2015).

To our knowledge, this is the first study identifying a significant relationship between various types of maltreatments or psychological traumas and BED diagnosed according to DSM-IV criteria in a large sample of obese patients. More precisely, we report very high rates of at least one type of maltreatment, from 58.8% in males without BED to 88.3% in females with BED. Maltreatment rates in the BED groups were generally higher than those reported in community samples (Walker et al., 1999), although similar to those reported in previous studies on BED (Fairburn et al., 1998; Yanovski et al., 1993) as well as in bariatric surgery candidates (Grilo et al., 2005). As in other studies (Yanovski et al., 1993; Grilo et al., 2005), BMI levels were not associated with maltreatment, albeit higher in males with BED than non-BED.

The independent relationship between emotional neglect and BED is not simply a function of other types of psychological traumas that

patients also experienced over their lifetime. Early studies showed higher rates of neglect and emotional abuse associated with BED than among overweight and obese participants without disordered eating (Allison et al., 2007). Physical and sexual abuse, however, were not more common. Witnessed domestic violence is highly correlated with food insecurity (Chilton et al., 2014; Hernandez et al., 2014), which itself is correlated with obesity in children (Casey et al., 2006) and adults (Gooding et al., 2012). Several studies support findings which suggest that attachment patterns could play the mediating role in the relationship between trauma and eating disorders. The attenuation of our findings linking witnessed domestic violence to BED remains that this violence is highly associated with emotional neglect and physical abuse and was not independently correlated with BED.

Contrary to Grilo and Masheb (2002), we found a relationship between sexual abuse and binge eating. In this study, a history of violence in adults was not considered. Other studies have shown a relationship between physical, sexual and emotional abuse before age 11 years and a higher early adult weight status (Mason et al., 2015). While the reported sexual abuse estimate itself was not statistically significant, the prevalence of sexual abuse in this latter study was lower compared with our population (8.2% vs. 11.3% in our study). Both child sexual and physical abuse have been reported associated with a doubling of the

Table 2
Prevalence of adverse psychological events in male and female patients.

	All (n = 1484)	Males (n = 326)	Females (n = 1158)	Chi ²	p
Physical abuse (total)	23.3%	14.5%	24.8%	17.10 (df = 1)	<0.0001
Childhood physical abuse	16.5%	14.1%	17.2%	1.53 (df = 1)	NS
Adult history of physical violence	4.2%	0%	5.3%	–	–
Childhood and adult physical abuse	2.6%	0.3%	3.3%	–	–
Witnessed domestic violence	17.7%	16.7%	18.0%	0.30 (df = 1)	NS
Sexual abuse	9.5%	2.8%	11.3%	21.0 (df = 1)	<0.0001
Emotional neglect (total)	74.7%	63.5%	77.8%	27.6 (df = 1)	<0.0001
Abandonic history	30.2%	20.8%	32.8%	17.00 (df = 1)	<0.0001
Parentification	15.9%	9.1%	17.8%	13.88 (df = 1)	<0.0001
Divorce. separation	16.7%	15.8%	17.0%	0.60 (df = 1)	NS
Familial upheaval	18.4%	13.9%	19.6%	5.48 (df = 1)	0.0193
Mourning during childhood	12.7%	14.2%	12.3%	0.72 (df = 1)	NS
Other emotional neglect	17.2%	16.0%	17.5%	0.37 (df = 1)	NS
At least one maltreatment	77.9%	64.3%	81.7%	44.5 (df = 1)	<0.0001

df: degree of freedom.

Table 3
Characteristics and prevalence of adverse psychological events in males and females with or without BED.

	Males (n = 326)		Females (n = 1158)		Chi ² = 10.63; p = 0.0011
	BED (n = 89) 27.3%	NO BED (n = 237) 72.7%	BED (n = 429) 37%	NO BED (n = 729) 63%	
Age	42.2 ± 12	44.2 ± 11.1	40.3 ± 11.1	41.9 ± 11.2	Anova 2 × 2 F = 9.715 p < 0.0001 Sex F = 3.42 p = 0.001 BED F = 2.48; p = 0.013 Interaction p = NS
BMI (kg/m ²)	49.3 ± 9	47 ± 7.9	46.1 ± 7.1	45.8 ± 7	Anova 2 × 2 F = 7.296 p = 0.001 Sex: F = 3.652 p < 0.0001 BED F = -1.459 p = NS Interaction p = NS

			Chi ²	p (< 0.025)		Chi ²	p (< 0.025)
Physical abuse	20.2%	11.0%	4.47	0.0345 ^a (NS)	33.1%	19.5%	25.59 < 0.0001
Witnessed domestic violence	23.6%	13.5%	4.47	0.0346 ^a (NS)	23.3%	14.7%	12.83 0.0003
Sexual abuse	4.5%	2.1%	1.30	NS	16.8%	8%	20.25 < 0.0001
Emotional neglect	71.9%	41.3%	23.10	< 0.0001	78.1%	61.4%	30.5 < 0.0001
Total trauma	80.9%	57.8%	14.70	0.0001	88.3%	77.8%	20.16 < 0.0001

^a α after Bonferroni correction (α = 0.05/2 = 0.025).

Proportion of patients with BED according to psychotrauma number

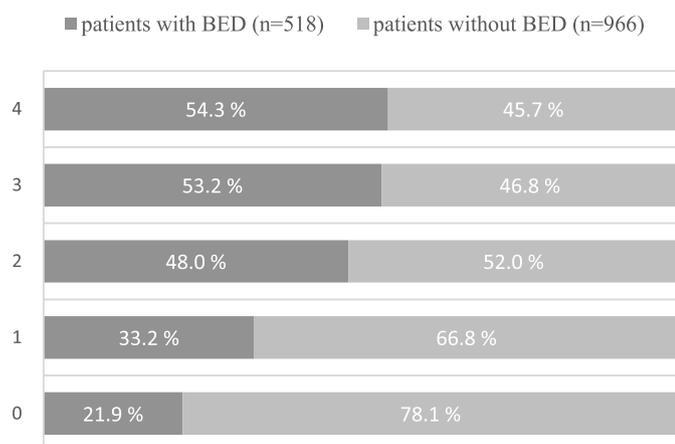


Fig. 1. proportion of patients with passed or currently BED, according to psychological trauma number.

odds of both obesity and depression in a large cohort of 4641 women, although child physical abuse was not associated with depression (Rohde et al., 2008). Our study, likewise to Holzer et al., showed that the link between this trauma and obesity may be eating disorders (Holzer et al., 2008). In fact, individuals who develop eating disorders after sexual trauma are likely to have experienced posttraumatic stress disorder symptomatology and have significant implications for causal models of eating disorder onset in trauma victims. In our population, PTSD was clearly absent in these women, probably because we did not retain lifetime PTSD symptoms (subsyndromic PTSD), but rather full PTSD. Another potential hypothesis is that binge eating prevents the clinical expression of full PTSD since it may serve as a powerful means of avoiding negative affect (Heatherton and Baumeister, 1991). In other words, binge eating could represent another strategy used by traumatized individuals as a form of self-medication (Brewerton, 2011). This hypothesis needs further prospective exploration, notably with regard to how PTSD and binge eating evolve over time in sexual assault patients for example.

Eating disorders (ED) and obesity share certain biological and environmental risk factors (Bachar et al., 2010; Haines et al., 2010) as

well as genetic (Bulik et al., 2003; Root et al., 2010), behavioral (Gunnard et al., 2012; Roemmich et al., 2011) and intermediate neurocognitive phenotypes (Danner et al., 2012; Van den Eynde and Treasure, 2009; Volkow et al., 2011). A controversial theory furthermore postulates that BED and obesity form part of a broad spectrum of eating-related and weight-related disorders (Marcus and Wildes, 2009; Volkow and O'Brien, 2007; Wilson, 2010). Our study supports the hypothesis of the importance of adversity exposure in the emergence of eating behaviors.

This study assessed the BES questionnaire in comparison to the semi-structured interview for the diagnosis of BED during lifetime. Analysis of the data revealed a false positive rate of 44.5%. When setting the BES cutoff value at 27, the specificity was 93% although the sensitivity was only 15.4% while the false positive rate remained high at 41.2%. Of note, 17.5% of these patients reported a prior history of BED but no current BED. In this group, the sensitivity of the BES questionnaire was 33.9%. Thus, the majority of the patients tested in our population who described experiencing BED in the past were not identified with this questionnaire. Several studies have shown that patients who have had a period of BED in the past have a high risk of relapse, especially after bariatric surgery (Meany et al., 2014; Kofman et al., 2010). BED is not constant over the course of a lifetime but varies depending on the occurrence of life events (death, separation, professional or family concerns, etc.). Kalarchian et al. (2007) accordingly make this distinction for BED diagnosis and axis 1 diagnosis. In their study, lifetime prevalence of BED was 27.1% while current prevalence was 16%. Psychiatric disorders and binge eating disorder may contribute to the development of severe obesity in vulnerable individuals. For example, some individuals report over-eating or binge eating when depressed, and since depression tends to be recurrent, repeated episodes could contribute to weight gain over time. Certain epidemiological studies furthermore suggest that mood problems antedate weight problems (Hasler et al., 2005). Patients with a history of BED are thus at very high risk of relapse and the risk of recurrence is considerable, whether recent or older. It therefore appears important to track BED throughout the lifetime of the patient. Consequently, the BES questionnaire may be an insufficient predictor of relapse after surgery.

Notwithstanding the above, many studies on BED have nevertheless used self-reported questionnaires, the result of which show that they tend to underestimate the prevalence of this condition (Ricca et al., 2000; Mannucci et al., 1999; Vamado et al., 1997). Other studies of BED

Table 4
Multivariate analysis in males and females using a logistic regression (dependent variables: BED (absent = 0 vs. present = 1); independent variables: physical abuse (0 vs. 1), witnessed domestic violence (0 vs. 1), sexual abuse (0 vs. 1), emotional neglect (0 vs. 1), and age).

	Univariate analysis						Females (n = 1158)							
	Male (n = 326)	IC 95%	P	β	SE	Wt	OR	IC 95%	P	β	SE	OR	IC 95%	P
Emotional neglect	1.151	0.300	3.82	3.16	1.75–5.69	<0.0001	0.798	0.269	2.963	2.22	1.31–3.05	2.22	1.31–3.05	<0.0001
Sexual abuse	0.761	0.684	1.112	2.14	0.56–8.17	NS	0.829	0.186	4.451	2.29	1.59–3.32	2.29	1.59–3.32	<0.0001
Physical abuse	0.703	0.339	2.076	2.02	1.04–3.9	0.0370	0.693	0.137	5.072	2.00	1.53–2.63	2.00	1.53–2.63	<0.0001
Witnessed domestic violence	0.658	0.315	2.084	1.93	1.04–3.57	0.0366	0.554	0.157	3.536	1.74	1.28–2.35	1.74	1.28–2.35	0.0004
Age	–2.313	–1.164	1.986	0.990	0.97–1.0	NS	–0.010	0.005	–1.940	0.99	0.980–0.995	0.99	0.980–0.995	0.0124

	Multivariate analysis			Females (n = 1158)		
	Male (n = 326)	OR	P	β	SE	Wt
Emotional neglect	4.172	3.49	<0.0001	0.604	0.148	4.091
Sexual abuse	0.349	1.28	NS	0.588	0.198	2.962
Physical abuse	0.078	1.03	NS	0.445	0.160	2.779
Witnessed domestic violence	0.892	1.38	NS	0.239	0.170	1.405
Age	–1.571	0.982	NS	–0.020	0.005	–4.292

	Females (n = 1158)		
	IC 95%	OR	P
Emotional neglect	1.37–2.44	1.83	<0.0001
Sexual abuse	1.22–2.65	1.80	0.0029
Physical abuse	1.14–2.12	1.56	0.0047
Witnessed domestic violence	0.91–1.77	1.27	NS
Age	0.971–0.993	0.98	0.0014

Table 5

BES score at a cutoff point of 17 and SCID-I/P diagnosis for all life.

SCID-I/P diagnosis during all life	BES score		Total (%)
	> 17 (%)	≤ 17 (%)	
BED	66 (50.8%)	64 (49.2%)	130 (100%)
Passed BED without current BED	20 (33.9%)	39 (66.1)	59 (100%)
No-BED	53 (25.2%)	157 (74.8%)	210 (100%)
Total	119 (35%)	221 (65%)	340 (100%)

Chi² = 23.1; p < 0.001.

BED: binge eating disorder, SCID-I/P: structured clinical interview for DSM-IV-TR, BES : binge eating scale.

have been limited to specific populations (e.g., young women) or were based only on questionnaires, rather than on personal interviews (Striegel-Moore and Franko, 2003). This disorder has been shown to be more frequent in obese patients (Filipova and Stoffel, 2016). Among patients with grade 3 obesity, based on random-effects estimates of prevalence, BED represented the most common mental health condition (17% (95% CI, 13–21%)) after depression (19% (95% CI, 14–25%)) (Dawes et al., 2016). However, this prevalence based on self-questionnaires, compared to a semi-structured interview, is most likely underestimated (Kalarchian et al., 2007; Fichter and Quadflieg, 2000). In fact, rates of pre-surgical BED were found to range from 2% to 49%, while rates of subclinical binge eating behaviors ranged from 6% to 64% across studies (Niego et al., 2007). The variety of assessment tools employed, as well as the inconsistent criteria used to identify eating disorders (i.e., meeting DSM-IV criteria for binge eating disorder vs. subclinical binge eating) likely explain these wide ranges. Conversely, carrying out structured interviews in larger numbers by well-trained interviewers, while costly and time-consuming, nonetheless allows assessing eating behaviors during lifetime and avoids the false negatives estimated at 22% with the Binge Eating Scale questionnaire (Grupski et al., 2013).

Results of this study highlight the fact that while BES can assist in the diagnosis of current or recent BED, it is poorly sensitive for detecting the history of BED. These findings hence suggest that an adaptation of the BES is necessary in order to consider the occurrence of BED during lifetime prior to performing the bariatric surgery.

Our study has several important limitations, the most important being its correlational nature since trauma and BED were assessed at the same time. Surgical protocols require that candidates undergo a pre-operative psychological evaluation, and these patients may understate their psychological trauma in order to ensure that the surgery proceeds as scheduled. In addition, our population of grade 2 and 3 obese patients was not representative of the larger population. Child abuse refers to a wide variety of experiences that differ in terms of age of occurrence, duration, intensity and nature, as well as the current age of the individual (Kenardy and Ball, 1998); a broader or more comprehensive assessment of childhood maltreatment might have produced different associations with obesity. However, the psychiatrist had the ability to interpret the nature and severity of the psychological trauma, to situate the event and/or the reactivation of this psychological trauma into the weight history.

5. Conclusion

Understanding relationships between past abuse and body size and eating behaviors appears fundamental. Since patients with BED may be engaging in other risky health behaviors, including substance abuse, depression or suicide, particularly after weight loss, addressing a history of childhood physical or emotional abuse is relevant, especially during preoperative management of obesity (Wolnerhanssen et al., 2009; Conason et al., 2013; King et al., 2012). These findings support the necessity of incorporating information on developmental history and cognitive factors into the assessment and treatment of individuals

with disordered eating.

Conflict of interest

The authors declare no conflict of interest.

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