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**Trauma and dissociation in obese patients with and without binge eating disorder: A case control study.**

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## **ABOUT THE AUTHORS**

Giovanni Luca Palmisano is PhD in clinical psychology at University of Bari “Aldo Moro”, Bari (Italy) and he is ending a postgraduate specialization in cognitive behavioral therapy and a master in psycho-traumatology and trauma related-therapy. Currently, his research areas include the relationship between childhood trauma, dissociation and the development of both eating disorders and substance use disorders. The research reported in this paper relates to wider project in the field of trauma related-therapy in traumatized eating disorder patients in collaboration with Marco Innamorati, associate professor of dynamic psychology at University “Tor Vergata” of Rome (Italy), Diego Sarracino, research fellow in dynamic psychology at University “Bicocca” of Milan (Italy), Andrea Bosco, associate professor of psychometrics at University of Bari “Aldo Moro” (Italy), Filippo Pergola, associate professor of developmental psychology at University “Tor Vergata” of Rome (Italy), and Johan Vanderlinden, coordinator of the Eating Disorder Unit of the University Psychiatric Center K.U. Leuven, Kortenberg (Belgium).

## **PUBLIC INTEREST STATEMENT**

Obesity is one of the leading causes of death in the world. Scientific evidences have suggested that traumatic experiences are strongly associated with obesity and binge eating disorder, a mental illness often associated with obesity, characterized by recurrent episodes of binge eating. The purpose of our study was to evaluate and compare the occurrence of both traumatic experiences and dissociative symptoms resulting from trauma, in obese people with and without binge eating disorder and in people with normal weight. Our results suggested that traumatic experiences are more present in individuals with obesity and binge eating symptoms and, in lesser way, in obese people without this diagnosis than in normal weight people. Thus, it is important to evaluate traumatic experiences and related symptoms to plan proper therapy in obese people with and without binge eating disorder, since traumatized subjects tend to leave the diets and regain weight more often than non-traumatized people.

**Keywords**

Binge Eating Disorder; Obesity; Childhood Trauma; Psychological Dissociation; Somatoform Dissociation.

**1. Introduction**

Over the past twenty years the association between childhood abuse and eating disorders (EDs) has been investigated extensively, suggesting above all a positive relation between early traumatic experiences and binge eating symptoms (Armour et

al., 2016; Guillaume et al., 2016; Palmisano et al., 2018; Treuer, Koperdak, Rozsa, & Furedi, 2005; Waller, 1991; Webster & Palmer, 2000; Wonderlich et al., 2001), but the understanding of the mechanism which links childhood trauma and EDs remains unclear.

Recently researchers have been focusing on the relationship between childhood abuse, obesity and binge eating disorder (BED). The BED is a fairly new eating disorder category described the first time by Stunkard (1959) and included in the classification of Eating Disorders of the Diagnostic Statistical Manual of Mental Disorders Fifth Edition (DSM-5; American Psychiatric Association, 2013). According to the criteria of DSM-5 (APA, 2013), BED is characterized by recurrent episodes of binge eating associated with a strong sense of loss of control over the eating during the episodes, which are not followed by regular use of inappropriate compensatory behaviors. It is fairly well established that obesity is strongly associated with BED (Bulik & Reichborn-kjennerud, 2003; Hudson, Hiripi, Pope, & Kessler, 2007), and that approximately 30% of subjects participating in weight control programs are meeting the criteria for BED (de Zwaan, 2001).

Epidemiological studies performed in large community samples, reported that individuals exposed to childhood trauma are more likely to be obese in adulthood (Alvarez, Pavao, Baumrind, & Kimerling, 2007; Williamson, Thompson, Anda, Dietz, & Fellitti, 2002). For example, using data from a very large sample in the Adverse Childhood Experiences study (ACE study), Felitti and colleagues (1998) found that childhood trauma increased 1.6 fold the lifetime risk to develop severe

obesity. Similarly, Maddi, Khoshaba, Persico, Bleecker, and VanArsdall (1997) in a representative sample of 1027 morbid obese subjects recruited from the Comprehensive Weight Management (U.S.A), revealed that a combination of childhood sexual, emotional and physical abuse predicted obesity in adulthood. Other cross-sectional studies performed in samples of extremely obese women who underwent gastric bypass surgery at a general medical center reported a percentage of several forms of abuse between 36% and 60% of subjects (Grilo, White, Masheb, Rothschild, & Burke-Martindale, 2006; Salwen, Hymowitz, Vivian, & O'Leary, 2014), percentages two to three times greater than those reported by a normative samples of adult women (Briere & Elliott, 2003; Walker et al., 1999). Furthermore, other authors highlighted that obese women reported most often exposure to any types of childhood maltreatment, including childhood sexual abuse (Aaron & Hughes, 2007; Gustafson & Sarwer, 2004; Noll, Zeller, Trickett & Putnam, 2007), physical abuse (Bentley & Widom, 2009), emotional abuse (Taylor et al., 2006), emotional and physical neglect (Johnson, Cohen, Kasen, & Brook, 2002; Lissau & Sørensen, 1994; Vámosi, Heitmann, Thinggaard, & Kyvik, 2011) and bullying by peers (Adams & Bukowski, 2008) and that obesity is common among victims of multiple forms of abuse (Midei & Matthews, 2011; Palmisano, Innamorati, & Vanderlinden, 2016; Power, Pinto, & Li, 2015).

Interestingly, regarding gender differences, research carried out in mixed samples of obese men and women obtained inconsistent findings. For example, van Reedt Dortland et al. (2012) found that childhood sexual, physical and emotional abuse

were positively associated with adult obesity both in women and men. In two other studies (Gunstad et al., 2006; Fuemmeler, Dedert, McClernon, & Beckham, 2009) only obese men, but not obese women, showed a history of emotional abuse, sexual abuse and bullying. Conversely, other authors (Mamun, Lawlor, O'callaghan, Bor, Williams, & Najman, 2007; Wildes, Kalarchian, Marcus, Levine, & Courcoulas, 2008) revealed that childhood emotional and sexual abuse predicted obesity in women but not in men.

Recently the prevalence of traumatic experiences are also studied in BED patients but the findings are still controversial. Research data show that childhood abuse is associated with BED, and that childhood maltreatment is roughly two to three times more frequently reported in the BED samples compared with healthy control samples (Grilo & Masheb, 2001; Becker & Grilo, 2011) and greater than other psychiatric patients (Grilo & Masheb, 2002). Furthermore, BED subjects reported higher levels of sexual and physical abuse, (Dunkley, Masheb, & Grilo, 2010; Striegel-Moore, Dohmn, Pike, Wiffley, & Fairburn, 2002), rape, stalking, and exposure to domestic violence (Mitchell, Mazzeo, Schlesinger, Brewerton, & Smith, 2012), compared with other psychiatric subjects (Fairburn et al., 1998). Other studies conducted in mixed female and male BED patients found higher rates of emotional abuse and neglect compared respectively with healthy controls (Grilo, Masheb, Brody, Toth, & Burke-Martindale, 2005), and OB individuals (Allison, Grilo, Masheb, & Stunkard, 2007; Grilo & Masheb, 2001). No differences were found in the distribution of any form of childhood maltreatment by gender. In contrast to previous results, some data showed



that sexual and physical abuse did not increase the risk of developing BED in adulthood (Cachelin et al., 1999; Favaro, Ferrara, & Santonastaso, 2003).

Several authors have attempted to outline possible mediating factors between the trauma-obesity/BED association, emphasizing the role of depression (Moyer, Di Pietro, Berkowitz & Stunkard, 1997; Pagoto et al., 2012), anxiety (Shultz & Laessle, 2010), body dissatisfaction (Preti, Incani, Camboni, Petretto, & Masala, 2006), self-criticism (Dunkley & Grilo, 2007; Dunkley et al., 2010) and post-traumatic stress symptoms (Mitchell et al., 2012).

An alternative explanation for an association between trauma, obesity and BED, could be the presence of dissociative symptoms. Dissociation refers to a broad spectrum of symptoms involving alterations of normal integrative function of memory, identity, environmental awareness, consciousness, and cognition, which is normally well integrated in a healthy person, (APA, 2013; Waller, Putnam, & Carlson, 1996) and has been strongly related to childhood trauma (Terock et al., 2016; Van Ijzendoorn & Schuengel, 1996). In this theoretical framework, a reduction of cognition and self-awareness consequent to dissociation, may precede and facilitate the development of binge-eating in response to the activation of negative emotional states (Engelberg, Steiger, Gauvin, & Wonderlich, 2007; Heatherton & Baumaister, 1991).

Despite many studies focusing on the relationship between trauma and dissociation in EDs (McShane & Zirkel, 2008; Oliosi & Dalle Grave, 2003; Vanderlinden, Spinhoven, Vandereycken, & van Dyck, 1995; Vanderlinden, Vandereycken, van

Dyck, & Vartommen, 1993), especially in relation to the bulimic symptoms (Cowan & Heselmeyer, 2011; La Mela, Maglietta, Castellini, & Lucarelli, 2010; Palmisano et al., 2018; Rodriguez-Srednicki, 2002; Mason et al., 2017), a thorough evaluation of the scientific literature showed that few data exist about this relationship in BED. Indeed, only two studies (Dalle Grave, Oliosi, Todisco, & Vanderlinden, 1997; Dalle Grave, Rigamonti, Todisco, & Oliosi, 1996) highlighted that BED subjects had higher scores of traumatic experiences and dissociation compared with obese non-BED subjects and healthy controls.

Besides the lack of research in psychoform dissociation in BED, very few authors also studied somatoform dissociation in EDs (Waller, Babbs, Wright, Potterton, Meyer, & Leung, 2003). Somatoform dissociation refers to the physiological component of dissociation, which includes symptoms of anesthesia, analgesia and freezing behaviors in response to traumatic events, especially those involving physical contact, such as physical abuse and sexual trauma (Nijenhuis, Spinhoven, van Dyck, van der Hart, & Vanderlinden, 1998a; Waller et al., 2001). To date only one study showed that somatoform dissociation was significantly more reported in bulimia nervosa and anorexia binge/purging subtypes than in restrictive anorexia and in non-clinical subjects (Fuller-Tyszkiewicz & Mussap, 2009; Waller et al., 2003). To our knowledge, no study measured the somatoform components of dissociation in both BED and OB patients.

Hence, the goal of this study is to evaluate whether overweight and obese individuals with BED, significantly differ regarding the presence of early-life

traumatic experiences, and level of somatoform and psychological dissociation compared to an age, sex, BMI, and social class matched sample of obese patients (OB) and a normal control group (NC) composed by normal weight people (BMI ranging between 18.5 and 25.5 kg/m<sup>2</sup>). Based on the existing studies it is assumed that (1) OB patients report greater occurrence of traumatic experiences than normal control subjects (2) and that the BED sample will show higher levels of both traumatic experiences and somatoform and psychological dissociation compared to the two other samples.

## **2. Material and Method**

### *2.1 Participants*

Participants in this study consisted of 3 different samples. The first sample consisted of 34 (25 females and 9 males) Italian adult out-patients meeting the criteria of the DSM-5 (APA, 2013) for a diagnosis of binge eating disorder (BED) and consequently admitted in the Eating Disorder Center “Salvatore Cotugno”, in Gravina in Puglia (Bari, Italy), for the psychiatric, psychotherapeutic and dietetic treatment of BED. The second sample consisted of 34 obese out-patients (BMI  $\geq$  30 kg/m<sup>2</sup>), with no current diagnosis of BED recruited from the same center and consequently admitted for the dietetic treatment of obesity. In addition, 34 “healthy” individuals without current or past history of psychiatric disorder or eating disorder were recruited by means of a printed advertisement by the Department of Psychology of the “Aldo Moro” University of Bari (Italy), and used as a normal control subjects. The mental health status of the control subjects was assessed using clinical interviews

performed by an independent psychotherapist employed at the department mentioned above. BED subjects were sex, age and social class matched with normal control subjects (NC), and sex, BMI and social class matched with obese subjects (OB). In the matching sampling, the maximum difference in age, between BED subjects and healthy subjects was 4 years, whereas the maximum difference in the matching samples between BED and OB subjects occurred in relation to BMI with the difference being 5.58 kg/m<sup>2</sup>. Inclusion criteria for the participation in this study were as follows: age older than 18 years, proper understanding of Italian language assessed by the clinicians, absence of any severe current medical condition, which could influence eating attitudes or weight, such as diabetes, thyroid problems, hypoglycemia, and the absence of any psychiatric or neurological condition which requires specific pharmacological treatment, such as psychosis, alcohol or drug abuse disorder, bipolar disorder, epilepsy, brain injury and mental retardation. Inclusion criteria for the obese group was BMI  $\geq$  30 kg/m<sup>2</sup>, and inclusion criteria for healthy group was normal weight with BMI ranged to 18.5 - 25.5 kg/m<sup>2</sup>. One BED subject was excluded, because a diagnosis of epilepsy, another obese subject was excluded because he was situated within the range of moderate mental retardation. One BED subject was excluded because he did not fully meet the DSM-5 criteria for a current diagnosis of BED.

Written informed consent was obtained by all participants and all participants voluntarily joined the study and none of them was paid for his participation. The

research was approved by the ethical committee of the Azienda Sanitaria Locale - 4, Bari (Italy).

## *2.2 procedure*

BED diagnoses were obtained through an Italian version of Eating Disorder Examination Interview (EDE 170D; Calugi et al., 2015) conducted by a psychiatrist specialized in eating disorders and by means of administration of several self-report questionnaires. Extensive information about the BED and the OB patient's history (socio-demographic characteristics, onset and course of disease, history of mental disease in the family, history of obesity in the family) were obtained by means of clinical interview and by administering several questionnaires. Weight and height was measured of all participants. BMI was calculated using the formula  $BMI = \text{Weight} / (\text{Height})^2$ .

## *2.3 Instruments*

The following instruments were administered.

**The Dissociation questionnaire** (DIS-Q, Vanderlinden, Van Dyck, Vandereycken, Vertommen, & Verkes, 1993) consists of 63 items with five different answer categories (1 = not; 2 = a little bit; 3 = moderately; 4 = quite a bit; 5 = extremely). Besides a total score, the DIS-Q contains four subscales: (1) DIS-Q 1: identity confusion/fragmentation, which refers to experiences of derealization and depersonalization; (2) DIS-Q 2: loss of control over behaviors, thoughts and

emotions, which refers to experiences of loss of control over behaviors, thoughts, and emotions (3) DIS-Q 3: amnesia, which refers to experiences of memory lacunas; (4) DIS-Q 4: absorption, which refers to experiences of enhanced concentration, which are supposed to play an important role in hypnosis. All scores (total score and subscale scores) are obtained by dividing the total score by the number of items and can vary between 1 and 5 (Vanderlinden et al., 1993). A cut-off score for the DIS-Q total score has been established: DISQ-total score  $\geq 2.9$  indicates those subject who are more likely to have a diagnosis of dissociative disorder according to the DSM-IV-TR criteria (Vanderlinden et al., 1993). Sensitivity and specificity are respectively 85% and 88% (Vanderlinden et al., 1993). The DIS-Q has a good internal consistency for the total scale (Cronbach's alpha = 0.96), and for the four subscales (respectively, .94, .93, .88, and .69) (Vanderlinden et al., 1993). The test-retest reliability coefficient for the total scale is .94 (interval 3 weeks), and respectively .92, .92, .93 and .75 for the four subscales, which shows that the DIS-Q produces scores that are stable over time. Administered to a group of 752 normal subjects (matched for age, sex, educational level, and demographic status) and several subgroups of psychiatric patients, the DIS-Q showed to have good discriminant validity and was able to distinguish between patients with dissociative pathology and other subjects (Vanderlinden, Van Dyck, Vertommen, & Vandereycken, 1992; Vanderlinden et al., 1993). Moreover a high correlation was found between total DES score and DIS-Q total score in a European sample ( $r = 0.85$ ;  $p < .0001$ ), as well as in a North-American sample ( $r = 0.87$ ;  $p < .0001$ ) (Sainton, Ellason, Mayar & Ross, 1993). The DIS-Q is

translated and validated in different languages. In this study, an Italian version of DIS-Q was used (Santonastaso, Favaro, Olivotto, & Friederici, 1997).

**Somatoform Dissociation Questionnaire (SDQ-20;** Nijenhuis, Spinhoven, Van Dyck, Van der Hart, & Vanderlinden, 1996; Nijenhuis, Spinhoven, Van Dyck, Van der Hart, & Vanderlinden, 1998b) is a 20 item self-report questionnaire for the assessment of somatoform dissociation. Items are answered on 5-point Likert scales that range from 1 (“this applies to me not at all”) to 5 (“this applies to me extremely”). Items are summed to provide a total score ranging from 20 to 100. These items include negative and positive symptoms of dissociation, which converge with the major symptoms of hysteria formulated by Janet such as analgesia, kinesthetic anesthesia, motor inhibition or loss of motor control, freezing, pain, and loss of consciousness (Nijenhuis, 2000). According to Mokken’s analysis (Mokken, 1971), items load on one single latent factor. The SDQ-20 has excellent psychometric characteristics (Nijenhuis et al., 1996; Nijenhuis et al., 1998b; Nijenhuis et al., 1999). The internal consistency is very high (Cronbach's alpha = .95). The convergent validity of the SDQ-20 is supported by the high intercorrelations with DIS-Q ( $r = .76$ ;  $p < .0001$ ) and Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986) ( $r = .85$ ;  $p < .0001$ ), for the measurement of psychological dissociation (Nijenhuis et al., 1996, 1998a; 1999; Sar, Kundakci, Kiziltan, Bakim, & Bozkurt, 2001). Discriminant validity was supported by the finding that the SDQ-20 scores discriminated among diagnostic groups over and above general psychopathology (Nijenhuis et al., 1999). High scores on SDQ-20 were found in case of somatoform diseases, conversion

diseases, PTSD, DDNOS, whereas extremely high scores are common in DID (Espirito Santo & Pio-Abreu, 2009; Nijenhuis, Spinhoven, van Dyck, van der Hart, & Vanderlinden, 1997). Finally, the criterion-related validity was supported by the finding that the degree of somatoform dissociation was higher in patients with DID and DDNOS in comparison with patients with other DSM-IV disorders (Nijenhuis et al., 1996) and strongly correlated with reported childhood sexual and physical abuse (Nijenhuis et al., 1998b). In addition to the SDQ-20, the short form of the scale, which includes five items of the 20-item version, is a dissociative disorders screening instrument (Nijenhuis et al., 1997). The SDQ-5 scores range from 5 to 25, and the optimal cut-off point in the screening for dissociative disorders is  $\geq 8$  (Nijenhuis et al., 1997; Nijenhuis et al., 1999). The SDQ-5 cut-off point discriminated with good sensitivity (74%) and high specificity (98%) between dissociative and non-dissociative psychiatric out-patients (Nijenhuis et al., 1997). In this study an Italian version of SDQ-20 was used (Nijenhuis, 2007).

**Traumatic Experiences Checklist (TEC).** The TEC (Nijenhuis, van der Hart, & Kruger, 2002) includes 25 descriptions of various traumatic experiences in addition to one open question asking for any other traumatic experience not mentioned. Participants are asked to rate whether or not they have experienced these events. If so, the age of the participant at the time of the event is assessed and the related degree of distress is rated on a 5-point scale ranging from 1 (*not at all*) to 5 (*very or seriously distressing*). Different scores can be calculated. For the general trauma score, all types of negative experiences are taken into account (range: 0 to 26). In



addition, separate sub-scores can be calculated for emotional neglect, emotional abuse, physical abuse, sexual approach, and sexual abuse. These scores take into account the closeness of the relation to the abuser (foreigner, family member, or parent or sibling), the age of onset, the duration of the abuse, and how disturbing it was for the individual. The maximum score for each of the five types of traumatic experience is 12. Finally, the sum of these sub-scores forms the total composed trauma score (range: 0 to 60), which best approaches what is meant by the notion of “trauma” as commonly used in the literature. The reliability of the TEC is based on good indices of the scale’s internal consistency and of the scale’s test–retest reliability. Internal consistency for the Traumatic Experiences Checklist is reported to be good, with Cronbach’s  $\alpha$  values of .86 and .90 for the test and retest, respectively (Nijenhuis et al., 2002). The test–retest reliability of the TEC total score is  $r = 0.91$  (Nijenhuis et al., 2002). Concerning Criterion-related Validity, the TEC total score was moderately to strongly correlated with measures of post-traumatic stress symptoms, psychoform and somatoform dissociation, measured respectively through PTSDss scores ( $r = .53$ ;  $p < .0001$ ), DES scores ( $r = .43$ ;  $p < .0001$ ), and SDQ-20 scores ( $.57$ ;  $p < .0001$ ). These associations were found in patients with dissociative disorders and other psychiatric disorders (Nijenhuis et al., 1998b), gynecology patients with chronic pelvic pain (Nijenhuis et al., 1999), and women who reported childhood sexual abuse (Nijenhuis et al., 2002). Concurrent validity was demonstrated with the correlation ( $r = 0.77$ ;  $p < 0.0001$ ) between the TEC and the Stressful Life Events Screening Questionnaire (SLESQ; Goodman, Corcoran, Turner,

Yuan, & Green, 1998). In the current study, an Italian version of TEC was used (Nijenhuis, 2007).

#### *2.4 Statistical analysis*

Since the normality of distributions of scores has not been confirmed for all scales (normality is evaluated with Kolmogoroff-Smirnoff test), non-parametric statistics were used for the comparison between BED group, OB group, and healthy control group (NC). Respectively Kruskal-Wallis H-test and Mann-Witney U-test, were performed for the comparison between the three groups and for the multiple comparisons for each group with each other. Chi square analysis was used to determine the differences between the three groups in the categorical data. All statistical analysis were performed with SPSS 19.0.

### **3. Results**

#### *3.1 Descriptive statistics*

As seen in the Table 1, mean age were respectively 36.65 years (SD = 14.69; range 18 - 68) for BED subjects, 40.45 years (SD = 14.76; range 18 - 70) for obese subjects (OB), and 36.82 years (SD = 14.59; range 18 - 67) for normal control subjects (NC).

On average the BED sample reported 8.97 (SD = 9.47; range 2 - 35) binges per week, the duration of illness of the BED symptomatology onset, averaged 10.06 years (SD = 8.82; range 1-39). Average BMI was respectively 38.51 (DS = 6.47; range 26.76 - 51.06) for the BED group, 36.68 (SD = 6.45; range 30.04 - 56.64) for the OB group,

and 22.50 (SD = 2.26; range 18.67 - 25.46) for the NC group. All subjects in BED group were obese (BMI  $\geq$  30 kg/m<sup>2</sup>) except for three subjects that were overweight (BMI  $\geq$  25.50 kg/m<sup>2</sup>).

Table 1 shows that no significant differences were found between BED group, OB group and NC group, with regard to age, years of education, level of education, work situation, social class and marital status. As expected, both BED and OB samples show higher weight and BMI, compared with NC sample. No significant differences between BED subjects and OB subjects BMI were found.

(insert here Table 1)

### *3.2 Comparison of traumatic experiences in NC, OB and BED sample*

Based on TEC responses, 59.8% (n = 61) of the subjects who participated in this study reported at least one type of abusive experience (emotional neglect, emotional abuse, bodily threat, sexual harassment and sexual abuse) in the first 18 years of life.

Kruskal-Wallis H-test and Mann-Witney U-test were used respectively to determine the differences between the three groups and for multiple comparisons between the three groups in the rates of trauma, psychological dissociation and somatoform dissociation. Table 2 shows the results of comparisons between the three groups on the dimensional measures of the traumatic experiences. As seen in table 2, BED sample reports more frequently all forms of trauma (TEC global score index) compared with both OB group and NC group, and OB group more traumatic experiences compared with NC group. Moreover, with regard to the composite scores of the TEC, which indicates the sum of all types of abuse occurred in the first 18

years of life, the score was higher in BED group compared to both OB and NC groups. Conversely, OB group and NC group did not differ significantly on this variable. In addition, BED group reported also higher composite score of emotional neglect, compared with the other two groups, and higher composite score of emotional abuse, compared with NC group. Nevertheless, no significant differences were found between the three groups in the composite scores of physical abuse and bodily threat, sexual harassment and sexual abuse.

(Insert here Table 2)

### *3.2 Comparison of psychological and somatoform dissociation in NC, OB and the BED sample*

As hypothesized, Kruskal-Wallis H-test indicated significant differences between the 3 samples on the total DIS-Q score. Compared with the OB subjects, BED subjects, report significantly higher scores on the total DIS-Q scale and the 4 DIS-Q subscales (identity confusion, loss of control, amnesia and absorption). As expected BED subjects also show higher scores on all DIS-Q scales compared with NC group. Using a cutoff score of  $\geq 2.9$  on the total DIS-Q score, respectively 8 BED subjects (23.5%) and only 1 OB (2.9%) and 1 NC (2.9%) were situated above the cut off score of 2.9 and these differences are statistically significant ( $\chi^2 = 10,865$ ;  $df = 2$ ;  $p = < .005$ ).

Concerning somatoform dissociation, as seen in Table 3, both the SDQ-20 total score and the SDQ-5 score are significantly higher in the BED group compared with both the OB and the NC group. No significant differences were found between the

OB and the NC group on these variables. Using a cut-off score of  $\geq 8$  on SDQ-5 subscale respectively 7 BED individuals (20.6%), 1 OB subject (2.9%) and none of the NC group exceeded the cut-off. These differences are statistically significant ( $\chi^2 = 11,665$ ;  $df = 2$ ;  $p = < .005$ ).

(Insert here Table 3)

## **Discussion**

Firstly, some limitations of this study need to be highlighted. Our sample size was rather small ( $n = 34 \times 3$ ), which does not permit the generalization of our results. Next, the use of self-reporting measures of abuse and neglect, which may reduce the reliability of assessment due to the retrospective nature of the assessment (Brewin, Andrews, & Gotlib, 1993) although a recent study shows a very small number of false positives in retrospective studies (Hardt & Rutter, 2004). Finally, although we used a case-control study, the retrospective nature of our study did not permit to make inferences on the causal relationship between the variables under consideration. More longitudinal studies carried out in large samples are needed to verify the exact contribution of trauma and dissociation in the development of the BED. It could be possible to recruit a population of children with trauma by means of social services reports on child abuse, to compare with young people without trauma concerning measures of binge eating symptoms in adolescence, young adulthood and adulthood. Given the difficulties in carrying out longitudinal studies, a valid alternative could be the use of statistical methods such as regression models and structural equation models to evaluate the contribution of childhood trauma and dissociation in

predicting the severity of binge eating symptoms. In this regard, some studies performed in samples of BED patients, suggested that low self-esteem and high self-criticism, resulting from early emotional abuse and neglect, may promote body dissatisfaction (Allison et al., 2007; Dunkley et al., 2010; van Gerko, Hughes, Hamill, & Waller, 2005), and overvaluation of shape and weight (Dunkley & Grilo, 2007), which are in turn related to the onset of both binge eating symptomatology (Fairburn et al., 2003; Grilo & Masheb, 2001) and its severity (Hrabosky, Masheb, White, & Grilo, 2007; Masheb, & Grilo, 2003).

Despite these limitations, this study has also some strengths. This is the first study evaluating the presence of somatoform dissociation in a BED sample. Secondly this study is a case control study in which the BED and the OB group were sex, social class and BMI matched, and compared with a sex, age and social class matched sample of subjects with normal weight and without a past or present psychiatric diagnosis, which may reduce the threats to internal validity of the study (Kazdin, 2003). Finally, this study focused on the assessment of a wide range of possible traumatic experiences, emphasizing the importance of also assessing emotional abuse and emotional neglect as a possible mediating variable in the development of EDs.

Consistent with the literature (Midei & Matthews, 2011), this study shows that BED patients report a higher frequency of all kind of traumatic experiences (total trauma score of the TEC), and a higher score on the total composite score of the TEC compared with the OB and NC subjects. More specifically, BED patients showed more emotional abuse and neglect compared to both the NC sample and the OB

patients and these findings are similar to those reported by others authors (Allison et al., 2007; Dalle Grave et al., 1996; Dalle Grave et al., 1997; Dominy, Johnson, & Koch, 2000; Grilo & Masheb, 2001; Pike et al., 2006). Nevertheless, no significant differences were found for physical abuse, bodily threat and sexual abuse, between the three samples.

Similarly, Favaro, Ferrara, and Santonastaso (2003) showed that a history of sexual or physical abuse was significantly associated with a high risk of developing anorexia nervosa and bulimia nervosa, but not with the risk of developing BED. This could stem from the fact that both physical and sexual abuse are usually relatively less frequent, when compared with a more cumulative, sustained effect of chronic emotional abuse or physical and emotional neglect (Hildyard & Wolfe, 2002). In this respect, a considerable amount of studies indicate that emotional abuse and neglect are the kind of traumatic experience most clearly associated with subsequent eating pathology relative to other forms of maltreatment, such sexual and physical abuse (Burns, Fischer, Jackson, & Groleau et al., 2012; Hund & Espelage, 2006; Kennedy, Ip, Samra, & Gorzalka, 2007; Kong & Bernstein, 2009; Mills, Newman, Cossar, & Murray, 2015; Racine & Wildes, 2015). In particular, childhood emotional abuse and neglect has been found to be more strongly associated with binge eating symptoms than both physical and sexual abuse (Feinson & Hornik-Lurie, 2016; Michopoulos et al., 2017). Moreover, recent review and meta-analysis found that emotional abuse and neglect were the most reported trauma in BED (Caslini et al., 2016; Kimber et al., 2017) and that BED patients reported less traumatic experiences involving body

contact (sexual or physical) compared with AN binge-purge subtypes and BN (Molendijk, Hoek, Brewerton & Elzinga, 2017). Although emotional abuse and neglect appears to be significantly higher in patients suffering from BED, compared with OB individuals (Allison et al., 2007) and normal control subjects (Pike et al., 2006), the nature and strength of correlation between these forms of child maltreatment and eating-related pathology is complex and remains poorly understood.

In this regards a number of potential psychological and neurobiological factors have been proposed as possible explanation of the association between childhood emotional abuse and neglect and the development of binge eating symptomatology.

The Neurosequential Model of Therapeutics (NMT; Perry & Hambrick, 2008) postulate that in certain sensitive periods, during which environmental experiences strongly influence synaptic growth (Heim & Binder, 2012; Knudsen, 2004), the absence of attentive primary caregiving may alter the functioning of the stress response systems and neural networks involved in emotional regulation, attachment, social communication, and affiliation (Perry & Hambrick, 2008). It is possible that early abuse and neglect affect or disorganize the functions of diencephalon, which is involved in appetite regulation (Perry, 2001; Perry & Dobson, 2013). In particular, patients with bulimic symptoms have been shown to exhibit a loss of normal satiety and an accompanying difficulty in stopping eating, in response to alteration in vago-vagal functions (Faris et al., 2008). Binge eating causes a reduction of hyperarousal and pain sensitivity due to the activation of the dorsal vagal system (Faris et al.,



2008), the same branch of the sympathetic nervous system mediating the shutdown-dissociation reaction in responses to trauma and acute stress (Porges, 2003). Thus, all these brain dysfunctions could predispose these children to disordered eating attitudes in adolescence and adulthood.

From an attachment perspective, early emotional abuse and neglect may engenders insecure attachment or, more often, disorganized attachment (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Riggs, 2010). Disorganized attachment is characterized by an irresolvable pattern of “fright without solution”, where the caregivers, even if not maltreating, are and contemporary a source of protection and threat (Main & Solomon, 1990; Liotti, 2004, 2006, 2013). This attachment working model can lead to an increase in HPA axis activity (Gunnar & Quevedo, 2007; Petrowski, Beetz, Schurig, Wintermann, & Buchheim, 2017), such as elevated baseline cortisol, as well as greater increase and slower decline of cortisol following stress exposure (Tarullo & Gunnar, 2006), which in turn has been put in relation with both emotional dysregulation and strong binge eating desire in response to psychological stress cues in BED patients (Gluck, Geliebter, Hung, & Yahav, 2004; Gluck, Geliebter, & Lorence, 2004; Rosenberg et al., 2013). Moreover, the activity of HPA may be attenuated by increases in endogenous opioid release caused by eating palatable food (Adam & Epel, 2007; Morris, Beilharz, Maniam, Reichelt, & Westbrook, 2015), therefore functioning as a negative reinforcement toward binge eating behaviors (Gluck et al., 2004). In accordance with these neurodevelopmental evidences, difficulties with emotion regulation has been found to mediate a positive association

between insecure-anxious and disorganized attachment and binge eating symptoms in bariatric surgery candidates with BED (Shakory et al., 2015). Moreover, some studies have highlighted that BED patients have a higher rate of insecure and unresolved/disorganized attachment compared to the comparison samples of non-BED patients (Barone & Guiducci, 2009; Maxwell, Tasca, Grenon, Ritchie, Bissada, & Balfour, 2017).

The findings discussed above fit with Emotion Regulation Hypothesis of binge eating (Overton, Selway, Strongman, & Houston, 2005) and are supported by clinical evidence indicating that dysfunction in emotion regulation may mediate the relationship between childhood emotional abuse and neglect and bulimic symptoms (Groleau et al., 2012; Mazzeo & Espelage, 2002). In this regards, BED patients with early life emotional abuse and neglect lack the experience of being contained by their caregivers in early life, thus it is unlikely that they develop a sense that the external environment is able to provide relief (van der Kolk, 2017). Consequently it is hypothesized that these children, unable to regulate their emotional states by themselves (van der Kolk, 2017), learn to use binge eating in an effort to temporally relieve intense emotional states (Burns et al., 2012; Gianini, White, & Masheb, 2013; Racine et al., 2017; 2018), and trauma-related memories and cognitions (Briere & Scott, 2007).

Regarding dissociation, we found that the BED group shows higher scores on the DIS-Q total scale, and on all 3 subscales of the DIS-Q (identity confusion, loss of control, amnesia) when compared to both the OB and NC sample. Seven BED

subjects (20.6%) showed DIS-Q total score exceeding the 2.9 cut off point, suggesting the possibility of the presence of a dissociative disorder. In line with other findings (see Pollert et al., 2013), the rates on the DIS-Q subscale loss of control were the most elevated in the BED sample. On the other hand, no significant differences were found on the DIS-Q, between the OB and the NC sample, a finding consistent with data from two other studies (Dalle Grave et al., 1997; Dalle Grave et al., 1996).

Concerning somatoform dissociation, the BED sample showed significantly higher rates of somatoform dissociation measured with SDQ-20 and SDQ-5, compared with both the OB and the NC sample, whereas no significant differences were found between the OB and the NC subjects. Furthermore, the number of subjects exceeding the cut-off of 8 to the SDQ-5 subscale is significantly higher in the BED group compared to both the OB and NC groups. The scores of somatoform dissociation in BED individuals are very similar to those reported by BED subjects in our previous study in which somatoform dissociation has been measured in a mixed sample of EDs (Palmisano et al., 2018). Moreover, our findings are similar to those reported by Waller et al. (2003) who found that both somatoform and psychological dissociation were higher in women who had a diagnosis of EDs with a bulimic component compared to patients with restrictive anorexia or healthy women.

Regarding the absence of significant differences found in both somatoform and psychoform dissociation between OB and NC groups it is possible that is due to the lack of differences in the rates of traumatic experiences between the two groups.

Consistent with the results of previous studies (Beato, Rodriguez, & Belmonte, 2003; La Mela et al., 2010; Oliosì & Dalle Grave, 2003; Palmisano et al., 2018; Dalle Grave et al., 1996; Vanderlinden et al., 1993), our study supports the hypothesis that psychological and somatoform dissociation and trauma may play an important role in both the understanding of the development and maintenance of binge eating behaviors (Demitrack, Putnam, Brewerton, Brandt, & Gold, 1990).

According to the theory of escape from self-awareness (Heatherton & Baumaister, 1991), subjects with bulimia or BED, in order to escape from reactivation of traumatic memories or from negative emotional states, tend to alter the state of individual consciousness, inducing dissociation. This shift towards lower levels of awareness, removes inhibitions, which may facilitate the occurrence of binge-eating or overeating, in EDs patients (Engelberg et al., 2007). In the other hand, Hallings-Pott, Waller, Watson, and Scragg (2005), using an experimental design, found that the exposure to subliminal clues inducing negative mood, increases the dissociative states, particularly the derealization, in the bulimic women, whereas in the healthy subjects these clues had no effect.

Another hypothesis explaining the link between traumatic experiences, dissociation and binge eating symptoms, focuses on negative perceptions and cognitions of one's own body (Fuller-Tyszkiewicz & Mussap, 2009). Consistent with this explanation, some authors found that body dissatisfaction are strongly associated with the severity of both childhood trauma (Dunkley et al. 2010; Muehlenkamp et al. 2011; Preti et al., 2006) and somatoform dissociation (Fuller-Tyszkiewicz & Mussap,

2008; 2009; 2011; Treuer et al., 2005; Waller et al., 2001), which in turn have been related to binge eating behaviors (Fuller-Tyszkiewicz & Mussap, 2008). Particularly, Fuller-Tyszkiewicz and Mussap (2008) found that body dissatisfaction and impulsive urgency partially mediate the relationship between somatoform dissociation and binge eating severity. On this basis, they highlights that somatoform dissociation, reflecting traumatic memories stored in the body (van der Kolk, 1994; Nijenhuis et al., 1996) may cause body image instability and distortion (Fuller-Tyszkiewicz & Mussap, 2011; Mussap & Salton, 2006), therefore predisposing individuals to adopt a range of unhealthy eating behaviors (Fairburn et al., 2003).

### **Implications**

The present study is part of a multidisciplinary research project concerning the role of early life traumatic experiences and attachment in problem behaviors in different stages of life (Innamorati et al., 2018; Palmisano et al., 2018). Our results suggest the necessity of assessing the presence of trauma and both somatoform and psychological dissociation in BED patients. When trauma and dissociative symptoms are present, the psychotherapeutic approach must incorporate specific methods for the treatment of trauma and both psychological and somatoform dissociation (Kennerley, 1996; van der Hart, Nijenhuis, & Steele, 2006). In this regard, a recent study carried out by Vanderlinden, Adriaensen, Vancampfort, Pieters, Probst, and Vansteelandt (2012), showed that a manualised cognitive behavioral group therapy (Vanderlinden, Pieters, Probst, & Norré, 2007; Vanderlinden, 2008) not only resulted in a significant

decrease in binge eating and weight, but also in a significant decrease of dissociative symptoms and increase of general psychological wellbeing.

Furthermore, mindfulness and acceptance based approaches, such as dialectical behavioral therapy (DBT; Linehan, 1993) and acceptance and commitment therapy (ACT; Harris, 2006; Hayes, Strosahl, & Wilson, 1999), turned out to be very useful in decreasing trauma-related symptoms (Batten, & Hayes, 2005; Becker & Zayfert, 2000; 2001; Wagner & Linehan, 2006; Walser, & Westrup, 2007; Walser & Hayes, 2006). Indeed, both these models suggest that the engagement in strategies designed to avoid or escape the experience of thoughts, emotions, memories and situations related to trauma, including emotional numbing and dissociation have a key role in the development and maintenance of post-traumatic stress symptoms (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996; Salters-Pedneault, Tull, & Roemer, 2004; Purdon, 1999). Thus, the methods used in ACT and mindfulness-based therapy are specifically directed at decreasing the use of avoidance or escape strategies, at increasing the acceptance of traumatic experiences and at encouraging the commitment to actions that are consistent with their life values (Follette, Palm, & Pearson, 2006).

## **Conclusion**

In conclusion, the current study revealed that traumatic experiences, especially childhood emotional abuse and neglect, and both psychoform and somatoform dissociation are more present in obese and overweight subjects with BED compared with OB individuals and normal weight control subjects. These findings may

contribute to support the hypothesis that trauma and dissociation increase the risk to develop BED in adulthood. Moreover, clinicians must be aware of the full range of different traumatic experiences, not only physical and sexual abuse, and systematically assessing the presence of these events, since the ED patients who report early trauma history often show a worse outcome than not traumatized ones (Carretero-Garcia et al., 2012). In addition, traumatized ED patients tend to drop out more likely in the psychotherapeutic treatment compared to those that did not have experienced such events (Grilo & Masheb, 2002). At the same time it is important to assess dissociation in clinical routine evaluation in EDs since it has been demonstrated that also dissociative experiences predict negative outcomes in the therapy of EDs (La Mela, Maglietta, Lucarelli, Moro, & Sassaroli, 2013; Speranza, Loas, Wallierd, & Corcosb, 2007; Sarracino, Garavaglia, Gritti, Parolin, & Innamorati 2013). Next, because childhood adversities are associated with adult risk to develop BED, increased attention must be given to the prevention of these adversities (Bruffaerts & Demyttenaere, 2009; Felitti & Williams, 1998). Future research should also include in their analyses the mediators able to better explain the relationship between childhood traumatic experiences and the development of binge eating symptomatology in adulthood.

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ABSTRACT: The aim of the current study is to evaluate the presence of childhood trauma, psychological and somatoform dissociation in obese and overweight patients with and without binge eating disorder (BED). 34 patients with BED diagnosis, were compared with a sex, age and social class matched sample of 34 obese patients (OB) without diagnosis of BED and with a control sample consisting of 34 healthy people (NC) with normal weight. Traumatic experiences were assessed by means of the Traumatic Experiences Checklist (TEC). Psychoform and somatoform dissociation were assessed respectively by means of the Dissociation Questionnaire (DIS-Q) and Somatoform Dissociation Questionnaire (SDQ-20). BED patients reported significantly more childhood traumatic experiences, psychological and somatoform dissociation, compared to OB patients and NC sample. Moreover, OB patients showed more traumatic experiences compared to the NC sample. BED patients showed higher levels of childhood neglect and emotional abuse compared to the OB patients and NC sample. No significant differences were shown between OB patients and NC subjects with respect to level of psychological and somatoform dissociation. Our results confirm the necessity of evaluating emotional abuse and neglect in adults with BED, and the importance of assessing psychoform and somatoform dissociation in these patients. Tailored treatment strategies based on trauma and dissociation may improve outcomes among patients with BED and a history of childhood trauma.

## Tables of content

**Table 1.**

Comparison Between BED group, OB group and HC group in Biometric and Sociodemographic Variables .

| Variables            | BED (n = 34)   | OB (n = 34)   | NC (n = 34)   | $\chi^2$ | <i>p</i> | group comparisons          |
|----------------------|----------------|---------------|---------------|----------|----------|----------------------------|
| Age                  | 36.65 (14.69)  | 40.12 (14.76) | 36.82 (14.59) | 1.106    | n.s.     | BED = OB = NC              |
| Females              | 25 (73.5%)     | 25 (73.5%)    | 25 (73.5%)    |          |          | BED = OB = NC              |
| Males                | 9 (26.5%)      | 9 (26.5%)     | 9 (26.5%)     |          |          | BED = OB = NC              |
| Education            |                |               |               |          |          |                            |
| Years of education   | 12.53 (2.86)   | 12.24 (4.11)  | 12.32 (3.36)  | 0.207    | n.s.     | BED = OB = NC              |
| Primary education    | 3 (9.1%)       | 1 (5.9%)      | 2 (2.9%)      | 10.174   | n.s.     | BED = OB = NC              |
| Secondary education  | 3 (9.1%)       | 8 (29.4%)     | 10 (23.5%)    |          |          | BED = OB = NC              |
| Higher education     | 25 (68.2%)     | 20 (41.2%)    | 14 (58.8%)    |          |          | BED = OB = NC              |
| University education | 3 (13.6%)      | 5 (23.5%)     | 8 (14.7%)     |          |          | BED = OB = NC              |
| Weight               | 104.53 (18.20) | 99.29 (19.82) | 62.35 (10.64) | 62.942   | < .0001  | BED = OB > NC <sup>a</sup> |
| BMI                  | 38.51 (6.47)   | 36.68 (6.55)  | 22.50 (2.29)  | 68.399   | < .0001  | BED = OB > NC <sup>a</sup> |
| Work situation       |                |               |               |          |          |                            |
| Housewife            | 12 (35,3%)     | 10 (29,4%)    | 7 (20,6%)     | 10.230   | n.s.     | BED = OB = NC              |
| Public Servant       | 4 (11,8%)      | 7 (20,6%)     | 8 (23,5%)     |          |          | BED = OB = NC              |
| Unemployed           | 7 (20,6%)      | 5 (14,7%)     | 4 (11,8%)     |          |          | BED = OB = NC              |
| Retired              | 3 (8,8%)       | 1 (2,9%)      | 2 (5,9%)      |          |          | BED = OB = NC              |
| Self-employed        | 1 (2,9%)       | 7 (20,6%)     | 5 (14,7%)     |          |          | BED = OB = NC              |
| Student              | 7 (20,6%)      | 4 (11,8%)     | 8 (23,5%)     |          |          | BED = OB = NC              |
| Social class         |                |               |               |          |          |                            |
| High                 | 7 (20,6%)      | 7 (20,6%)     | 7 (20,6%)     | 1.000    | n.s.     | BED = OB = NC              |
| Medium               | 20 (58,85%)    | 20 (58,8%)    | 20 (58,8%)    |          |          | BED = OB = NC              |
| Low                  | 7 (20,6%)      | 7 (20,6%)     | 7 (20,6%)     |          |          | BED = OB = NC              |
| Marital status       |                |               |               |          |          |                            |
| Married/cohabiting   | 11 (32.4 %)    | 16 (47.1%)    | 14 (41.2%)    | 6.111    | n.s.     | BED = OB = NC              |
| Unmarried            | 18 (52.9 %)    | 12 (35.3%)    | 18 (52.9%)    |          |          | BED = OB = NC              |
| Widow                | 3 (8.8 %)      | 2 (5.9%)      | 1 (2.9%)      |          |          | BED = OB = NC              |
| Divorced/ Separated  | 2 (5.9 %)      | 4 (11.8%)     | 1 (2.9%)      |          |          | BED = OB = NC              |

Note. BMI = Body Mass Index (kg/m<sup>2</sup>); BED = Binge Eating Disorder group; OB = Obese group; NC = Normal Control group.

Statistics: Mean (SD) for age, years of education, weight and BMI; frequency and percentage within group for level of education, marital status; Kruskal-Wallis H-test for the comparison between groups for age, years of education, weight, BMI; Mann-Whitney U-test for the multiple comparisons between groups for age, years of education, weight and BMI; Chi square Test for comparison between categorical variables, level of education, work situation, social class and marital status.

<sup>a</sup>Means differ at  $p < .0001$  in the Mann-Whitney U-Test



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**Table 2.**

Comparison between BED, OB and HC on dimensional measures of traumatic experiences.

| Variables | Mean (S.D.)  |             |             | $\chi^2$ | <i>p</i> | group comparisons                         |
|-----------|--------------|-------------|-------------|----------|----------|---|
|           | BED (n = 34) | OB (n = 34) | NC (n = 34) |          |          |   |
| TEC total | 4.91 (2.74)  | 4.06 (2.84) | 2.06 (1.92) | 19.96    | < .0001  | BED > OB > NC <sup>a</sup>                |
| TEC-1     | 7.76 (7.10)  | 4.35 (6.25) | 2.62 (4.47) | 12.63    | < .005   | BED > (OB = NC) <sup>a</sup>              |
| TEC-2     | 4.03 (4.29)  | 1.68 (2.98) | 0.79 (1.87) | 17.72    | < .0001  | BED > (OB = NC) <sup>a</sup>              |
| TEC-3     | 2.68 (4.13)  | 1.79 (3.00) | 0.65 (1.39) | 4.34     | < .0001  | BED > NC <sup>a</sup> ; BED = OB; OB = NC |
| TEC-4     | 0.41 (1.08)  | 0.53 (1.54) | 0.44 (1.46) | 0.14     | n.s.     | BED = OB = NC                             |
| TEC-5     | 0.50 (1.48)  | 0.24 (0.95) | 0.18 (0.58) | 1.49     | n.s.     | BED = OB = NC                             |
| TEC-6     | 0.15 (0.61)  | 0.12 (0.69) | 0.06 (0.34) | 0.50     | n.s.     | BED = OB = NC                             |

Note. BED = binge eating disorder group; OB = obesity group; NC = normal control group; TEC total = Traumatic Experiences Checklist total score; TEC-1 = total TEC composite score; TEC-2 = neglect; TEC-3 = emotional abuse; TEC-4 = bodily threat and physical abuse; TEC-5 = sexual harassment; TEC-6 = sexual abuse.

Statistics: Means and Standard Deviation for all groups; Kruskal-Wallis H-test for comparison between the three groups; Mann-Whitney U-test for multiple comparisons between BED and OB, BED and NC, OB and NC;

<sup>a</sup> Means differ at least for  $p < .05$  in the Mann-Whitney U-Test.

**Table 3.**

Comparison between BED, OB and HC on psychological dissociation and somatoform dissociation.

| Variables    | Mean (S.D.)  |              |              | $\chi^2$ | <i>p</i> | group comparisons            |
|--------------|--------------|--------------|--------------|----------|----------|------------------------------|
|              | BED (n = 34) | OB (n = 34)  | NC (n = 34)  |          |          |                              |
| DIS-Q total  | 2.30 (0.67)  | 1.73 (0.42)  | 1.76 (0.59)  | 19.87    | < .0001  | BED > OB > NC <sup>a</sup>   |
| DIS-Q 1      | 1.99 (0.71)  | 1.42 (0.40)  | 1.43 (0.64)  | 21.04    | < .0001  | BED > (OB = NC) <sup>a</sup> |
| DIS-Q 2      | 2.58 (0.69)  | 1.70 (0.52)  | 1.72 (0.72)  | 30.25    | < .0005  | BED > (OB = NC) <sup>a</sup> |
| DIS-Q 3      | 1.87 (0.82)  | 1.41 (0.38)  | 1.38 (0.52)  | 12.15    | < .005   | BED > (OB = NC) <sup>a</sup> |
| DIS-Q 4      | 2.56 (0.87)  | 2.03 (0.59)  | 2.51 (0.98)  | 7.38     | < .05    | (BED = NC) > OB <sup>a</sup> |
| SDQ-20 total | 24.18 (4.53) | 21.65 (2.78) | 21.50 (2.56) | 11.34    | < .005   | BED > OB <sup>a</sup> = NC   |
| SDQ-5        | 5.79 (1.43)  | 5.32 (0.77)  | 5.15 (0.44)  | 4.441    | < .05    | BED > OB <sup>a</sup> = NC   |

Note. BED = binge eating disorder group; OB = obesity group; NC = normal control group; DIS-Q total = Dissociation Questionnaire total score; DIS-Q 1 = identity confusion; DIS-Q 2 = loss of control; DIS-Q 3 = amnesia; DIS-Q 4 = absorption; SDQ-20 total = Somatoform Dissociation Questionnaire total score; SDQ-5 = Somatoform Dissociation Questionnaire short version.

Statistics: Mean (SD) for all groups; Kruskal-Wallis H-test for comparison between the three groups; Mann-Whitney U-test for multiple comparisons between BED and OB, BED and NC, OB and NC;

<sup>a</sup> Means differ at least for  $p < .05$  in the Mann-Whitney U-Test.