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ORIGINAL ARTICLE

Parental bonding, childhood maltreatment and eating disorder psychopathology: an investigation of their interactions

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Abstract

Purpose Childhood trauma and parental bonding have been widely recognized as risk factors for eating disorders (EDs). However, their interplay in determining ED psychopathology has been poorly investigated. Consequently, we have assessed their interaction with core ED psychopathological symptoms.

Methods Fifty-seven patients with anorexia nervosa, 43 with bulimia nervosa and 77 healthy women completed the Childhood Trauma Questionnaire, the Parental Bonding Instrument and the Eating Disorder Inventory-2. Chi square test and regression analyses with a moderation model were performed to investigate the interplay between childhood trauma, parental bonding and ED symptoms such as ineffectiveness, social insecurity, drive to thinness, interoceptive awareness, impulsivity and perfectionism.

Results Compared to controls, patients with EDs showed higher levels of trauma and parental control perception and lower levels of parental care. Childhood maltreatment was more prevalent in patients with the affectionless control parental style. Moderation analyses revealed that higher maternal control significantly predicted the ED symptom of social insecurity only when participants experienced lower levels of emotional abuse.

Conclusions These findings demonstrate an interplay between deranged problematic parental bonding and childhood trauma in promoting a possible vulnerability to social insecurity, one of the most central dimensions of ED psychopathology. This interaction might have psychotherapeutic implications.

Level of evidence Level V, cross-sectional descriptive study.

Keywords Attachment · Parenting style · Childhood abuse · Eating disorders · Social insecurity

Introduction

Eating disorders (EDs) are complex psychiatric illnesses with severe medical consequences [1]. Several factors contribute to the pathogenesis of EDs [2], including insecure attachment styles and childhood trauma exposure [3, 4].

Bowlby [5] defined attachment as an innate psychobiological system that promotes infant's interactions with caregivers to guarantee the infant's survival. The quality of these interactions leads to the development of internal working models, which represent cognitive–emotional expectations of self-worth and other's availability and care in relationships, that persist later in adulthood and have been defined as adult attachment styles [6]. Indeed, studies in adults found that patterns of relational expectations, emotions and behaviors result from attachment history [7]. Thus, individual differences in adult attachment style begin

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in childhood interactions with parents [8], although adolescence or adult meaningful interactions also may have a role in the development/consolidation of adult attachment style [9, 10]. The continuity between the perception of parental bonding and adult attachment models has been demonstrated in healthy young adults across different cultures [11–13]. A more recent longitudinal study also confirmed this hypothesis and showed that high control parenting contributes to development of attachment style with a negative self-image [14]. However, it is important to underline that literature studies have traditionally focused on the Bowlbian attachment construct, which primarily involves parental emotional responsiveness to children, paying no attention to the effects of parental protection and control [15]. This leads to the need to investigate both these dimensions of parenting style that contribute to attachment development.

It is widely believed that insecure attachment is a non-specific vulnerability factor conferring an increased risk of responding with emotional problems and/or maladaptive behaviors to potentially threatening and stressful stimuli [16, 17]. As a result, an insecure attachment style may promote ED development through maladaptive perfectionism [18], negative affect [19], abnormal body experience [20] and interpersonal rejection sensitivity [21], which have all been implicated in ED pathophysiology. Compared to healthy subjects, individuals with EDs exhibit a higher prevalence of insecure attachment [see for review 4] with no significant difference in parental bonding among the main ED diagnostic categories [22]. Indeed, according to a recent review [23], only two out of nine studies identified differences between patients with anorexia nervosa (AN) and bulimia nervosa (BN), with a higher paternal protection in the latter group. Paternal overcontrol has also been observed in other studies but without significant differences between AN and BN. Indeed, Romans et al. [24] found that paternal overcontrol predicted the development of both AN and BN in people who had experienced childhood sexual abuse, while Yamaguchi et al. [25] reported that parental overprotection was associated with suicidal behaviors in ED patients.

Experiences of childhood maltreatment have been shown to be even more common in EDs than in other psychiatric conditions [3]. A clear dose-dependent effect of early adverse experiences on eating symptoms has also been identified [26], and this association seems to be independent of psychiatric comorbidities, at least for childhood emotional abuse [26]. According to the most recent meta-analyses [3, 27], some differences have been detected in the prevalence rates of the different types of maltreatment among ED diagnoses. Caslini et al. [27] reported a less significant association between sexual abuse and AN compared to that observed in BN and binge eating disorder (BED), while physical abuse was significantly associated with all EDs. Molendijk et al. [3] observed that the higher prevalence of every type of childhood maltreatment found in EDs than in healthy subjects was less pronounced in the AN restrictive subtype. Evidence of a more severe clinical presentation and specific biological features in maltreated patients with EDs has also been provided [28, 29], promoting the idea of the occurrence of a maltreated ED "ecophenotype" as in other psychiatric disorders [30].

The association between childhood maltreatment and parental bonding has been investigated in healthy subjects [31]. It has been hypothesized that either abusive or neglecting parenting may directly promote altered attachment schema in children. Similarly, witnessing domestic violence may induce fear in children who will not perceive their parents as being protective and this may lead to the indirect development of a disrupted attachment [32]. Furthermore, if on one hand maltreated children are at risk of developing an insecure attachment [31, 33], on the other hand insecure attachment can influence the psychological response to early trauma [34], suggesting a reciprocal interaction between these two factors.

To the best of our knowledge, only one study [35] has investigated the association between attachment styles and early trauma exposure in subjects with EDs and has specifically found that childhood adverse experiences were associated to the ED psychopathology through the mediation of adult anxious and avoidant attachment. However, according to Cicchetti and Doyle [36], there is some doubt surrounding the testing of a mediation model when there is no empirical evidence of the ordering time between attachment style and trauma exposure. Therefore, the interaction between childhood maltreatment and attachment in patients with EDs needs to be explored more thoroughly. For this purpose, it is worth investigating the effects that parental levels of protection and control have on this interaction [15]. Consequently, in the present study we explored the relationships between attachment styles, evaluated as parental bonding perception, childhood maltreatment and eating-related psychopathology in young adult patients with EDs. We have hypothesized that: (i) parenting style characterized by high control and low care as well as childhood trauma exposure are more frequent in patients with EDs than in healthy controls; (ii) childhood trauma exposure is more frequent in insecure attached ED patients; (iii) parental bonding perception and childhood maltreatment are significantly associated to ED psychopathology and their interplay affects the strength of their association with ED symptoms, given the suggested reciprocal interaction between these two factors [31, 33, 34].

Materials and methods

Participants

Consecutive patients attending the Eating Disorder Center of the Department of Psychiatry at the University of Campania

"Luigi Vanvitelli" were enrolled in the study if they met the following criteria: (a) female gender; (b) age ≥ 18; (c) current diagnosis of anorexia nervosa (AN) or bulimia nervosa (BN), according to DSM-5 and confirmed by the Structured Clinical Interview for DSM-5 Disorders-Research Version [37]; (d) absence of severe physical disorders; (e) no history of endocrine disorders, psychoactive substance use or head trauma; (f) willingness to cooperate in the experimental procedures and to sign a written informed consent. All patients were tested before entering specific treatment programs.

Healthy controls (HC) were recruited among students of the Naples' University of Campania "Luigi Vanvitelli", provided they met the following inclusion criteria: (a) absence of current and lifetime Axis I psychiatric disorders and intellectual disability, (b) no history of head trauma or substance abuse, (c) absence of physical diseases and current drug use, (d) body mass index (BMI) between 18.5 and 25.0 kg/m^2.

The final ED sample was composed of 57 women with AN (41 with AN restrictive sub-type and 16 with AN purging sub-type) and 43 women with BN; 77 healthy women were also enrolled. The mean age of the healthy women did not significantly differ from that of each ED group. Given the reported reduced prevalence of maltreatment in patients with AN restricting type in comparison to other EDs [3, 27], we distinguished participants with AN restricting type from those with AN purging type and, because of the low number of the latter (only 16) in our sample, we merged these patients with BN ones in a single "binging–purging" (BP) group.

Procedure

Sociodemographic, psychopathological and clinical data were collected through a face-to-face interview by expert psychiatrists.

Each participant in the study was asked to fill in the following questionnaires: (1) the Eating Disorders Inventory-2 (EDI-2) [38]; (2) the Parental Bonding Instrument (PBI) [15]; (3) the Childhood Trauma Questionnaire (CTQ) [39].

The EDI-2 assesses ED symptomatology and psychopathology. The questionnaire includes 11 subscales: ineffectiveness (ten items; Cronbach's $\alpha = 0.87$; "I would like to be someone else"); social insecurity (eight items; Cronbach's $\alpha = 0.78$; "I know people love me"); drive to thinness (seven items; Cronbach's $\alpha = 0.9$; "I eat sweets and carbohydrates without feeling nervous"); interoceptive awareness (ten items; Cronbach's $\alpha = 0.81$; "I feel bloated after a normal meal"); maturity fear (eight items; Cronbach's $\alpha = 0.68$; "I would like to be younger"); body dissatisfaction (nine items; Cronbach's $\alpha = 0.78$; "I think my thighs are too big"); perfectionism (six items; Cronbach's $\alpha = 0.86$; "only excellent results are accepted in my family"); interpersonal distrust (seven items; Cronbach's $\alpha = 0.78$; "I talk about my feelings"); impulsivity (eleven items; Cronbach's $\alpha = 0.8$; "I impulsively say things that I regret having said"); bulimia (seven items; Cronbach's $\alpha = 0.89$; "I kept bingeing feeling like I could not stop myself"); ascetism (eight items; Cronbach's $\alpha = 0.85$; "I am ashamed of the needs of my body").

The PBI is a 25-item questionnaire designed for adults which measures attachment to parents along two dimensions, namely care (12 items) and control (13 items), perceived in parental bonding up to the age of 16 years. Sample items are "he/her spoke to me in a warm and friendly voice" for the care subscale and "he/her tried to control everything I did" for the control subscale. Parental care and control have two poles defined as high and low, according to the cutoff scores previously identified [15], that can be combined providing four parental style categories. Indeed, high care and low control identify the optimal parenting, high control and high care characterize the affectionate constraint style, low care and high control distinguish the affectionless control style and low care and low control are typical of the neglectful parenting style. In our ED sample, Cronbach's α values were 0.87 for maternal care, 0.81 for maternal control, 0.83 for paternal care and 0.78 for paternal control.

The CTQ [39] explores childhood trauma exposure. It is a 28-item questionnaire which identifies childhood experience across five types of childhood maltreatment: emotional neglect (EN) (five items; Cronbach's $\alpha = 0.87$; "when I was child/adolescent I felt loved"), emotional abuse (EA) (five items; Cronbach's $\alpha = 0.81$; "when I was child/adolescent parents wished was never born"), sexual abuse (SA) (five items; Cronbach's $\alpha = 0.73$; "when I was child/adolescent I was sexually abused"), physical neglect (PN) (five items; Cronbach's $\alpha = 0.76$; "when I was child/adolescent I had not enough to eat") and physical abuse (PA) (five items; Cronbach's $\alpha = 0.70$; "when I was child/adolescent I was punished with hard objects"). The scoring of the CTQ produces five subscale scores for each sub-type of maltreatment and a composite CTQ total score encompassing all five subscale scores. Validated cutoff scores indicating the occurrence of maltreatment are: emotional neglect ≥ 15, emotional abuse ≥ 10, sexual abuse ≥ 8, physical abuse ≥ 8, physical neglect ≥ 8 [40]. For our purposes, subjects were classified as maltreated participants when they scored higher than the threshold in at least one subscale, and as non-maltreated participants when they scored below the thresholds for all five subscales.

The study was approved by the Institutional Board of the "Department of Mental Health, Physical Health and Preventive Medicine" of the University of Campania "Luigi Vanvitelli", Naples, Italy.

Statistical analysis

One-way ANOVA followed by Tukey's post hoc test was used to compare age, BMI, illness duration, age at onset, EDI-2, PBI and CTQ total and sub-scores among the study groups. The presence/absence of childhood maltreatment as a single dichotomous variable (maltreated or non-maltreated participants) and the prevalence of PBI parental styles were compared among the study groups by the Chi square test.

To assess the associations between PBI and CTQ sub-scores with ED psychopathology (EDI-2 sub-scores), Pearson's correlations were performed. Moreover, differences in the prevalence of maltreated subjects among the categories of PBI parental styles were evaluated in the overall ED group and in healthy subjects. To assess if the interaction between PBI and CTQ sub-scores predicts ED symptomatology, in the light of the lack of empirical evidence of the ordering time between PBI and CTQ variables [36] which advises against the possibility to test a mediation model, we ran moderation analyses. Moderation analyses explored whether the association between perceived parental bonding and EDI-2 symptoms changes according to the levels of the CTQ variable. According to Baron and Kenny [41], a moderator is a qualitative or quantitative variable that affects the direction and/or the strength of the association between an independent or predictor variable and a dependent or criterion variable. PROCESS program estimated a simple moderation model with the effect of PBI sub-score on EDI-2 sub-score moderated by levels of CTQ sub-score. Conditional effects of PBI sub-score ("simple slopes") on EDI-2 dimension for different levels of CTQ scores were calculated by means of linear regression analyses. For all analyses, we verified that collinearity between predictors was not an issue (i.e., VIF < 2).

All analyses were performed using SPSS version 24 (SPSS Inc, Chicago, IL, USA).

Results

General results

The ANOVA results (Table 1) show that compared to healthy women, patients with AN restricting type and those with BP behaviors reported higher values in all EDI-2 and CTQ subitem scores, except for the EDI-2 bulimia score and CTQ sexual abuse and physical abuse scores, which did not differ between AN restricting type patients and healthy controls. Similarly, both ED patient groups scored higher than healthy controls in maternal and paternal control PBI sub-scores, but lower in parental care PBI sub-scores (Table 1). When the two groups of patients were compared, significant differences emerged in EDI-2 interpersonal distrust, impulsivity and bulimia scores (Table 1).

The Chi square results (see Tables 2, 3) show that the distribution of maltreated and non-maltreated individuals was statistically different between ED and healthy women groups ($\chi^2 = 30.3$; $p < 0.001$; Cramer's $V = 0.42$), since among the patients with EDs, 63 were classified as maltreated and 37 as non-maltreated, while among healthy women, 15 (20%) were maltreated and 57 (80%) were non-maltreated. No significant differences emerged between AN restricting type and BP groups in the prevalence of maltreated subjects and in the frequency of the different childhood maltreatment sub-types (Table 2). Compared to healthy controls, all maltreatment events were more frequent in AN restricting and BP groups with the exception of sexual abuse whose prevalence was higher only in the BP group (Table 2).

The prevalence of each parental PBI category was significantly different between patients and healthy controls, while it did not differ between AN restricting type and BP groups: both patient groups reported higher prevalence of the affectionless control style and a reduced rate of the optimal style in the comparison to healthy women, either for maternal ($\chi^2 = 50.13$; $p < 0.001$; Cramer's $V = 0.37$) or paternal ($\chi^2 = 56.32$; $p < 0.001$; Cramer's $V = 0.4$) bonding (Table 3). Moreover, with respect to healthy controls, patients in the BP group reported a higher incidence of the neglectful maternal style and of the affectionate constraint paternal style, while the restrictive group showed an increased prevalence of the neglectful paternal style (Table 3). No significant differences emerged between the two patient groups.

Given the lack of statistically significant differences in most of the EDI-2 sub-scores, in PBI and CTQ emotional sub-scores as well as in the prevalence of childhood maltreatment between patients with AN and those with BP behaviors, in the following analyses, according to the transdiagnostic perspective of EDs [42], we merged the two diagnostic groups into a single ED group. In the ED sample, the prevalence of maltreatment was higher when patients reported the affectionless control maternal ($\chi^2 = 8.341$; $p = 0.039$; Cramer's $V = 0.29$) and paternal styles ($\chi^2 = 10.99$; $p = 0.011$; Cramer's $V = 0,33$). This was not evident in healthy controls.

Pearson's correlations

In the sole ED patient group, the PBI maternal and paternal care scores were significantly negatively correlated with the CTQ emotional neglect and emotional abuse scores, whereas the PBI maternal and paternal control scores were significantly positively correlated with nearly every CTQ subscale scores (Table 4). Among CTQ items, only the CTQ emotional abuse was positively and significantly correlated with EDI-2 ineffectiveness, social insecurity,

Table 1 Clinical and demographic characteristics of anorexia nervosa restricting (ANR) and binging–purging (BP) patients and healthy controls (HC)

	ANR patients ($n=41$)	BP patients ($n=59$)	HC ($n=77$)	F
AGE, years	25.45 ± 8.02	27.14 ± 9.78	25.58 ± 2.31	1.87
BMI, kg/m^2	16.74 ± 2.08^a	21.59 ± 6.07^b	21.30 ± 2.06^b	18.39**
Age of onset	18.16 ± 5.72	19.98 ± 7.15		− 0.45§
Illness duration	7.21 ± 6.87	9.25 ± 8.33		− 1.33§
EDI-2_IN	12.84 ± 8.07^a	14.40 ± 8.28^a	1.85 ± 3.23^b	77.04**
EDI-2_SI	9.32 ± 4.38^a	9.09 ± 4.25^a	3.23 ± 2.42^b	51.79**
EDI-2_DT	14.05 ± 6.43^a	15.54 ± 5.90^a	2.36 ± 4.26^b	45.31**
EDI-2_IA	13.53 ± 7.16^a	16.33 ± 7.35^a	1.40 ± 2.92^b	112.49**
EDI-2_MF	10.79 ± 6.45^a	9.68 ± 6.19^a	4.33 ± 4.19^b	26.45**
EDI-2_BD	13.61 ± 7.19^a	16.51 ± 6.96^a	5.76 ± 4.79^b	57.42**
EDI-2_P	7.61 ± 5.04^a	6.89 ± 4.57^a	3.45 ± 3.13^b	19.54**
EDI-2_ID	9.50 ± 4.51^a	6.79 ± 4.21^b	2.01 ± 2.78^c	62.24**
EDI-2_I	8.05 ± 6.41^a	11.72 ± 8.21^b	1.87 ± 3.27^c	45.31**
EDI-2_BU	1.71 ± 2.57^a	10.42 ± 6.02^b	0.92 ± 1.75^a	112.49**
EDI-2_ASC	7.68 ± 5.14^a	9.18 ± 4.45^a	2.62 ± 1.72^b	59.77**
CTQ_EA	9.48 ± 4.52^a	9.54 ± 4.02^a	6.17 ± 2.21^b	22.74**
CTQ_EN	11.42 ± 5.22^a	13.21 ± 4.58^a	8.15 ± 3.55^b	24.35**
CTQ_SA	6.61 ± 3.76^{a,b}	6.86 ± 3.80^a	5.25 ± 0.80^b	6.34**
CTQ_PA	6.13 ± 1.72^{a,b}	6.51 ± 2.20^a	5.50 ± 1.03^b	5.58**
CTQ_PN	6.68 ± 2.62^a	6.60 ± 2.03^a	5.54 ± 1.13^b	7.35**
PBI_Mcare	24.45 ± 8.80^a	22.35 ± 8.47^a	29.64 ± 5.86^b	16.18**
PBI_Mcontrol	17.39 ± 9.19^a	18.47 ± 8.84^a	11.40 ± 7.62^b	18.15**
PBI_Pcare	17.42 ± 10.19^a	19.82 ± 9.93^a	28.28 ± 6.54^b	21.53**
PBI_Pcontrol	16.37 ± 10.55^a	15.68 ± 8.57^a	9.01 ± 7.13^b	16.91**

EDI-2 Eating Disorder Inventory-2, *IN* ineffectiveness, *SI* social insecurity, *DT* drive for thinness, *IA* interoceptive awareness, *MF* maturity fear, *BD* body dissatisfaction, *P* perfectionism, *ID* interpersonal distrust, *I* impulsivity, *BU* bulimia, *ASC* ascetism, *CTQ* Childhood Trauma Questionnaire, *EA* emotional abuse, *EN* emotional neglect, *SA* sexual abuse, *PA* physical abuse, *PN* physical neglect, *PBI* parental bonding instrument, *M* maternal, *P* paternal

§Independent samples *t* test

*$p<0.05$: **$p<0.01$ (one-way ANOVA)

Table 2 Distribution of childhood maltreatment events in anorexia nervosa restricting type (AN-R), binging–purging (BP) type and healthy controls (HC) groups

	AN-R	BP	HC	Total
Emotional neglect	10 (27%)^a	20 (54.1%)^a	7 (18.9%)^b	37
Emotional abuse	19 (39.6%)^a	25 (52.1%)^a	4 (8.3%)^b	48
Sexual abuse	6 (25%)^{a,b}	14 (58.3%)^a	4 (16.7%)^b	24
Physical neglect	11 (33.3%)^a	17 (51.5%)^a	5 (15.2%)^b	33
Physical abuse	9 (32.1%)^a	14 (50%)^a	5 (17.9%)^b	28

Significant differences between groups are indicated by a and b

interoceptive awareness, perfectionism and impulsivity; PBI maternal control resulted in being positively and significantly correlated with EDI-2 social insecurity, interoceptive awareness, impulsivity and ascetism; PBI paternal control was positively and significantly associated with EDI-2 interoceptive awareness, perfectionism, impulsivity and ascetism (Table 4).

In the sole healthy control group, all PBI subscales significantly correlated with CTQ emotional neglect and emotional abuse sub-scores. Regarding the associations with ED psychopathology, all PBI sub-scores were significantly correlated to EDI-2 perfectionism; the PBI maternal care sub-score significantly correlated also with EDI-2 drive for thinness, intoreceptive awareness and interpersonal distrust; the PBI maternal control sub-score significantly correlated with EDI-2 intoreceptive awareness and the PBI paternal care sub-score correlated with EDI-2 interpersonal distrust. Among the CTQ subitem scores the sexual and physical abuse scores were the only ones that were not significantly correlated to anyone of the EDI-2 subitem scores (Table 5).

Correlation analyses were run also in the whole participant sample and results are shown in Table 6.

Table 3 Distribution of maternal and paternal styles in anorexia nervosa restricting type (AN-R), binging–purging (BP) and healthy controls (HC) groups

	AN-R	BP	HC	Total
PBI maternal style				
Optimal parenting	6 (11.5%)[a]	4 (7.7%)[a]	42 (80.8%)[b]	52
Affectionate constraint	11 (25%)[a]	14 (31.8%)[a]	19 (43.2%)[a]	44
Affectionless control	18 (32.7%)[a]	27 (49.1%)[a]	10 (18.2%)[b]	55
Neglectful parenting	6 (23.1%)[a,b]	14 (53,8%)[b]	6 (23.1%)[a]	26
PBI paternal style				
Optimal parenting	5 (7.6%)[a]	9 (13,6%)[a]	52 (78.8%)[b]	66
Affectionate constraint	10 (27.8%)[a,b]	16 (44.4%)[b]	10 (27.8%)[a]	36
Affectionless control	17 (34.7%)[a]	24 (49%)[a]	8 (16.3%)[b]	49
Neglectful parenting	9 (36%)[a]	10 (40%)[a,b]	6 (24%)[b]	25

Significant differences between groups are indicated by a and b

PBI Parental bonding instrument

Moderation model

Moderation analyses were conducted for those CTQ and PBI variables that resulted in being significantly correlated to EDI-2 sub-scores in ED patients. Thus, PROCESS [43] was used to test a simple moderation model with the effect of the perceived maternal control on EDI-2 dimensions moderated by the levels of childhood emotional abuse. The interaction between PBI maternal control and CTQ emotional abuse in relation to social insecurity was found to be significant ($b = -0.0237$; $p = 0.037$; CI -0.0459, -0.0014) (Fig. 1). A simple slopes analysis was performed to assess the interaction in terms of ranges of the moderator (emotional abuse) where PBI maternal control is significantly related to EDI-2 social insecurity and where it is not, according to PROCESS estimation of low, medium and high levels of the moderator. These analyses showed that the relationship between PBI maternal control and EDI-2 social insecurity was significant for ED participants with low levels of emotional abuse ($b = 0.21$, $p = 0.01$), but not for those with medium ($b = 0.1$, $p = 0.07$) or high ($b = 0.002$, $p = 0.9$) levels of emotional abuse (see Fig. 1). The same model did not show a significant interaction when the PBI paternal control was entered as an independent predictor instead of maternal control ($b = 0.004$; $p = 0.66$; CI -0.016, 0.025).

Similarly, according to the Pearson's correlation results showing a simultaneous association of CTQ emotional abuse and PBI paternal/maternal control with EDI-2 interoceptive awareness and impulsivity, we tested the moderation effect of CTQ emotional abuse on the associations between paternal/maternal PBI control and EDI-2 interoceptive awareness and impulsivity. The interaction between CTQ and PBI sub-score in the prediction of interoceptive awareness was not statistically significant neither for paternal control ($b = 0.0026$; $p = 0.8768$; CI -0.0307, 0.0359) or for maternal control ($b = -0.008$; $p = 0.63$; CI -0.0413, 0.0253). No significant moderation was detected considering EDI-2 impulsivity as outcome either for PBI maternal control ($b = -0.029$; $p = 0.14$; CI -0.067, 0.098) or for PBI paternal control ($b = 0.016$; $p = 0.37$; CI -0.02, 0.05). Finally, according to Pearson's results, we tested the interaction of CTQ emotional abuse and PBI maternal care/paternal control in the prediction of EDI-2 perfectionism. Both models were not significant (PBI maternal care: $b = 0.006$; $p = 0.6$; CI -0.019, 0.033; PBI paternal control: $b = 0.098$; $p = 0.39$; CI -0.012, 0.032).

The same moderation analyses were performed in healthy subjects. When PBI maternal control was entered as predictor, CTQ emotional abuse as moderator and EDI-2 social insecurity as the dependent variable, the interaction between maternal control and emotional abuse was significant ($b = -0.06$; $p = 0.006$; CI -0.109, -0.018). Simple slopes analysis showed a significant interaction between maternal control and emotional abuse only for high levels of emotional abuse ($b = -0.09$; $p = 0.04$). All the other moderation models were not significant in healthy controls.

In the whole sample, including both ED patients and healthy women, when PBI maternal control was entered as predictor, CTQ emotional abuse as moderator and EDI-2 social insecurity as the dependent variable, the interaction between maternal control and emotional abuse was significant ($b = -0.016$; $p = 0.04$; CI -0.033, -0.003). Simple slopes analysis showed a significant interaction between maternal control and emotional abuse for low levels ($b = 0.17$; $p < 0.01$) and medium levels ($b = 0.16$; $p < 0.01$) of emotional abuse. All the other moderation models were not significant in the whole group.

Finally, we conducted four additional moderation analyses. For all participants combined (ED patients and healthy controls), we assessed the interaction between CTQ total score and the four PBI scores (maternal care, maternal control, paternal care and paternal control) on the EDI-2 total score. None of these models was significant.

Discussion

According to our first study hypothesis, childhood experiences, whether insecure parental bonding or traumatic events, were more common in ED patients than in healthy subjects and were associated with each other and with ED psychopathology.

Table 4 Pearson's correlation coefficients in the ED group

	PBI_M_ care	PBI_M_ control	PBI_P_ care	PBI_P_ control	EDI-2_IN	EDI-2_SI	EDI-2_DT	EDI-2_IA	EDI-2_ MF	EDI-2_ BD	EDI-2_P	EDI-2_ID	EDI-2 I_	EDI-2_ BU	EDI-2_ASC
CTQ_EN	**−0.41****	0.16	**−0.33****	**0.22***	0.06	0.04	0.06	0.12	−0.10	0.05	0.10	−0.05	0.09	0.17	−0.03
CTQ_EA	**−0.24***	**0.31****	**−0.34****	**0.38****	**0.26***	**0.31****	0.08	**0.27****	0.04	0.16	**0.27****	0.03	**0.20***	−0.08	0.17
CTQ_SA	−0.04	**0.25***	−0.05	**0.28****	0.10	0.11	0.04	0.17	0.03	0.06	0.16	−0.04	0.16	0.02	0.07
CTQ_PN	**−0.36****	0.10	−0.13	**0.23***	0.01	−0.01	0.03	0.10	−0.18	0.04	0.18	−0.04	0.10	0.06	0.04
CTQ_PA	−0.11	0.19	−0.12	0.13	0.03	−0.04	0.02	0.13	−0.00	0.05	0.11	−0.14	0.16	0.18	0.04
PBI_M_ care					−0.04	−0.07	−0.02	−0.09	0.15	−0.19	**−0.21***	−0.01	−0.05	−0.19	−0.16
PBI_M_ control					0.16	**0.23***	0.16	**0.33****	0.10	0.17	0.17	0.07	**0.35****	0.07	**0.20***
PBI_P_ care					−0.09	−0.08	0.02	−0.13	−0.19	−0.02	−0.15	0.04	−0.14	0.05	−0.04
PBI_P_ control					0.00	0.19	0.19	**0.21***	0.12	0.06	**0.21***	0.05	**0.23***	0.07	**0.23***

Statistical significant correlations are reported in bold

EDI-2 Eating Disorder Inventory-2, *IN* ineffectiveness, *SI* social insecurity, *DT* drive for thinness, *IA* interoceptive awareness, *MF* maturity fear, *BD* body dissatisfaction, *P* perfectionism, *ID* interpersonal distrust, *I* impulsivity, *BU* bulimia, *ASC* ascetism, *CTQ* Childhood Trauma Questionnaire, *EA* emotional abuse, *EN* emotional neglect, *SA* sexual abuse, *PN* physical neglect, *PA* physical abuse, *PBI* parental bonding instrument, *M* maternal, *P* paternal

*Correlation is significant at $p < 0.05$ level (two-tailed)

**Correlation is significant at $p < 0.01$ level (two-tailed)

Table 5 Pearson's correlation coefficients in the healthy control group

	PBI_M_ care	PBI_M_ control	PBI_P_ care	PBI_P_ control	EDI-2_IN	EDI-2_SI	EDI-2_ DT	EDI-2_IA	EDI-2_ MF	EDI-2_ BD	EDI-2_P	EDI-2_ID	EDI-2 I_	EDI-2_ BU	EDI-2_ ASC
CTQ_EN	**−0.71****	**0.44****	**−0.43****	**0.41****	**0.24***	0.00	**0.29****	**0.38****	−0.21	0.14	**0.34****	0.19	**0.28***	0.19	**0.26***
CTQ_EA	**−0.75***	**0.23***	**−0.38****	**0.33****	0.16	−0.01	**0.23***	**0.27***	−0.10	0.21	**0.38****	0.19	**0.22***	0.07	0.06
CTQ_SA	−0.05	**0.31***	−0.18	0.06	0.09	0.03	0.08	0.14	0.09	−0.03	0.13	0.16	0.09	0.02	0.02
CTQ_PN	**−0.34****	0.03	**−0.36****	0.07	**0.33****	0.07	**0.40****	**0.28***	0.00	0.16	0.15	0.03	0.14	**0.32****	0.11
CTQ_PA	**−0.32****	0.08	**−0.35****	**0.23***	−0.01	0.11	0.16	−0.02	−0.06	0.13	0.20	0.17	0.19	−0.07	0.11
PBI_M_ care					−0.08	0.05	**−0.24***	**−0.24***	0.07	−0.19	**−0.35****	**−0.23***	−0.19	−0.07	−0.16
PBI_M_ control					0.01	−0.04	0.07	**0.26***	0.13	0.00	**0.36****	0.12	0.11	0.06	0.08
PBI_P_ care					−0.06	−0.12	−0.22	−0.17	−0.07	−0.22	**−0.36****	**−0.29***	−0.20	−0.03	−0.07
PBI_P_ control					−0.04	−0.01	−0.09	−0.01	0.15	−0.14	**0.32****	0.05	0.00	−0.04	−0.07

Statistical significant correlations are reported in bold

EDI-2 Eating Disorder Inventory-2, *IN* ineffectiveness, *SI* social insecurity, *DT* drive for thinness, *IA* interoceptive awareness, *MF* maturity fear, *BD* body dissatisfaction, *P* perfectionism, *ID* interpersonal distrust, *I* impulsivity, *BU* bulimia, *ASC* ascetism, *CTQ* Childhood Trauma Questionnaire, *EA* emotional abuse, *EN* emotional neglect, *SA* sexual abuse, *PN* physical neglect, *PA* physical abuse, *PBI* parental bonding instrument, *M* maternal, *P* paternal

*Correlation is significant at $p < 0.05$ level (two-tailed)

**Correlation is significant at $p < 0.01$ level (two-tailed)

Table 6 Pearson's correlation coefficients in the whole sample (patients with eating disorders and healthy subjects)

	PBI_M_ care	PBI_M_ control	PBI_P_ care	PBI_P_ control	EDI-2_IN	EDI-2_SI	EDI-2_ DT	EDI-2_IA	EDI-2_ MF	EDI-2_ BD	EDI-2_P	EDI-2_ID	EDI-2 I_	EDI-2_ BU	EDI-2_ ASC
CTQ_EN	**−0.58****	**0.39****	**−0.48****	**0.40****	**0.36****	**0.29****	**0.42****	**0.44****	0.11	**0.33****	**0.32****	**0.28****	**0.34****	**0.36****	**0.30****
CTQ_EA	**−0.47****	**0.41****	**−0.47****	**0.48****	**0.46****	**0.45****	**0.41****	**0.50****	**0.22****	**0.39****	**0.43****	**0.32****	**0.41****	**0.18***	**0.39****
CTQ_SA	−0.14	**0.31****	**−0.17***	**0.32****	**0.24****	**0.23****	**0.22****	**0.29****	**0.15***	**0.19****	**0.24****	0.13	**0.26****	**0.15***	**0.21****
CTQ_PN	**−0.42****	**0.18***	**−0.28****	**0.27****	**0.22****	**0.17***	**0.28****	**0.29****	0.01	**0.22****	**0.27****	**0.15***	**0.24****	**0.21****	**0.21****
CTQ_PA	**−0.24****	**0.23****	**−0.2****	**0.23****	**0.17***	0.12	**0.21****	**0.24****	0.09	**0.19***	**0.21****	0.08	**0.26****	**0.24****	**0.18***
PBI_M_ care					**−0.30****	**−0.27****	**−0.34****	**−0.37****	−0.09	**−0.38****	**−0.37****	**−0.29****	**−0.28****	**−0.33****	**−0.36****
PBI_M_ control					**0.37****	**0.36****	**0.39****	**0.49****	**0.29****	**0.34****	**0.36****	**0.31****	**0.45****	**0.26****	**0.38****
PBI_P_ care					**−0.35****	**−0.32****	**−0.36****	**−0.41****	**−0.34****	**−0.33****	**−0.35****	**−0.30****	**−0.35****	**−0.19****	**−0.30****
PBI_P_ control					**0.27****	**0.34****	**0.37****	**0.40****	**0.30****	**0.25****	**0.37****	**0.28****	**0.36****	**0.24****	**0.37****

Statistical significant correlations are reported in bold

EDI-2 Eating Disorder Inventory-2, *IN* ineffectiveness, *SI* social insecurity, *DT* drive for thinness, *IA* interoceptive awareness, *MF* maturity fear, *BD* body dissatisfaction, *P* perfectionism, *ID* interpersonal distrust, *I* impulsivity, *BU* Bulimia, *ASC* Ascetism, *CTQ* Childhood Trauma Questionnaire, *EA* emotional abuse, *EN* emotional neglect, *SA* sexual abuse, *PN* physical neglect, *PA* physical abuse, *PBI* parental bonding instrument, *M* maternal, *P* paternal

*Correlation is significant at $p < 0.05$ level (two-tailed)

**Correlation is significant at $p < 0.01$ level (two-tailed)

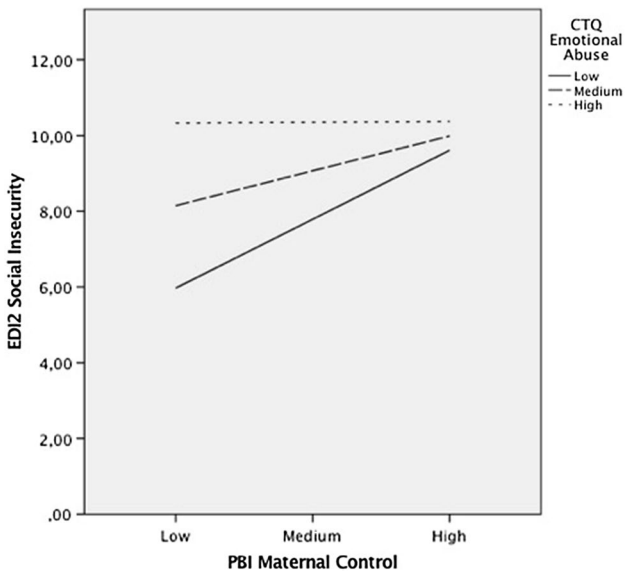

Fig. 1 Simple slopes equation of the regression of PBI maternal control on EDI-2 social insecurity at three levels of emotional abuse [low (line), medium (dashed line) and high (dotted line)] in patients with eating disorders. The interaction between PBI maternal control and CTQ emotional abuse in relation to social insecurity was significant ($b = -0.0237$; $p = 0.037$; CI -0.0459, -0.0014). *PBI* parental bonging instrument, *CTQ* Childhood Trauma Questionnaire, *EDI-2* Eating Disorder Inventory-2

Indeed, with respect to healthy subjects, in both AN and BP groups, the levels of perceived maternal and paternal care were found to be reduced, while parental control was perceived as heightened with no significant difference between AN and BP subjects. Therefore, in line with literature studies [see for reviews 23, 44], patients with EDs tend to recall their parents as having been less warm and empathic and with a tendency to restrict their autonomy and independence during childhood. This agrees with previous findings from ED families showing the presence of insecure parental bonding, lack of intimacy and maternal caresses and, more in general, reduced body-focused behaviors [45].

Moreover, compared to healthy women, our individuals with both AN and BP behaviors displayed a more severe self-reported experience of childhood trauma exposure and some differences with respect to the type of experienced trauma. Indeed, sexual and physical abuse scores were significantly increased in the BP group but not in the AN restricting group, while heightened emotional trauma scores were found in both AN restricting and BP groups. This is only partially consistent with the results of a previous meta-analysis, which identified a weaker relationship between emotional trauma and the diagnosis of AN restricting type [3]. Indeed, results of this meta-analysis [3] are affected by the low number of studies (only 2) involving patients with AN, which makes those data debatable.

The second hypothesis of our study was also confirmed, since we found that, unlike in healthy controls, maltreatment was more frequent among those patients with EDs who experienced an affectionless control style, the most pathogenic of the four parental styles identified through the PBI [15, 46], in both perceived maternal and paternal bonding. These findings may lead us to suggest that attachment problems with parental figures and childhood traumatic experiences may interact, resulting in an increased risk of ED psychopathology as suggested for other psychiatric disorders in retrospective studies [47]. Furthermore, in a longitudinal study, the association between trauma and restrictive caregiving has been found to predict dissociation symptoms in adulthood, probably as a means to escape from early memories [48, 49]. However, the cross-sectional nature of our study design does not allow us to draw definitive conclusions on the time ordering of this interaction. Only one previous study has assessed this issue with respect to adult intimate attachment and identified a possible mediating role of avoidant and anxious insecure attachment in the association between childhood maltreatment and ED symptoms [35]. However, as already pointed out in the introduction, this result is debatable.

In agreement with our third study hypothesis, in the whole sample, significant associations were found between almost all childhood trauma types, perceived maternal and paternal control and EDI-2 dimensions. Instead in the sole ED patient group, significant associations were found between childhood trauma exposure, especially emotional abuse, or perceived maternal and paternal control and some EDI-2 dimensions. Our findings are only partially consistent with those from a previous study in a mixed Korean ED population [50] showing significant associations between emotional abuse and EDI-2 ineffectiveness, impulsivity and interoceptive awareness but not with EDI-2 social insecurity. Moreover, we did not observe significant relationships among other trauma types and eating-related symptomatology. These discrepancies may be related to the high values of the CTQ scores reported in that study [50], suggesting possible transcultural differences. Overall, our findings corroborate the importance of early adverse experiences as predictors of the severity of ED symptomatology [3, 10]. Furthermore, we have also found similar findings in healthy subjects; so, we may suggest a possible dimensional nature of the association between early experiences and some ED psychopathological traits, which strengthens the role of childhood events in vulnerability to psychopathology.

On the basis of these correlation results, we have investigated how attachment to parents and childhood trauma may interact with ED psychopathology through a moderation model and we have found that, in both the whole participant group and in the sole ED patient group, emotional abuse experiences significantly affect the strength of the

association between perceived maternal control and social insecurity. In particular, when the perception of over-controlling maternal parenting, as characterized by intrusiveness and a tendency to restrict independence, is associated with low and (possibly) medium levels of child emotional abuse, this interplay predicts an increased and cumulative risk of social insecurity. An opposite interaction has been found in our healthy subjects, where maternal control predicts reduced social insecurity only when associated with "high" levels of emotional abuse. It is worth clarifying that "low" or "medium" levels of emotional abuse are not absolute values but are referred to this ED population: therefore, given the higher levels of emotional abuse scores identified in our patient sample compared to the control group, "low" levels of emotional abuse should be considered as reflecting significant traumatic emotional experiences. Furthermore, these findings may be interpreted as an overlap between high control maternal parenting and low levels of humiliating or demeaning behavior by an adult or older person, as expressed by the emotional abuse score. Although the CTQ does not make it possible to distinguish between familiar and not familiar early experiences, the low levels of collinearity partially rule out this overlap possibility and point to these variables as independent predictors. In addition, it seems that high levels of emotional abuse do not affect the relationship between maternal control and social insecurity, suggesting a possible ceiling effect of childhood experiences of emotional abuse on the development of social difficulties. The opposite interaction in healthy subjects may depend upon the fact that maternal control corresponds to protection in this sample; therefore, we suggest that effective maternal bonding may mitigate the effects of severe emotional abuse experiences on the development of interpersonal confidence. This finding further corroborates our hypothesis of a linear association between childhood adverse experiences and social insecurity, regardless of the illness. In conclusion, it is possible to speculate that children exposed to a moderate emotional abuse who simultaneously perceive their attachment figure as not providing comfort are more likely to develop attachment disorganization [31] as well as social insecurity in adulthood, as a common final pathway for maltreatment and over-controlling maternal parenting.

It is worth mentioning that the interaction found in our study predicts the social insecurity of people with EDs, confirming that early adverse experiences affect social information processing: indeed, such an environment may adaptively promote a distorted evaluation of stimuli to promote survival [51]. However, this cognitive style, characterized by an increased rejection sensitivity and reduced social reward appraisal [52], may lead to dysfunctional behaviors during adulthood, as already observed in EDs [53, 54]. In agreement with this, it has been shown that attachment to people who responded sensitively in early development is essential to generate epistemic trust [55].

This study presents some significant limitations. First of all, the cross-sectional nature of our findings does not allow us to draw definitive conclusions regarding the ordering time of maltreatment experiences and attachment development. Another limitation regards the self-reporting nature of the questionnaire used, which provides conscious attitudes toward relationships and early experiences. This is potentially problematic, since recalling past experiences may be affected by current relationships as well as by the onset of EDs [44]. Nonetheless, there is widespread agreement in considering the use of dimensional self-reporting attachment instruments appropriate [56]. A final limitation is that, due to the relatively small size of our sample, we have not explored childhood maltreatment in relation to the different types (i.e., emotional/physical) of trauma experienced.

The main strength of this study is that, to the best of our knowledge, this is the first work to assess the interaction between parental bonding perception and experiences of childhood maltreatment in women with EDs compared to healthy women. We have found that these risk factors are associated to each other and to low self-concept, to difficulties in relationships with others and to impaired recognition of hunger, satiety and visceral sensations. Moreover, we suggest that a possible interplay of early relationships with caregivers and emotional traumas may predict social insecurity. Therefore, our study points to attachment and childhood trauma as factors that may determine a possible framework for vulnerability to social stressful events.

Our data also provide some implications for clinical research. In particular, in the presence of childhood trauma, it may be appropriate to direct psychotherapy interventions towards the exploration of attachment style effects on trauma perception and later processing. Moreover, particular attention should be directed to social difficulties and their possible connections with early experiences. The importance of this aspect is corroborated by the observation that abused patients with EDs had a poorer outcome after cognitive behavioral therapy which focuses primarily on ED symptoms [57]. Indeed, focusing on past experiences and relationships (i.e., working models) to differentiate between interpersonal schemas derived from past versus current relationships may promote new ways of thinking and behaving in current and future relationships. To conclude, it must be underlined that future studies assessing attachment and trauma in EDs, as well as in other psychiatric disorders, have to take into consideration their interconnection to clarify the nature of this association.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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

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