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ORIGINAL PAPER

Differences in the association between childhood trauma history and borderline personality disorder or attention deficit/hyperactivity disorder diagnoses in adulthood

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Abstract Common environmental etiological factors between borderline personality disorder (BPD) and attention deficit/hyperactivity disorder (ADHD) have not been fully studied. The main aim of this study was to investigate the relationship between childhood trauma histories, assessed by the Childhood Trauma Questionnaire-Short Form (CTQ-SF), with adult BPD, ADHD or BPD-ADHD diagnoses. Comorbid BPD-ADHD patients exhibited significantly higher clinical severity and higher scores in the Total Neglect Scale, compared to BPD and ADHD patients, and only a marginal difference was observed for Sexual Abuse when BPD and ADHD patients were compared. Physical Trauma Scales were associated with ADHD diagnosis, whereas Emotional Abuse and Sexual Abuse Scales were associated with BPD or BPD-ADHD diagnoses. The study findings support the association between experiencing traumatic events in childhood and a higher clinical severity of BPD in adulthood. Furthermore, physical trauma history in childhood could be associated with the persistence of ADHD in adulthood and emotional or sexual abuse with later development of BPD or comorbid BPD-ADHD. Whereas experiencing childhood traumas is associated with later development of more general psychopathology, our study supports that a specific type of traumatic event could increase the risk for the consolidation of a concrete psychiatric disorder in the trajectory from childhood to adulthood of vulnerable subjects.

Keywords BPD · ADHD · Comorbidity · Etiology · Child maltreatment · Severity

Introduction

Clinical similarities between borderline personality disorder (BPD) and attention deficit/hyperactivity disorder (ADHD) have attracted interest of many researchers in the past years [1–5]. Studies have reported between 16 and 40 % of childhood ADHD in adult BPD samples [2, 4]. Moreover, the co-occurrence of the two disorders has been associated with higher severity [4], a more impulsive subgroup of BPD patients [1, 6], and, from an etiological point of view, with the consideration of childhood ADHD as a predisposing factor for later BPD development [3, 7, 8]. A complex transactional process including shared biological and environmental factors has been hypothesized to justify the strong association that has been established between ADHD and BPD [9]. However, a causality relationship cannot yet be evidenced [10].

From an etiological perspective, one of the most accepted models explaining BPD development is the biosocial or transactional model [11]. The major premise in Linehan's model is that BPD results from biological irregularities of the emotional regulation system and the interaction and transaction over time with certain dysfunctional environments. The result of this interaction is that the subject with biological vulnerability, presenting a predisposition to certain behaviors, develops more extreme dysfunctional patterns at early stages of development in an effort to

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cope with the difficulties and the invalidating environment. Linehan's model has been extended considering the possibility that impulsivity and emotion dysregulation could both be considered independently as biological vulnerability factors for BPD development [12].

Impulsivity, which has been traditionally implicated in the development of BPD [12–14], could also be linked to ADHD [15–17]. Similarly, emotional dysregulation, the other core psychobiological factor linked to BPD development [12, 18], has also been considered a relevant associated clinical feature of adult ADHD [19]. Moreover, genetic studies have shown similar findings involving polymorphisms of the serotonergic and dopaminergic systems that have been associated with impulsivity and emotional dysregulation, in BPD (for a review, see [20]) and in ADHD (for a review, see [21]). Through twin and twin family studies, BPD heritability has been estimated to be around 40 % [22] and around 60–80 % in children with ADHD [23]. However, a heritability of 45 and 36 %, respectively, has been estimated for BPD and ADHD symptoms, considering the remaining variance in symptoms of both disorders as explained by unique environmental influences [9].

Within the environmental factors that have been associated with BPD development, childhood maltreatment has been extensively considered in research literature [24–30]. Less is known about childhood trauma history in ADHD, although it has also been studied as a possible environmental risk factor for the disorder [31–34]. Only one recent study has compared childhood maltreatment history in ADHD and BPD adult patients. This study found no differences between BPD and ADHD patients in relation to the total rate of child maltreatment, but a higher rate of childhood trauma was found in both disorders when patients were compared with healthy control subjects [6]. The only difference between BPD and ADHD in Prada et al.'s study was that a higher rate of childhood sexual abuse history was observed in BPD patients. Therefore, more research is needed in this line to establish the role of early child maltreatment in the presence of these disorders in adulthood.

BPD and ADHD clinical similarities and the reported high comorbidity between the two disorders have undoubtedly contributed to support the association of childhood ADHD symptoms and BPD diagnosis in adulthood [35]. However, clinical differences between both disorders have also been reported [5, 36] and knowledge about the possible etiological communalities and differences between BPD and ADHD is still scarce [35]. In this sense, the main aim of the present study is to compare the association of childhood maltreatment history between adult diagnoses of BPD, ADHD and BPD-ADHD comorbidity.

Methods

Participants

An initial sample of 231 patients who had been referred and consecutively admitted to our outpatient BPD program with a probable Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV) BPD diagnosis was considered for the study. Of the potential total samples, 189 (81.8 %) were women and 42 (18.2 %) were men. Subjects' mean age was 31.35 (SD = 9.71) years. Twenty-seven patients (11.7 %) were not included in the study, as they met some of the exclusion criteria. The final sample was composed of 204 patients with BPD clinical features according to DSM-IV criteria, which were not better explained by another psychiatric disorder, with 170 (83.3 %) women and a mean age of 31.17 (SD = 9.61) years. One hundred and sixty patients (78.5 %) reached the DSM-IV diagnostic cutoff score for BPD diagnosis, and 44 patients (19.0 %) did not.

Procedure

The institutional ethics committee approved the research protocol, and informed written consent was obtained from all participants after they had received a complete explanation of the study. An initial screening was performed to determine whether the potential participants between 18 and 50 years old had at least average intelligence, no history or current symptoms of a serious organic condition that might be associated with the development of psychiatric symptoms, no current or past diagnosis of schizophrenia or bipolar I disorder and no current diagnosis of substance dependence disorder. Participants who did not meet the exclusion criteria were then assessed for DSM-IV criteria of ADHD through the Spanish version of Conners' Adult ADHD Diagnostic Interview for DSM-IV (CAADID) [37].

Participants underwent two further interviews during which they were evaluated for BPD using the Spanish versions of the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II) [38] and the Revised Diagnostic Interview for Borderlines (DIB-R) [39]. Participants were diagnosed with BPD only if they met diagnostic criteria according to both interviews. SCID-II and DIB-R interviews were administered by two psychologists (inter-rater reliability ranged from kappa .70 to .73). At the end of the second interview, patients completed two self-reported scales, the Childhood Trauma Questionnaire-Short Form (CTQ-SF) [40] to evaluate the history of childhood trauma and the Spanish version of the Wender Utah Rating Scale

(WURS) [41] to study childhood ADHD. Diagnosis of ADHD was established for patients meeting diagnostic criteria according to CAADID and WURS. As in a previous study [1], a conservative WURS cutoff score was applied (≥46).

Measures

Diagnostic instruments

Structured Clinical Interview for DSM-IV Axis II Disorders (*SCID-II*) [42] We used the Spanish version of the SCID-II [38], a semi-structured interview to assess personality disorders according to DSM-IV criteria. SCID-II Spanish version inter-rater reliability ranges from kappa .37 to 1.00, and the overall kappa is .85 [38].

Revised Diagnostic Interview for Borderlines (*DIB-R*) [43] We used the validated Spanish version of DIB-R [39]. The DIB-R is a semi-structured diagnostic interview for BPD that provides the diagnosis within the last 2 years. The Spanish version has shown good psychometric properties and an acceptable inter-rater reliability (kappa = .59) [39].

Conners' Adult ADHD Diagnostic Interview for DSM-IV (*CAADID*) [44] has been shown to be a reliable and accurate interview for adult ADHD assessment [45]. The CAADID interview assesses ADHD DSM-IV criteria in childhood and also their continuity in adulthood. We applied the Spanish version of the CAADID, which has shown optimal psychometric properties [37].

Clinical measures

Childhood Trauma Questionnaire-Short Form (*CTQ-SF*) [40] The CTQ-SF is a 28-item self-report scale developed to assess childhood maltreatment history, developed by means of exploratory and confirmatory factor analyses of the original 70-item original version [46]. Items on the CTQ-SF are rated on a five-point Likert scale (ranging from *never* to *very often*). The questionnaire includes five clinical subscales: Sexual, Physical, and Emotional Abuse and Physical and Emotional Neglect. The questionnaire has shown good psychometric properties in four heterogeneous samples [40].

The Wender Utah Rating Scale (*WURS*) [47] The WURS is a self-report scale of 61 items developed to assess retrospectively childhood ADHD symptom severity. Each item on the WURS is rated on a five-point Likert scale (ranging from *never* to *much*). The questionnaire has shown good psychometric properties in the Spanish version [41]. A conservative cutoff of 46 has been proposed by some authors to reduce the false positive diagnoses [1, 2, 4, 6].

Statistical analysis

To test our hypothesis, the sample was divided into four groups: 'no BPD-no ADHD group' [patients who did not meet the study diagnostic criteria for BPD and/or ADHD; $n = 44$ (21.6 %) patients], 'ADHD group' [patients who met the study diagnostic criteria for ADHD but not for BPD; $n = 22$ (10.8 %) patients]; 'BPD group' [patients who met the study diagnostic criteria for BPD but not for ADHD; $n = 82$ (40.2 %) patients]; and 'BPD-ADHD group' [patients who met the study diagnostic criteria for BPD and for comorbid ADHD; $n = 56$ (27.4 %) patients]. All analyses were performed with the SPSS 20 software package for MAC, and the hypotheses were tested with a two-tailed significance level of .05.

Between-group comparisons involving categorical data were analyzed with the *Chi-squared* test, and between-group comparisons involving continuous data were analyzed using ANOVA. The associations of childhood trauma history with BPD, ADHD and ADHD comorbidity in BPD patients were studied through logistic regression analyses with a conditional forward step procedure in order to estimate the effect of patients' self-reported childhood trauma history on BPD patients with and without diagnosed comorbid ADHD.

Results

Sociodemographic and clinical differences between groups

Demographic characteristics of patients included in the study are presented in Table 1. No between-group differences were observed for age ($F_{(3,\ 200)} = 1.32$, $p = .27$), marital status ($\chi^2_{(df)} = 9.13_{(6)}$, $p = .17$) or education ($\chi^2_{(df)} = 8.07_{(6)}$, $p = .23$). A higher but nonsignificant frequency of females was observed in both BPD groups (BPD and BPD-ADHD groups) compared with both no BPD groups (ADHD and no BPD-no ADHD groups) ($\chi^2_{(df)} = 5.40_{(3)}$, $p = .14$). Significant between-group differences were only observed for occupation, indicating a higher frequency of unemployed patients in the no BPD-no ADHD, BPD and BPD-ADHD groups compared with the ADHD group [ADHD: $n = 8$ (38.1 %) vs. no BPD-no ADHD: $n = 29$ (65.9 %); BPD: $n = 59$ (73.8 %) and BPD-ADHD: $n = 36$ (67.9 %); ($\chi^2_{(df)} = 9.57_{(3)}$, $p = .02$)].

As expected, due to the characteristics of the study sample, which was composed of patients who had been referred to our BPD program with a probable BPD diagnosis, a high frequency of BPD clinical features was observed in the sample. The sample mean of BPD criteria assessed by the SCID-II

Table 1 Between-group demographic and descriptive comparison

	No BPD-no ADHD (44) Mean (SD)	ADHD (22) Mean (SD)	BPD (82) Mean (SD)	BPD-ADHD (56) Mean (SD)	$F_{(3,200)}$	p
Age	31.98 (11.26)	33.00 (10.07)	29.57 (8.82)	32.14 (9.03)	1.32	.27
DSM-IV BPD[a]	2.58 (1.22)	2.55 (1.40)	6.87 (1.29)	7.39 (1.37)	175.95	<.001
	n (%)	*n* (%)	*n* (%)	*n* (%)	$\chi^2_{(df)}$	p
Gender (females)	34 (77.3)	16 (72.7)	69 (84.1)	51 (91.1)	$5.40_{(3)}$	.14
Marital status						
Never married	33 (75.0)	15 (68.2)	53 (64.6)	28 (50.0)	$9.13_{(6)}$	.17
Married or cohabiting	3 (6.8)	3 (13.6)	16 (19.5)	14 (25.0)		
Divorced, separated or widowed	8 (18.2)	4 (18.2)	13 (15.9)	14 (25.0)		
Education						
Primary education or less	16 (36.4)	14 (63.6)	39 (48.8)	30 (55.6)	$8.07_{(6)}$	.23
High school diploma	13 (29.5)	4 (18.2)	20 (25.0)	16 (29.6)		
University degree	15 (34.1)	4 (18.2)	21 (26.2)	8 (14.8)		
Occupation						
Employed	15 (34.1)	13 (61.9)	21 (26.2)	17 (32.1)	$9.57_{(3)}$	.02
Unemployed	29 (65.9)	8 (38.1)	59 (73.8)	36 (67.9)		

[a] Number of BPD DSM-IV criteria

Table 2 CTQ-SF score between-group comparison

	No BPD-no ADHD (44) Mean (SD)	ADHD (22) Mean (SD)	BPD (82) Mean (SD)	BPD-ADHD (56) Mean (SD)	$F_{(3,200)}$	p
Emotional abuse	11.61 (4.09)	12.82 (4.71)	13.69 (3.93)	15.34 (4.22)	6.97	<.001
Sexual abuse	6.91 (3.30)	6.54 (3.90)	8.44 (4.86)	9.12 (5.72)	2.72	.05
Physical abuse	9.04 (2.79)	11.14 (3.62)	10.40 (3.59)	9.98 (4.11)	2.08	.10
Emotional neglect	12.93 (4.76)	14.14 (5.18)	13.82 (4.96)	16.51 (4.07)	5.63	.001
Physical neglect	7.95 (2.06)	9.00 (2.39)	8.64 (2.25)	10.20 (3.27)	7.13	<.001
Total abuse	27.57 (5.63)	30.50 (8.06)	32.54 (9.04)	34.45 (10.77)	5.36	.001
Total neglect	20.89 (5.82)	23.14 (6.68)	22.45 (6.01)	26.71 (6.40)	8.52	<.001
Total CTQ-SF	48.45 (9.34)	53.64 (11.98)	54.99 (12.67)	61.16 (14.92)	8.43	<.001

was 5.65 (SD = 2.49). However, significant between-group differences were observed for the number of BPD criteria ($F_{(3,200)} = 175.95$, $p < .001$) (see Table 1). Post hoc analysis showed that both BPD groups (BPD and BPD-ADHD groups) presented a significantly higher number of BPD criteria than both no BPD groups (no BPD-no ADHD and ADHD groups) (all ps < .001). Moreover, no between-group differences were observed when both no BPD groups were compared ($t_{(63)} = .11$, $p = .91$), and a significantly higher number of BPD criteria were observed in the BPD-ADHD group compared with the BPD group ($t_{(137)} = 2.29$, $p = .02$).

Between-group childhood trauma differences

Regarding childhood trauma differences, ANOVA results indicated significant differences between groups for all the general measures of CTQ-SF (Total CTQ-SF, Total Abuse and Total Neglect; all ps $\leq .001$), and all the subscales of Abuse and Neglect (all ps $\leq .05$), with the sole exception of Physical Abuse ($F_{(3,200)} = 2.08$, $p = .10$) (see Table 2).

Post hoc between-group comparisons of the three CTQ-SF general scores indicated that the BPD-ADHD group scored significantly higher than the no BPD-no ADHD group in all three scales (Total CTQ-SF: $t_{(93.73)} = 5.20$, $p < .001$; Total Abuse: $t_{(86.52)} = 4.70$, $p < .001$; and Total Neglect: $t_{(98)} = 4.94$, $p < .001$). Moreover, the BPD-ADHD group also scored significantly higher than the ADHD and BPD groups in Total CTQ-SF (BPD-ADHD vs. ADHD group: $t_{(76)} = 2.11$, $p = .04$; BPD-ADHD vs. BPD group: $t_{(136)} = 2.61$, $p = .01$) and Total Neglect (BPD-ADHD vs. ADHD group: $t_{(76)} = 2.19$, $p = .03$; BPD-ADHD vs. BPD group: $t_{(136)} = 3.98$, $p < .001$) but no differences were

observed in Total Abuse (all *p*s > .05). The BPD group scored significantly higher than the no BPD-no ADHD group in Total CTQ-SF ($t_{(124)} = 3.01$, $p = .003$) and Total Abuse ($t_{(124)} = 3.32$, $p = .001$), but no between-group differences were observed for Total Neglect ($p > .05$). However, no significant differences were observed between the BPD and ADHD groups for the three CTQ-SF general scores (all *p*s > .05); and no significant differences were observed when the ADHD group was compared with the no BPD-no ADHD group in the three CTQ-SF general scores (all *p*s > .05).

When the Abuse and Neglect CTQ-SF scales were compared between groups, a similar pattern was observed; that is, significantly higher scores in most of the CTQ-SF subscales when the BPD-ADHD group was compared with the no BPD-no ADHD group (Emotional Abuse: $t_{(98)} = 4.44$, $p < .001$; Sexual Abuse: $t_{(98)} = 2.29$, $p = .02$, Emotional Neglect: $t_{(98)} = 4.06$, $p < .001$; Physical Neglect: $t_{(98)} = 3.97$, $p < .001$). However, specific differences emerged when the BPD-ADHD group was compared with the BPD group (Emotional Abuse: $t_{(136)} = 2.34$, $p = .02$; Emotional Neglect: $t_{(136)} = 3.37$, $p = .001$; Physical Neglect: $t_{(136)} = 3.33$, $p = .001$) and with the ADHD group (Emotional Abuse: $t_{(76)} = 2.30$, $p = .02$; Sexual Abuse: $t_{(56.21)} = 2.28$, $p = .03$, Emotional Neglect: $t_{(76)} = 2.15$, $p = .04$). Moreover, the BPD group scored higher than the no BPD-no ADHD group in the Emotional Abuse and Sexual Abuse scales (Emotional Abuse: $t_{(124)} = 2.79$, $p = .006$; and Sexual Abuse: $t_{(117.11)} = 2.09$, $p = .04$) but a tendency toward significantly higher scores was only observed in Sexual Abuse when the BPD group was compared with the ADHD group ($t_{(40.29)} = 1.91$, $p = .06$). Finally, no between-group differences were observed between the ADHD group and the no BPD-no ADHD group (all *p*s > .05).

Logistic regression analyses

Sets of logistic regression analyses were performed with the aim of studying the association of childhood trauma history with BPD and/or ADHD diagnoses (see Table 3). The results comparing the no BPD-no ADHD group with the other three groups indicated that when the former group was compared with the ADHD group, ADHD was predicted by Physical Abuse and Physical Neglect ($\beta = .25$ and .29, respectively); however, when the no BPD-no ADHD group was compared with the BPD groups, the CTQ-SF Emotional Abuse scale was associated with the diagnoses of BPD and comorbid BPD-ADHD ($\beta = .13$ and .16, respectively). Moreover, when the ADHD group was compared with both BPD groups, only the CTQ-SF Abuse scales were introduced in the model, with Sexual Abuse predicting BPD diagnosis ($\beta = .12$), and Emotional Abuse ($\beta = .18$), Physical Abuse ($\beta = -.22$) and Sexual Abuse ($\beta = .15$) predicting BPD-ADHD diagnosis. Finally, when the BPD group was compared with the BPD-ADHD group, a principal association of the CTQ-SF Neglect scales was observed (Emotional Neglect $\beta = .10$; Physical Neglect $\beta = .18$).

Table 3 Logistic regression analysis

	β	TE	*p*	OR	OR 95 % interval
No BPD-no ADHD versus ADHD[a]					
Physical abuse	.25	.11	.02	1.29	1.05–1.59
Physical neglect	.29	.15	.06	1.33	.99–1.79
No BPD-no ADHD versus BPD[a]					
Emotional abuse	.13	.05	.01	1.41	1.03–1.27
Physical abuse	.14	.07	.06	1.15	.99–1.32
No BPD-no ADHD versus BPD-ADHD[a]					
Emotional abuse	.16	.06	.005	1.17	1.05–1.32
Physical neglect	.25	.11	.02	1.28	1.04–1.58
ADHD versus BPD[a]					
Sexual abuse	.12	.08	.10	1.13	.97–1.32
ADHD versus BPD-ADHD[a]					
Emotional abuse	.18	.07	.01	1.20	1.04–1.38
Physical abuse	−.22	.08	.01	.81	.68–.95
Sexual abuse	.15	.08	.05	1.16	1.00–1.35
BPD versus BPD-ADHD[a]					
Physical abuse	−.08	.05	.09	.92	.83–1.01
Emotional neglect	.10	.04	.03	1.10	1.01–1.20
Physical neglect	.18	.08	.02	1.20	1.03–1.40

Dependent variables BPD and/or ADHD diagnoses

[a] No different results were observed when gender was introduced as a covariant

Discussion

The aim of this study was to analyze the relationship of childhood trauma history with BPD and/or ADHD diagnoses in a sample of adult psychiatric outpatients with a previously suspected diagnosis of BPD. Our results indicated that BPD patients who presented comorbid ADHD (BPD-ADHD) referred more history of maltreatment during childhood, compared with no BPD-no ADHD, BPD and ADHD patients. Moreover, whereas there were no differences in abuse or neglect experiences between ADHD and no BPD-no ADHD patients, BPD and BPD-ADHD patients reported more history of abuse than the other two groups (ADHD and no BPD-no ADHD). Interestingly, whereas reported history of sexual and emotional abuse was higher in BPD-ADHD compared with no BPD-no ADHD and ADHD, reported history of physical and emotional neglect was the most frequently reported maltreatment when BPD-ADHD was compared with BPD. These results could

be interpreted as indicating that adult BPD patients with severe childhood traumatic antecedents present clinical profiles of greater severity, with more comorbidity and an expected worse response to treatment [25] and reinforcing the results showing that BPD-ADHD comorbidity has been considered a highly severe group of BPD patients [4], as they exhibited the highest average number of BPD criteria. The number of BPD criteria could be considered an indicator of clinical severity on a continuum of BPD pathology [48, 49].

No sociodemographic differences were observed between groups, with the only exception of occupational status. The lowest rate of unemployed patients was observed in the ADHD group. This finding is noteworthy, especially in the comparison with the no BPD-no ADHD control group. However, it must be kept in mind that the no BPD-no ADHD control group is an unhealthy control group, including patients that exhibit BPD clinical features. In this sense, it has been observed that even the presence of only one BPD criteria is associated with higher functional impairment [50]. Although the difference was minimal, the no BPD-no ADHD group presented a significantly higher average number of BPD criteria than the ADHD group. However, whereas significant differences were observed for occupational status, in other sociodemographic variables such as education, although nonsignificant, ADHD patients had achieved a lower educational level. Taking into account all above comments, the difference observed in the labor status could be due to the severity of the no BPD-no ADHD group, or simply be the result of socioeconomic influences of the moment when the study was developed. It must also be noted that the ADHD group is the smallest one and different results with a higher number of patients included in it could be expected.

There is a consistent body of evidence indicating that childhood trauma increases the risk for psychopathology (for a review, see [51]). Specifically, childhood maltreatment has been commonly reported among disorders associated with development, such as BPD [29, 52, 53]. Also, evidence of childhood maltreatment history in developmental disorders like ADHD has emerged in the last few years [6, 31, 34]. However, despite the recognized importance of the BPD-ADHD comorbid condition in terms of the transactional interaction between the two disorders across the lifespan, only in Prada et al. has the reported history of childhood trauma been compared in BPD, ADHD and comorbid BPD-ADHD patients. In this study, BPD-ADHD patients reported the highest level of maltreatment compared with healthy controls, BPD and ADHD patients [6]. Our results support this finding, and others indicating that severe forms of childhood maltreatment could be a risk factor for the development of BPD pathology in ADHD patients [35].

Although evidence of maltreatment history has been observed when ADHD patients are compared with healthy participants [6, 34], our results did not show differences in reported history of childhood maltreatment between ADHD patients and our unhealthy control group. In our study, ADHD patients were compared with psychiatric patients who presented BPD clinical features but who did not meet the necessary criteria to be diagnosed with BPD or ADHD. This result could be indicating that while maltreatment could increase the risk for the development of psychopathology, specific types of childhood maltreatment could increase the risk for the consolidation of different disorders in adulthood. This idea is consistent with our results of no childhood maltreatment differences between no BPD-no ADHD patients and ADHD patients, and the higher report of sexual abuse history found in BPD and BPD-ADHD patients, compared with no BPD-no ADHD patients and ADHD patients. In this sense, while our results confirm Prada et al.'s [6] conclusion that BPD is not the only disorder that shows childhood trauma history, BPD seems to be more closely related to sexual abuse history compared to other psychiatric disorders with phenotypical similarities.

Interestingly, and in the same line of the above paragraphs, when the association of childhood maltreatment history with ADHD and BPD diagnoses was studied by comparing it with that of no BPD-no ADHD patients, ADHD diagnosis was principally associated with physical abuse and neglect, and BPD diagnosis was associated with emotional abuse. Moreover, the BPD-ADHD comorbid condition was associated with history of abuse when it was compared with ADHD patients and with history of neglect when it was compared with BPD. These results seem to be showing that while history of childhood physical abuse and neglect could be a risk factor for the persistence of adult ADHD, history of childhood sexual and emotional abuse could be a risk factor for BPD and/or BPD-ADHD diagnoses in adulthood. Hence, the study findings provide specificity to the role of environmental factors in the development of BPD in at-risk children and support the need for early intervention strategies [54].

The results of this study should be considered in the context of three important limitations. The main limitation of the present study concerns the retrospective nature of the assessment of childhood history of maltreatment. The risks of retrospective memory bias could be affecting the results, and a longitudinal study would be necessary to confirm the conclusions. However, although results should be considered under the premise of a possible bias in the emotional memory of BPD patients [55], the retrospective assessment of childhood trauma history has been considered a valid approach and it has been frequently used in BPD research [25, 56, 57]. Another limitation is that we did not use a healthy control group. In our

study, all the participants had been referred as probable BPD, although not all the patients were finally diagnosed as BPD according to SCID-II and DIB-R. The design of the study makes it impossible to establish whether childhood maltreatment history is a risk factor for the development of BPD. However, our design allows us to establish the influence of different types of maltreatment in the consolidation of the studied disorders in the adulthood, as we compared groups of patients diagnosed with BPD, ADHD and BPD-ADHD with an unhealthy control group composed of patients exhibiting clinical features of BPD but who did not achieve the cutoff score to be categorically diagnosed with BPD. The results also support the idea of a continuum in symptom severity [48, 49], as the more severe patients who achieved a formal diagnosis presented a higher number of child traumas, compared with the clinically less severe no BPD-no ADHD patients. The fact that the ADHD group consists of patients with an initial suspected diagnosis of BPD can also be considered a limitation, as the study results are not representative of all ADHD patients. However, considering only ADHD cases with a high phenotypic correlation with BPD, the study of differential environmental influences in the adult development of BPD, ADHD or BPD-ADHD could contribute to the improvement of differential diagnosis [9]. In clinical practice, ADHD is not usually considered as a possible diagnosis when BPD is suspected [10], compromising the achievement of the appropriate treatment. In this sense, the study of childhood traumas could be helpful for ADHD identification when BPD symptoms attract more attention in the clinical presentation, given the stronger association of trauma history with BPD development [10].

In conclusion, considering results from previous research and from our study, it could be considered that, as commented by Teicher and Samson [51], childhood maltreatment could be increasing the risk for psychopathology development, but this risk factor is not exclusive to BPD. Second, within psychiatric patients, physical abuse and neglect seem to be associated with the persistence of ADHD in adulthood whereas emotional abuse seems to be associated with BPD consolidation in adulthood. Finally, BPD-ADHD has been considered a severe and more impulsive form of BPD [1, 4, 6], and childhood maltreatment has been considered to be implicated in the trajectory from childhood ADHD to adult BPD-ADHD [35]. Our results are consistent with these findings and indicate that emotional and sexual abuse could be considered specific risk factors implicated in the trajectory from childhood ADHD to BPD-ADHD in adulthood. Altogether, these findings reinforce the need for follow-up studies analyzing the influence of biological and environmental factors in the trajectories of childhood and adolescent psychopathology to adulthood.

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Compliance with ethical standards

Conflict of interest There are no conflicts of interest.

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