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Research paper

Relationships between self-reported childhood traumatic experiences, attachment style, neuroticism and features of borderline personality disorders in patients with mood disorders

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ABSTRACT

Background: Co-occurring borderline personality disorder (BPD) features have a marked impact on treatment of patients with mood disorders. Overall, high neuroticism, childhood traumatic experiences (TEs) and insecure attachment are plausible aetiological factors for BPD. However, their relationship with BPD features specifically among patients with mood disorders remains unclear. We investigated these relationships among unipolar and bipolar mood disorder patients.

Methods: As part of the Helsinki University Psychiatric Consortium study, the McLean Screening Instrument (MSI), the Experiences in Close Relationships-Revised (ECR-R), the Short Five (S5) and the Trauma and Distress Scale (TADS) were filled in by patients with mood disorders (n=282) in psychiatric care. Correlation coefficients between total scores of scales and their dimensions were estimated, and multivariate regression (MRA) and mediation analyses were conducted.

Results: Spearman's correlations were strong (rho=0.58; $p < 0.001$) between total scores of MSI and S5 Neuroticism and moderate (rho=0.42; $p < 0.001$) between MSI and TADS as well as between MSI and ECR-R Attachment Anxiety. In MRA, young age, S5 Neuroticism and TADS predicted scores of MSI ($p < 0.001$). ECR-R Attachment Anxiety mediated 33% (CI=17–53%) of the relationships between TADS and MSI.

Limitations: Cross-sectional questionnaire study.

Conclusions: We found moderately strong correlations between self-reported BPD features and concurrent high neuroticism, reported childhood traumatic experiences and Attachment Anxiety also among patients with mood disorders. Independent predictors for BPD features include young age, frequency of childhood traumatic experiences and high neuroticism. Insecure attachment may partially mediate the relationship between childhood traumatic experiences and borderline features among mood disorder patients.

1. Introduction

Borderline personality disorder (BPD) is one of the most clinically significant personality disorders in psychiatric settings. It is associated with substantial mental and physical disability, significant treatment utilization and high risk of mortality by suicide (Grant et al., 2008; McGlashan et al., 2000; Paris, 1993; Zanarini et al., 2000b).

The aetiology and pathogenesis of BPD have been investigated and debated for decades (Gabbard, 2005; Gunderson and Singer, 1975; Gunderson, 2009; Lieb et al., 2004). Current multifactorial aetiological models highlight the interactions of psychosocial, genetic and neurobiological factors in the pathogenesis of BPD (Leichsenring et al., 2011). Among psychosocial factors, childhood traumatic experiences (TEs) and insecure attachment have received the greatest empirical support (Mosquera et al., 2014; Zanarini et al., 2000a, 2000b).

Patients with BPD tend to report considerably more TEs in childhood than patients with other psychiatric disorders (Yen et al., 2002). An association between childhood sexual abuse experiences and BPD

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has been extensively debated (Herman et al., 1989; Paris and Zweig-Frank, 1992). Moreover, previous studies have indicated that the severity and frequency of TEs correlate with the severity of borderline pathology (Silk et al., 1995; Zanarini et al., 2002). However, despite the large body of studies illustrating high prevalence of childhood TEs in BPD patients, the causal role of TEs in BPD symptoms remains controversial (Bornovalova et al., 2013; Paris, 1998).

One of the suggested mechanisms underlying influence of childhood TEs on the manifestation of BPD in adulthood is insecure attachment style (Fonagy et al., 2000; Gunderson and Lyons-Ruth, 2008). Numerous studies have demonstrated a clear association between BPD features and insecure attachment using both categorical and dimensional models of attachment (Aaronson et al., 2006; Agrawal et al., 2004a; Levy et al., 2005). Particularly, patients with BPD often demonstrate unresolved, fearful and preoccupied attachment styles (Agrawal et al., 2004b). Using dimensional self-report measures of attachment, many studies have shown a strong association between BPD and Attachment Anxiety, while associations with Avoidant Attachment remain inconsistent (Choi-Kain et al., 2009; Scott et al., 2009). Attachment Anxiety is characterized by hypersensitivity to rejection and fear of abandonment – both core symptoms in BPD (Campbell and Marshall, 2011). This demonstrates partial overlap between adult Attachment Anxiety and BPD features (Minzenberg et al., 2006). Some studies have also shown the important role of genetic factors in individual differences in attachment styles (Crawford et al., 2007; Picardi et al., 2011). However, while adult attachment anxiety appears to be an important factor for developing BPD, the predictive value or causality of anxious attachment in BPD remains uncertain (Scott et al., 2009, 2013).

The view of the fundamentally dimensional nature of personality disorders has received substantial empirical support (Clark, 2007; Gotzsche-Astrup and Moskowitz, 2016). The five-factor model (FFM) (Costa, 1991) defines five broad personality dimensions that show moderate heritability (Distel et al., 2009). In the context of FFM, patients with BPD tend to score low on Agreeableness and Conscientiousness and high on Neuroticism (Morey and Zanarini, 2000; Samuel and Widiger, 2008; Saulsman and Page, 2004). Neuroticism, in turn, is associated with mood, anxiety and substance use disorders and is probably related to high comorbidity of BPD and these disorders (Ormel et al., 2013). Moreover, neuroticism has been shown to correlate with psychological distress and suicidal behaviour – both prevalent in BPD (Ormel et al., 2013).

BPD is often comorbid with mood disorders (Links and Eynan, 2013; Mantere et al., 2006; McGlashan et al., 2000; Melartin et al., 2002a; Riihimaki et al., 2014) and according to self-report, symptoms of BPD are abundantly present in patients with mood disorders (Baryshnikov et al., 2015, 2016a). However, the validity of personality assessment in patients with mood disorders is debatable (Morey et al., 2010; Zimmerman, 1994). Some studies have shown notable effects of mood states on personality traits (Griens et al., 2002; Hirschfeld et al., 1983), while others suggest that personality disorder diagnoses established during depressive episode are a valid reflection of personality pathology (Morey et al., 2010). One Finnish study described relatively poor categorical stability of concurrent personality disorder assigned during unipolar depression when dimensional stability was moderate (Melartin et al., 2010).

The origins of self-reported features of BPD, as well as their risk factors in patients seeking treatment for mood disorders are incompletely understood. Our previous study indicated that self-reported features mood instability and impulsivity are shared between BPD and bipolar disorders (Baryshnikov et al., 2015). Overall, mood instability among mood disorder patients may be also related to inherited vulnerability to emotional dysregulation (Koenigsberg, 2010; Peng et al., 2015; Stein et al., 2009). Thus, there is uncertainty whether self-reported features of BPD in patients with mood disorder are intrinsically related to underlying concurrent borderline pathology.

Nevertheless, mood disorder patients with both clinical and subclinical features of BPD have been reported to demonstrate greater impairment in several functional domains than patients without BPD features (Zimmerman et al., 2012). Consequently, recognition and treatment of subclinical BPD features in mood disorder patients are clinically relevant.

Psychosocial interventions are recommended as the primary treatment for BPD (Bateman, et al., 2015). Several evidence-based psychotherapies, mentalization-based treatment and schema therapy are based on the attachment theory (Fonagy et al., 2000; Kellogg and Young, 2006). In the framework of attachment theory, the insecure attachment is suggested as an explanatory link between childhood TEs and BPD (Fonagy et al., 2000; Johnston et al., 2009; Kellogg and Young, 2006). The majority of studies demonstrating the beneficial effect of these psychotherapies have been conducted in patients with clinical diagnoses of BPD (Bateman et al., 2015; Stoffers et al., 2012). As mentioned previously, treatment of self-reported BPD features at both clinical and subclinical levels is clinically relevant. On the other hand, despite increasing use of mentalization-based treatment and schema therapy in clinical practice, little is known about the relationships between self-reported BPD features, dimensions of attachment and childhood TEs.

In this study, we aimed to investigate relationships between self-reported features of BPD, childhood TEs, adulthood attachment styles and neuroticism in patients with mood disorders. We hypothesized that a) childhood TEs, high attachment anxiety and high neuroticism are associated with the self-reported features of BPD in mood disorder patients and b) anxious and avoidant dimensions of attachment may mediate the effect of childhood TEs on the self-reported features of BPD. Therefore, we investigated associations between self-reported BPD, TEs and attachment style, examined factors predicting the prevalence of self-reported BDP features in patients with mood disorders and examined the mediating effect of self-reported attachment styles on the relationships between self-reported BPD features and TEs in patients with mood disorders.

2. Methods

The background and methodology of HUPC have been reported in detail elsewhere (Aaltonen et al., 2016; Baryshnikov et al., 2016b).

2.1. The Helsinki University Psychiatric Consortium (HUPC)

This investigation is part of the HUPC study, a collaborative research project between the Faculty of Medicine of the University of Helsinki; the Department of Mental Health and Substance Abuse Services of the National Institute for Health and Welfare; the Department of Social Services and Health Care, City of Helsinki; and the Department of Psychiatry, University of Helsinki and Helsinki University Hospital. The study protocol was approved by the Ethics Committee of Helsinki University Central Hospital.

2.2. Setting

The study was conducted in 10 community mental health centres, three psychiatric inpatient units and one day-hospital, all offering specialized secondary public mental health services in the metropolitan area of Helsinki between 12.1.2011 and 20.12.2012.

2.3. Sampling

Inclusion criteria were patients' age≥18 years and provision of informed consent. Patients with mental retardation, neurodegenerative disorders and insufficient Finnish language skills were excluded. Stratified patient sampling selection was performed by identifying all patients within a certain day or week in a unit or by randomly drawing

eligible patients from patient lists. Of the 902 eligible patients with mood, neurotic or personality disorders, 372 refused to participate and 216 were lost for other reasons. In addition, 31 patients with other lifetime diagnoses were excluded.

2.4. Clinical diagnoses

The validity of the clinical diagnoses assigned by the attending physicians was critically evaluated by the authors (IB, KA, MK, BK) by re-examining all available information from patient records. The validated clinical diagnoses were based on the ICD-10-DCR (World Health Organization, 1992). Lifetime principal diagnosis was assigned. Although there is no division of BD into types I (BD-I) and II (BD-II) in the ICD-10, we subtyped patients into these categories according to the DSM-IV (American Psychiatric Association, 1994). This distinction is established clinical practice in Finland and included in the national BD treatment guidelines.

2.5. Description of patients

Altogether 282 patients participated in the study. Their mean age was 42.2 ± 13.1 years, and 209 (74.1%) were female. There were 109 (38.7%) patients. There were 183 patients with Unipolar Depression (UD) (F32-F33) (mean age 41.4 ± 13.3 years) and 99 with Bipolar Disorder (BD) (F31, mean age 43.7 ± 12.7 years). In patients with BD, 36 (36.3%) had type I (BD-I), 55 (55.5%) type II (BD-II) and 8 (8%) Not Otherwise Specified (NOS). Patients with BD-NOS and BD-2 were allocated to the same group. 17 patients with BP had also comorbid BPD; among patients with UD 39 patients had comorbid BPD. In terms of age and gender, sample distribution did not differ from patients with the same diagnoses treated in 2011 and 2012 in psychiatric care organizations.

2.6. Trauma and Distress Scale (TADS)

TADS is a self-report questionnaire that measures childhood trauma and distress experiences through 43 items (Patterson et al., 2002). The TADS items measure symptoms in five main domains: emotional abuse, physical abuse, sexual abuse, emotional neglect and physical neglect. Each item is rated on a four-point Likert scale from 1 to 4 (0=never, 1=rarely, 2=sometimes, 3=often, 4=nearly always). TADS has been validated in Finland (Salokangas et al., 2016). Cronbach's alpha for TADS' total scores was 0.6. Cronbach's alphas were 0.8 for emotional abuse, 0.8 for physical abuse, 0.9 for sexual abuse, 0.9 for emotional neglect and 0.7 for physical neglect.

2.7. Experiences in Close Relationships – Revised (ECR-R)

The ECR-R questionnaire is a self-report measure of adult romantic attachment dimensions during lifetime romantic relationships (Fraley et al., 2000). It includes 36 items that are scored on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The ECR-R assesses two dimensions of attachment (18 items for each scale): Attachment Anxiety and Attachment Avoidance. Higher mean scores indicate greater degrees of anxiety and/or avoidance, and consequently lower levels of attachment security. Cronbach's alpha was 0.9 for Attachment Anxiety and 0.9 for Attachment Avoidance. Although the ECR-R measures the adulthood attachment style, it is assumed to reflect attachment style established in childhood, according to the attachment theory (Fonagy et al., 2000).

2.8. Short Five (S5)

S5 is a 60-item self-report questionnaire constructed for measuring 30 facets of the Five-Factor Model (Konstabel et al., 2012). These items measure five personality factors: neuroticism, extraversion, openness, agreeableness and conscientiousness. Cronbach's alpha for neuroticism was 0.9, for extraversion 0.9, for openness 0.8, for agreeableness 0.7 and for conscientiousness 0.8.

2.9. McLean Screening Instrument (MSI)

The MSI is a ten-item questionnaire designed according to DSM-IV diagnostic criteria to screen for BPD (Zanarini et al., 2003). It has been translated into Finnish and validated in Finland (Melartin et al., 2009). Each item requires a "yes/no" response. Each positive item indicates the presence of BPD symptoms. The Kuder-Richardson 20 coefficient for MSI was 0.747.

2.10. Statistical analysis

The independent samples *t*-test was conducted to compare differences between two continuous variables. Possible differences between three or more continuous variables were assessed using ANOVA tests. For variables that met a required assumption of homogeneity, the Tukey's Honestly Significant Difference (Tukey's HSD) was used in Post Hoc analyses, otherwise we used the Games-Howell test. The correlation analysis was executed between scales' total scores and their factors. Spearman's correlation coefficient was estimated between continuous variables. To protect from Type I Error in correlation and regression analyses, the Bonferroni corrections were conducted, dividing the original significance level by the number of analyses on the dependent variable. The correlation from 0.6 to 0.79 was classified as "strong", from 0.40 to 0.59 as "moderate", from 0.20 to 0.39 as "weak" and less than 0.2 as "very weak".

Hierarchical multivariate regression analysis was used to assess putative risk factors for self-reported features of BPD. To adjust for possible confounding effects of age, sex and concurrent depressive symptoms on the reporting of childhood's TEs, Attachment, and neuroticism, the model 1 included these variables. Due to moderate correlations between scores of TADS, ECR-R Anxious Attachment and S5 neuroticism, they were placed in different models - model 1 (age, sex, BDI), model 2 (TADS (self-reported childhood traumatic experiences), models 3 (ECR-R (self-reported attachment style)) and model 4 (S5 (self-reported neuroticism).

The mediation analysis was conducted using the bootstrapping method with the bias-corrected confidence estimates (Mackinnon et al., 2004). The independent variable was TADS, depended variable MSI and mediator variable ECR-R anxious. The 95% confidence interval of the indirect effects was obtained with 5000 bootstrap resamples (Preacher and Hayes, 2008). The analyses were performed by using SPSS (IBM Corp. Released 2013).

3. Results

3.1. Total scores

Traumatic experiences were widely present, as shown by the TADS scores (Table 1). Means of total scores of TADS, ECR-R and S5 are given in Table 2. No differences in mean scores of TADS and ECR-R between patients with BD-1, BD-2 and UD emerged. As expected, patients with BD-1 scored higher on the S5 extraversion scale than others ($p < 0.001$ in Post Hoc by Tukey's HSD), and patients with BD-2 scored higher on the MSI than others ($p < 0.001$ in Post Hoc by Tukey's HSD).

3.2. Correlation analysis of self-reported scales

Spearman's correlations between the scores of TADS, ECR-R, S5 and MSI are provided in Table 3. A strong correlation emerged between total scores of MSI and S5 neuroticism (rho=0.6; $p < 0.001$). Correlations between MSI scores and TADS dimensions were moderate

Table 1
Frequencies and means scores of Trauma and Distress Scale (TADS) items in mood disorder patients (n=283).

TADS item	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)	Mean (SD[a])[2]
I felt safe and protected	24 (8)	62(22)	61(21)	59 (20)	81 (28)	2.4 (1.3)
I was often hungry	141 (49)	71 (25)	45 (16)	27 (9)	3 (1)	0.9 (1)
I was bullied at school	65 (23)	61 (21)	74 (26)	46 (16)	41 (14)	1.8 81.3)
I often had to wear ragged or dirty clothes	202 (70)	42 (15)	25 (9)	11 (4)	7 (2)	0.5 (1)
I felt valued or important	33 (12)	70 (24)	65 (23)	66 (23)	52 (19)	2.1 (1.3)
My parents were often drunk, stoned or wasted	149 (52)	52 (18)	32 (11)	44 (15)	10 (4)	1 (1.3)
I have been bullied at work	128 (45)	52 (19)	74 (26)	27 (9)	5 (2)	1 (1.1)
My family was emotionally warm and loving	37 (13)	51 (18)	63 (22)	76 (27)	60 (21)	2.2 (1.3)
I was hit so hard that it left marks, cuts or bruises	191 (66,6)	38 (13)	38 (13)	14 (5)	6 (2)	0.6 (1)
I felt rejected by my parents	102 (36)	44 (15)	66 (23)	57 (20)	18 (6)	1.5 (1.3)
There was an adult I could confide in	70 (24)	57 (20)	47 (16)	54 (19)	59 (21)	1.9 (1.5)
I was humiliated by people in my family	124 (43)	47 (816)	53 (19)	43 (15)	20 (7)	1.3 (1.3)
Members in my family looked after each other	35 (12)	54 (19)	48 (17)	80 (28)	70 (24)	2.3 (1.4)
I believe that I am bad person	99 (35)	65 (23)	77 (29)	12 (4)	7 (2)	1.3 (1.1)
I believe that somebody dies because of me	232 (81)	19 (7)	17 (6)	12 (4)	7 (2)	0.4 (1)
I have experienced serious physical assault	180 (63)	35 (12)	51 (18)	15 (5)	6 (2)	0.7 (1)
Adults noticed cuts, bruises or marks from when I was beaten	262 (91)	13 (5)	9 (3)	0 (0)	3 (1)	0.1 (0.6)
My childhood was perfect	83 (29)	70 (24)	63 (22)	54 (19)	17(6)	1.5 (1.3)
I am bothered by a very shameful secret	141 (49)	42 (15)	44 (15)	30 (11)	30 (11)	1.2 (1.4)
I was physically abused when I was young	181 (63)	45 (16)	30 (11)	25 (9)	6 (2)	0.7 (1.0)
I respect myself	34 (12)	98 (34)	67 (23)	48 (17)	40 (14)	1.9 (1.2)
Someone touched me or tried to make me touch them in a sexual way	216 (75)	34 (12)	18 (6)	13 (5)	6 (2)	0.5 (0.9)
I have had experiences that I feel very guilty about	75 (26)	58 (20)	75 (26)	53 (19)	26 (9)	1.6 (1.3)
I have been involved in life-threatening situations	146 (51)	65 (23)	53 (819)	14 (5)	9 (3)	0.9 (1.0)
I was forced to keep secrets about someone sexually interfering with me when I was young	258 (90)	9 (3)	4 (1)	4 (1)	12 (4)	0.3 (0.9)
I felt hated by a member or members of my family	158 (54)	48 (16)	42 (14)	21 (7)	20 (7)	1 (1.3)
My family was the greatest ever	62 (22)	49 (17)	81 (28)	54 (19)	41 (14)	1.9 (1.3)
Other people have acted badly because of me	158 (55)	57 (20)	61 (21)	8 (3)	3 (1)	0.7 (1)
I felt like the odd one out in my family	74 (26)	59 (21)	69 (24)	64 (22)	21 (7)	1.6 (1.3)
I have experienced sexual assault	242 (84)	14 (5)	22 (8)	6 (2)	3 (1)	0.3 (0.8)
Someone would always take me to see a doctor or nurse	8 (3)	21 (7)	38 (13)	68 (24)	151 (53)	3.1 (1.0)
I was put down, criticized and made to feel inferior when I was young	80 (28)	51 (18)	62 (22)	55 (19)	38 (13)	1.7 (1.4)
Someone sexually molested me	220 (77)	31 (11)	18 (6)	9 (3)	8 (3)	0.4 (0.9)
I feel responsible for harm or injury to another person	192 (67)	40 (14)	35 (12)	13. (5)	6 (2)	0.6 (1.0)
I had friends I could talk to about personal problems	78 (27)	65 (23)	61 (21)	56 (20)	26 (9)	1.6 (1.3)
I have experienced harassment/persecution from other ethnic groups	270 (94)	4 (1)	7 (2)	5 (2)	0 (0)	1.1 (0.5)
I did well at school	20 (7)	47 (16)	79 (28)	61 (21)	79 (28)	2.5 (1.3)
I have experienced the loss of somebody who was very important to me	80 (28)	48 (17)	90 (31)	41 (14)	27 (9)	1.6 (1.3)
I do not deserve to do well in life	87 (30)	63 (22)	70 (24)	46 (16)	20 (7)	1.5 (1.3)
My family was supportive and encouraging when I was young	49 (17)	66 (23)	63 (22)	63 (22)	45 (16)	2 (1.3)
I was sexually abused	231 (81)	24 (8)	8 (3)	9 (3)	14 (5)	0.4 (1.0)
I feel afraid of someone in my family	97 (34)	45 (16)	52 (18)	48 (17)	44 (15)	1.6 (1.4)
I could make friends easily	32 (11)	57 (2)	83 (29)	75 (26)	39 (14)	2.1 (1.2)

[a] SD – Standard Deviation; item range 0–4.

(rho varied from 0.3 to 0.4; $p < 0.001$). ECR-R anxious score correlated moderately with MSI scores (rho=0.4; $p < 0.001$).

3.3. Hierarchical Multiple Regression (HMR)

Altogether 23% of responders were unable to provide ECR-R data, probably due to a lack of intimate relationships. The ECR-R sample therefore comprised 219 individuals. In Model 1 R2=0.238, F (3, 215) =22.4., $p < 0.0001$, age and BDI had a significant weight (see Table 4). The addition of TADS (Model 2) led to a significant increase in R2 by 0.064, F (1, 214)=23.2, $P < 0.0001$, with significant weights for age, BDI and TADS. The addition of ECR-R Anxious and Avoidant (Model 3) led to a significant increase in R2 by 0.060, F (2, 211)=20.1, $P < 0.0001$, with significant weights for age, BDI, ECR-R anxious and TADS. The addition of S5 (neuroticism) (Model 4) led to a significant increase in R2 by 0.089, F (1, 210)=24.8, $P < 0.0001$, with significant weights for age, TADS and S5 neuroticism. The HMR was conducted also separately for patients with UD and BD without notable differences. Moreover, the results remained similar when the HMR was conducted separately for patients with mood disorder with and without comorbid BPD.

3.4. Mediation analysis

ECR avoidant scores were not used in mediation analysis because they did not predict MSI scores. A mediating effect of Attachment Anxiety (ECR-R anxious score) was detected for the relationships between childhood TEs assessed by TADS and BPD features assessed by MSI. The indirect effect of TADS on MSI through ECR-R anxious score was significant (B=0.02; CI=0.01 to 0.03). The direct effect of TADS on MSI was smaller (B=0.04; t (216)=4.3; $p \leq 0.0001$) than the total effect of TADS on MSI (B=0.06; t (216)=6.5; $p \leq 0.0001$), suggesting a partial mediating effect of ECR-R (see Fig. 1). Specifically, 33% (CI=17–53%) of the association between TADS and MSI was estimated to be mediated by ECR-R anxious score. In sensitivity analyses including separately the UD, BP-1 or BP-2 patients; and patients with mood disorders with and without comorbid BPD; the mediation findings remains similar. In addition, the mediation analysis was repeated using a control variable BDI. No significant changes in the relationships between TADS, ECR-R Anxious Attachment and MSI emerged. Moreover, a moderated mediation analysis was conducted, using BDI as a mediator on relations between a) TADS and ECR-R Anxious Attachment; b) t ECR-R Anxious Attachment and MSI; c) TADS and MSI. No significant interactions between BDI as moderator and TADS; ECR-R Anxious Attachment; and MSI emerged (data available by request).

Table 2
Mean scores of self-reported scales (TADS[a], ECR-R[b] and S5) in patients with mood disorder (n=282).

Questionnaire	BD-1 mean (SD)	BD-2 mean (SD)	UD mean (SD)	P[1]
TADS total score[1]	20.7 (13)	25.2 (17)	27.2 (18)	0.099
TADS emotional abuse[2]	5 (5)	6.2 (5)	7.1 (1)	0.063
TADS physical abuse	2.5 (2.6)	3 (3.5)	3.2 (3.6)	0.581
TADS sexual abuse	0.8 (2.5)	1.8 (3.5)	2.1 (4.3)	0.201
TADS emotional neglect	8 (5.3)	8.8 (5.8)	10 (5.3)	0.084
TADS physical neglect	4.2 (3)	5.4 (4)	4.8 (3.8)	0.320
ECR-R anxious	3.55 (1.33)	4.11 (1.5)	4.0 (1.5)	0.198
ECR-R avoidant	3.4 (1)	3.2 (1)	3.6 (1.3)	0.124
S5 neuroticism	4.4 (13.2)	9.8 (13.4)	8.8 (13.8)	0.142
S5 extraversion	2.2 (13)	0.14 (12)	−5.5 (14)	0.001[2]
S5 openness	10.3 (11)	11 (10)	8.8 (11.6)	0.331
S5 agreeableness	13.6 (8.7)	12 (8.5)	12.8 (9.7)	0.727
S5 conscientiousness	2.4 (11.7)	−0.2 (11.9)	1.8 (12.1)	0.448
MSI	4.5 (2.4)	6.3 (2.4)	5.4 (2.8)	0.024[3]

TADS – Trauma and Distress Scale; ECR-R – Experiences in Close Relationships-Revised (ECR-R); S5 – "Short Five".
[a] Data missing for 0.7% of patients, n=285;
[b] Data missing for 23.0% of patients, n=221;
[1] P by ANOVA; P is significant at the level ≤0.01;
[2] Mean extraversion is higher in patients with BD-1 than in others ($p < 0.01$ in Post Hoc by Tukey's HSD);
[3] Mean MSI is higher in patients with BD-2 than BD-1 ($p < 0.05$ in Post Hoc by Tukey's HSD).

4. Discussion

We investigated psychiatric patients with unipolar or bipolar mood disorders and correlates of their self-reported features of borderline personality disorder (BPD). We found strong correlations of self-reported BPD features with self-reported neuroticism and moderate correlations with self-reported childhood traumatic experiences (TEs) and with adulthood Attachment Anxiety. As hypothesized, in the mediation analysis we observed self-reported Attachment Anxiety to mediate one-third (33%) of the relationship between self-reported childhood TEs and self-reported BPD both in patients with mood disorders overall and in the diagnostic subgroups separately.

To our knowledge, this is the first study to examine associations between self-reported features of BPD measured as a dimensional entity and self-reported childhood traumatic experiences and attachment anxiety in mood disorder patients. Strengths of our study were the relatively large and representative number of mood disorder patients recruited from specialized psychiatric care and the extensive data of self-reported symptoms. Moreover, we investigated a comprehensive set of self-reported data of childhood traumatic experiences and attachment style; both are important domains in the aetiology of BPD (Leichsenring et al., 2011).

Some limitations of the study should, however, also be noted. First, the response rate was only 43%, perhaps because the study was conducted in busy routine clinical practice. Moreover, some volunteers were lost due to technical reasons and the survey was extensive and time-consuming. Nevertheless, an analysis of representativeness indicated no significant differences in terms of age or sex between our cohort and the whole patient population within specialized psychiatric care of the catchment area (data not shown). Furthermore, in terms of demographic characteristics our cohort did not differ from screening-based representative cohorts from the same area (Mantere et al., 2004; Melartin et al., 2002b). Second, the clinical diagnoses were not verified with structured clinical diagnostic interviews. However, all patients had been diagnosed with mood disorders in specialized psychiatric settings, and all information was re-evaluated by the authors. In addition, the focus of this study was on dimensionally self-reported data, not on categorical diagnoses. Third, 23% of patients were unable to respond to ECR-R, possibly due to lack of romantic relationships. Overall 38.7% of the patients were not cohabiting, which may indicate loneliness and possibly limited experience of or lack of recent romantic relationships. Fourth, the results of our study are based on self-report scales. Numerous studies have shown that patients with mood disorders often demonstrate impairments in social cognition (Hoertnagl and Hofer, 2014), autobiographical memory disruptions (Talarowska et al., 2016) and distortions in self-reflections (Philippi and Koenigs, 2014). These factors might affect the patients' ability to assess their own symptoms. Moreover, largely described symptoms of dissociation (Mosquera et al., 2014; Vermetten and Spiegel, 2014) may affect a patient's ability to recall events in childhood. Fifth, for purposes of this study, we assumed a causal relationship between self-reported TEs and features of BPD, to be tested in mediational analysis. However, although the retrospectively evaluated temporal sequence of exposures and outcomes is theoretically plausible, causality of such relationships cannot be shown in a cross-sectional study. Moreover, the temporal sequence of exposures and outcome remains uncertain, and possibility of reverse order cannot be excluded. At least in some cases or to some extent, self-reported adult attachment style could also be a consequence rather than cause of BPD symptoms. Sixth, we did not measure affective temperaments (Rihmer et al., 2010) in this study, and therefore, cannot evaluate possible conceptual and clinical overlap between various affective temperaments and self-reported BPD features or overlap in their putative risk factors. Seventh, we have not considered the potential impact of mood state on reporting of the BPD features.

The high prevalence of childhood TEs in patients with mental disorders is widely acknowledged (Hasin and Grant, 2015; Infurna et al., 2016). Moreover, the complexity and severity of childhood TEs were shown to be associated with the severity of psychopathology and with greater impairment in several domains in a range of mental disorders (Hasin and Grant, 2015; Martin-Blanco et al., 2014; Nusslock and Miller, 2015; Verdolini et al., 2015). Our study indicated that self-reported TEs are prevalent among patients with mood disorders, and a substantial proportion of patients with mood disorders

Table 3
Spearman's correlations between scores of MSI, ECR-R, S5 and TADS (n=282).

	MSI	ECR-R anxiety score	ECR-R avoidance score	S5 neuroticism	S5 extraversion	S5 openness	S5 agreeableness	S5 conscientiousness
TADS $_{\text{total score}}$	0.42**	0.39**	0.19**	0.31**	−0.20**	−0.07	−0.20**	−0.20**
Emotional abuse	0.38**	0.39**	0.17*	0.30**	−0.20**	−0.03	−0.07	−0.10**
Physical abuse	0.30**	0.24**	0.18**	0.19**	0.0	−0.05	−0.2**	−0.09
Sexual abuse	0.27**	0.19**	0.03	0.08	0.04	0.10	0.02	−0.08
Emotional neglect	0.35**	0.38**	0.22**	0.31**	−0.20**	−1	−0.20**	−0.20**
Physical neglect	0.34**	0.28**	0.09	0.25**	−0.08	−0.04	−0.20**	−0.20**
ECR-R anxiety score	0.42**	1	0.23	0.49**	−0.1	−0.60	−0.20**	−0.30**
ECR-R avoidance score	0.17*	0.23**	1	0.27**	−0.30**	−0.3**	−0.20**	−0.20**
MSI	1	0.42**	0.17*	0.58**	−0.8	0.1	−0.30**	−0.40**

MSI – McLean Screening Instrument; TADS – Trauma and Distress Scale; ECR-R – Experiences in Close Relationships-Revised (ECR-R); S5 – "Short Five".
* $p < 0.05$;
** $p < 0.001$; P is significant at the level 0.005.

Table 4
Hierarchical Multiple Regression in predicting MSI scores from age, sex, BDI, TADS, ECR-R and S5 dimensions in patients with mood disorders (n=219).

	Model 1		Model 2		Model 3		Model 4	
Variable	B	β	B	β	B	β	B	β
Constant	5.8*		5.9*		5.2*		5.4*	
Age	−0.06*	−0.3*	−0.06*	−0.293*	−0.06*	−0.27*	−0.05*	−0.23*
Sex	0.04	0.07	−0.19	−0.03	−0.26	−0.04	−0.16	−0.03
BDI	0.081*	0.38*	0.06*	0.28*	0.04*	0.2*	0.004	0.01
TADS			0.04*	0.3*	0.04*	0.27*	0.03*	0.21*
ECR-R anxious					0.47*	0.26*	0.212	0.116
ECR-R avoidant					0.12	0.06	0.05	0.02
S5 neuroticism							0.08*	0.40*
R2	0.24		0.304		0.364		0.453	
ΔR2	0.24		0.06		0.06		0.118	
F	22.5*		23.2*		21.4*		29.1*	
ΔF	22.5*		19.4*		10.7*		34.3*	

Model 1 (age, sex, BDI); Model 2 (age, sex, TADS); Model 3 (age, sex, TADS, ECR-R); Model 4 (age, sex, TADS, ECR-R, S5).
B – unstandardized coefficients; β - standardized coefficients; MSI – McLean Screening Instrument; TADS – Trauma and Distress Scale; ECR-R - Experiences in Close Relationships-Revised (ECR-R); S5 - "Short Five".
* $p < 0.001$; p is significant at the level 0.005.

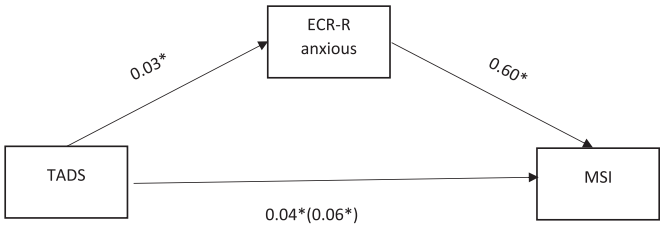

Fig. 1. Indirect effect of Trauma and Distress Scale (TADS) on MSI through ECR-R Attachment Anxiety in patients with mood disorders (n=219). Numbers indicate regression coefficients. *p≤0.001.

reported that the TEs were present "often" or "always" during their childhood. Moreover, patients with mood disorders appeared to report TEs more often than non-psychiatric individuals investigated in an earlier study (Salokangas et al., 2016). Moreover, the mean score of the "sexual abuse" dimension of the TADS was higher in patients with mood disorders (1.9 ± 4.0) than in individuals from the general population (0.5 ± 1.8). Interestingly, patients with clinical high risk for psychosis received the same mean score of "sexual abuse" of TADS (1.9 ± 4.4) (Tikka et al., 2013) as the patients with mood disorders in our study (1.9 ± 4.0).

The relationships between childhood TEs and borderline pathology remain debated (Goodwin, 2005; Lonie, 1993; Murray, 1993). On the one hand, individuals with BPD tend to report a high number of traumatic events in childhood (Battle et al., 2004; Lobbestael et al., 2010), but, on the other hand, the degree of effect of TEs on clinical manifestation of BPD is somewhat uncertain (Fossati et al., 1999; Laporte et al., 2011a; Paris, 1998). In our study, as expected, self-reported childhood TEs correlated moderately with self-reported BPD symptoms.

However, not all children exposed to TEs develop later personality disorders and not all patients with BPD report TEs in childhood (Paris, 1998). The maladaptive variants of the normal temperamental dimension of personality, such as high neuroticism, may contribute to the development of BPD (Samuel, et al., 2013). Our study indicated that self-reported symptoms of BPD correlated strongly with neuroticism. Moreover, we have shown that both self-reported childhood TEs and high neuroticism may independently predict self-reported symptoms of BPD in patients with mood disorders. A previous study indicated that low neuroticism and absence of childhood sexual abuse are significant predictors for earlier remission of BPD (Zanarini et al., 2006). Thus, the presence or absence of TEs and the degree of neuroticism may aggravate or reduce the severity of concurrent borderline pathology also in patients with mood disorders.

Mechanisms mediating the possible influence of childhood TEs on BPD are poorly understood. Among several hypotheses, impaired attachment style has received much attention (Fruzzetti et al., 2005; Laporte et al., 2011b; Rutter et al., 2006; Thatcher et al., 2005) (Fonagy et al., 2000; Minzenberg, et al., 2006). According to the attachment theory (Bowlby, 1982), early experiences with caregivers result in "internal working models" or mental representations of self and others. These "internal working models" tend to persist into adulthood as general representations with respect to close relationships (Fraley, et al., 2000). In the framework of attachment theory, insecure attachment was suggested as an explanatory link between childhood TEs and BPD (Fonagy et al., 2000; Johnston et al., 2009; Kellogg and Young, 2006). However, clinical studies demonstrating a mediating effect of insecure attachment between childhood TEs and borderline pathology are scarce. Furthermore, some of studies have been conducted using a non-clinical population (Alexander et al., 1998) or a categorical diagnostic approach (Fonagy et al., 1996; Minzenberg et al., 2006). Our findings were consistent with a partial mediating effect of adulthood Attachment Anxiety on the relationship between childhood TEs and self-reported BPD features among patients with mood disorders.

We demonstrated that after controlling for childhood TEs and young age, self-reported adulthood attachment anxiety appears to be an independent predictor of self-reported BPD features. In contrast, after controlling for childhood TEs, young age and neuroticism, adulthood Attachment Anxiety was not a significant predictor. These findings can be interpreted from different perspectives. First, our results are congruent with studies indicating that interactions between biological temperamental and environmental factors, such as childhood TEs, play an essential role in the development of BPD (Beauchaine et al., 2009; Crowell et al., 2009). In addition, one previous study suggested a mediating role of neuroticism in the relationship between childhood adversities and psychopathology (Laporte et al., 2011b). Moreover, we indicated a significant mediating effect of neuroticism between childhood TEs and BPD features in mood disorders also (data available on request). Second, possible phenomenological overlap between adulthood Attachment Anxiety and neuroticism may to some extent affect our results.

5. Conclusions

A strong association exists between self-reported childhood TEs and self-reported BPD features in patients with mood disorders. Young

age, the frequency of TEs and the degree of neuroticism are significant independent predictors of concurrent self-reported features of BPD in mood disorder patients. Self-reported attachment anxiety may partly mediate the association between self-reported childhood TEs and features of BPD in patients with mood disorders.

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