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Differential associations between childhood maltreatment types and borderline personality disorder from the perspective of emotion dysregulation

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Abstract

Background Borderline Personality Disorder (BPD) is characterized by pervasive instability in a range of areas including interpersonal relationships, self-image, and affect. Extant studies have consistently identified significant correlations between childhood maltreatment (CM) and BPD. While exploring this CM-BPD link, a number of cross-sectional studies commonly emphasize the role of emotion dysregulation (ED). A better understanding of the associations between BPD and (1) CM and (2) ED are essential in formulating early, effective intervention approaches, and in addressing varied adverse impacts.

Methods This cross-sectional study analyzed a subset of baseline data collected for a larger community-based longitudinal study. Given that our current focus on CM and ED, only those participants who completed the baseline CM assessment and ED measure ($N = 144$) were included for the primary analyses. We conducted stepwise multivariate linear models to examine the differential relationships between BPD features, ED, and multiple CM types. A path analysis with latent factors using the structural equation modeling (SEM) method was performed to test the indirect effect from CM to BPD features via ED.

Results Linear regression models revealed that only emotional abuse (relative to other trauma types) was significantly associated with high BPD features. The SEM, by constructing direct and indirect effects simultaneously, showed that (1) ED partially mediated the path from CM to BPD features; and (2) CM played an important role in which the direct effect remained significant even after accounting for the indirect effect through ED.

Conclusions Our results highlight a most consistent association between emotional abuse and BPD, indicating its unique role in understanding BPD features in the context of CM. Further, shame-related negative appraisal and ED were found critical when examining the association between CM and BPD, possibly providing promising treatment targets for future practices.

Keywords Childhood maltreatment, Abuse, Childhood trauma, Emotion dysregulation, Borderline personality disorder

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Background

Borderline Personality Disorder (BPD) is characterized by pervasive instability in a range of areas including interpersonal relationships, self-image, and affect. People with BPD often evidence marked impulsivity manifested in various contexts such as overspending, risky sex, substance use, and/or binge eating [1]. The median population prevalence of BPD ranges from 1.6% to as high as 5.9% [1]; nevertheless, Lenzenweger [2] concluded the general population prevalence to be approximately 1% based on an overview of international and national studies [3–5]. BPD is associated with many adverse psychosocial impacts, including impairment in interpersonal relationships and employment, excessive utilization of medical services, and marital distress and violence [6–9].

Literature review

Extant studies have consistently identified significant correlations between CM and BPD [10–16]. Commonly reported CMs by adults with BPD in previous studies include emotional abuse, verbal abuse, physical abuse, sexual abuse, and neglect, with sexual abuse being most frequently associated with a diagnosis of BPD among adults [17]. Additional CM-related risk factors for BPD include caregivers' failure to protect, denial of feelings, emotional withdrawal, and non-interpersonal CM.

While exploring this CM-BPD link, a number of cross-sectional studies focusing on adult populations commonly emphasize the role of emotion dysregulation (ED), specifically a high sensitivity to negative emotional stimuli [18–20]. ED usually concerns failure in targeting one or several of these cognitive/behavioral areas. For instance, an individual might lack awareness of their own emotions, be unable to activate or achieve a goal, and/or lack adaptive strategies to alter emotional processes [21]. In line with Linehan's biosocial theoretical perspective of BPD, ED can manifest as (1) excessive sensitivity to negative emotional stimuli, (2) a high amplitude of emotional response, (3) and/or a slow return to baseline [18]. For example, Tyrka et al. (2009) suggested that a sensitivity to negative emotional stimuli is a central aspect of BPD symptomatology, and they found in a community sample of adults with childhood experiences of abuse and neglect were more likely to report symptoms of BPD than those without such childhood adversities [16]. Gratz et al. (2008), employing a sample of inner-city substance users, found a partial indirect effect via emotion dysregulation between CM and BPD status. Their work further identified emotional abuse as the only factor significantly associated with BPD status after controlling for other forms of abuse and negative affect [15].

In addition to an overall ED deficit, specific ED sub-constructs (such as high sensitivity, intense emotions and slow return) were further explored by several studies, among which an elevated sensitivity to negative emotions has been consistently identified among BPD individuals who experienced CM. And shame, guilt and anger were most frequently reported negative emotions [15, 20, 22–27]. For instance, shame is consistently associated with an early experience of sexual abuse and results in a wide array of negative outcomes relevant for BPD symptomatology, including low self-esteem, negative self-appraisals, intolerance of disapproval and problematic interpersonal relationships [24, 25]. Likewise, persistent states of shame, guilt and anger were commonly reported among BPD individuals with CM experience [23, 24]. Further, anger has been noted among CM survivors, especially for those who later carry a diagnosis of PTSD. Finally, maladaptive regulation of those reported negative emotions was reported to be associated with several psychopathologies, including BPD [28].

Aims and significance of the current study

Although past studies examined ED and CM concerns among BPD individuals, the potential differential associations between CM types and (a) ED, and CM and (b) BPD remain unclear. While ED is a core feature of BPD, it is reasonable to propose that ED problems and CM are distinct concepts which worth further examining. More meaningfully, a better understanding of the associations is essential in formulating early, effective intervention approaches, and in addressing varied adverse impacts on interpersonal relationships and employment, excessive utilization of medical services, and marital distress and violence. Knowledge of key factors such as ED and CM will potentially contribute to early identification of BPD traits. Improved knowledge in this aspect will in particular facilitate effective prevention and inform future practice.

In light of this, the aims of the current study are: (1) to examine the differential association of CM types (specifically, physical, sexual, and emotional abuse, and physical and emotional neglect) with BPD features, and ED constructs with BPD, and (2) to examine the direct and indirect relationships between CM and BPD, potentially through the third channel of ED. In addition to a general relationship between CM and BPD as suggested by previous literature, we hypothesize that (1) differential associations exist between (1) CM and BPD features: Specifically, in line with a large number of cross-sectional studies, sexual abuse may have a stronger association with BPD relative to other CM types, and (2) further there will be a significant indirect effect of CM through

the channel of ED examined by structural equation modeling.

Methods

Participants and procedures

This cross-sectional study is a secondary analysis of a subset of baseline data collected for a larger community-based longitudinal study (Pittsburgh Girls Study [PGS]). The PGS involves 2450 girls (now women) who were initially recruited in 1999 and 2000 when they were ages 5 to 8 years old (see Keenan et al., 2010 for further details on PGS recruitment and study design). Participants for the sub-study, which focused on aggressive and self-harming behavior in young women, were identified from the larger PGS based on self-reports of recent aggressive behavior, suicidality, or self-injury (see [29] for additional details). A total of 166 young women were recruited and consented to participate in the sub-study. During initial assessments (baseline) of the sub-study, participants completed a battery of clinical interviews and self-report measures (see Measures section for details). Follow-up assessments (data were not presented here) occurred at 6- and 12-months, respectively, after the initial assessments (Tables 1 and 2).

Given that our current focus is on CM and ED, only those participants who completed the baseline assessment measures of CM and ED ($N = 144$) were included for the primary analyses and the results presented here. These participants were between the ages of 18 and 24 ($M = 21.51$, $SD = 1.57$), and were primarily African American or non-Hispanic White. The demographics of this sub-study sample were similar to those of the larger longitudinal study (redacted citation) from which participants were selected (see Table 1 for additional information).

Measures

BPD in the linear regression models

The Structured Interview for DSM-IV-TR Personality (SIDP-IV [30];) was used to generate dimensional BPD scores for our linear models. The SIDP-IV is a semi-structured diagnostic interview for DSM-IV-TR personality disorders. Interviews were administered by research staff with a bachelor's degree or higher who were trained to reliability by a doctoral-level clinical psychologist. SIDP-IV items are rated on a 0 to 3 scale (0 = *not present*, 1 = *subthreshold*, 2 = *present*, 3 = *strongly present*). Dimensional scores (a sum of all BPD item scores) were used as an index of BPD symptomatology severity. The BPD items demonstrated adequate internal consistency for dimensional BPD scores in this subsample (Cronbach's $\alpha = .87$).

Table 1 Demographic Characteristics of Study Participants ($N = 144$)

Variables	n (%)
Age: Mean at Wave 1 (Range)	21.51 (18.83-24.91)
Race/Ethnicity	
African American	101 (70.1)
White	40 (27.8)
Multiracial	3 (2.1)
Sexual orientation	
Heterosexual orientation	107 (74.3)
Bisexual orientation	23 (16)
Gay/lesbian/homosexual orientation	12 (8.3)
Not sure	2 (1.4)
Marital status	
Never married	134 (93.1)
Married/living with someone	10 (6.9)
Education level	
Grade 7 to 12 did not graduate high school	14 (9.7)
High school/HS equivalent	60 (41.7)
College (graduated 2-year or 4-year college/part college)	67 (46.5)
Graduate/professional school (completed/part graduate or professional school)	3 (2.1)
Employment status	
Homemaker	2 (1.4)
Did not work due to disability	2 (1.4)
Did not work	49 (34)
Worked full time	36 (25)
Worked part time	55 (38.2)

BPD in the SEM

In addition to SIDP-IV, we used the Personality Assessment Inventory-Borderline Features Scale (PAI-BOR, [31]) in our structure equation model (SEM). PAI-BOR is a 24-item self-report measure that assesses four dimensions underlying BPD: affective instability, identity problems, negative emotions, and self-harm. The rational to use two BPD measures is that SIDP-IV is clinically-administered and can generate less biased dimensional diagnostic scores; whereas PAI-BOR contains four BPD domains which have been statistically validated and therefore can be conveniently used to specify the measurement model in SEM in addition to assess the relationships among three latent factors (ED, CM and BPD). Intraclass coefficients among this sample for subscales are as follows: Affect instability ($\alpha = .72$), identity problems ($\alpha = .68$), self-harm ($\alpha = .73$), and negative relationships ($\alpha = .64$).

Table 2 Measures

	Item #	Cronbach's α	M	SD	Skewness	Kurtosis	Range
CTQ	Total	α=.92 (6 subscales with MN)	54.2	14.5	1.55	6.13	34-117
	Total	α=.91 (5 subscales without <M)	46.3	16.2	1.27	5.09	25-111
PN	1	α=.71					
	2						
	4						
	6						
	26						
EA	3	α=.82					
	8						
	14						
	18						
	25						
EN	5	α=.84					
	7						
	13						
	19						
	28						
PA	9	α=.76					
	11						
	12						
	15						
	17						
MN	10	α=.79					
	16						
	22						
SA	20	α=.93					
	21						
	23						
	24						
	27						
Anger (STAXI)	Total	α=.91 (30 items)	69.8	13.3	0.48	2.62	43-109
T-Anger	STAXI12	α=.88					
	STAXI13						
	STAXI14						
	STAXI15						
	STAXI16						
	STAXI17						
	STAXI18						
	STAXI19						
	STAXI20						
Ang-Con	STAXI24	α=.81					
	STAXI28						
	STAXI31						
	STAXI35						
	STAXI38						
	STAXI40						

Table 2 (continued)

	Item #	Cronbach's α	M	SD	Skewness	Kurtosis	Range
Ang-Out	STAXI27	α=.83					
	STAXI29						
	STAXI32						
	STAXI34						
	STAXI39						
	STAXI42						
	STAXI43						
Ang-In	STAXI25	α=.71					
	STAXI26						
	STAXI30						
	STAXI33						
	STAXI36						
	STAXI37						
	STAXI41						
PAIBOR	Total	α=.87	59.5	11.4	−0.07	2.49	32-85
Affect Instability	paibor1	α=.72					
	paibor4						
	paibor7r						
	paibor10						
	paibor14r						
	paibor18						
Identity Problems	paibor2	α=.68					
	paibor5						
	paibor8						
	paibor11						
	paibor15						
	paibor19r						
Negative Relationships	paibor3	α=.64					
	paibor6						
	paibor9						
	paibor12r						
	paibor16						
	paibor20r						
Self-harm	paibor13	α=.73					
	paibor17						
	paibor21						
	paibor22						
	paibor23						
	paibor24r						
GASP	Total	α=.80	71.1	14.9	−0.48	2.76	27-104
Guilt-Negative-Behavior-Evaluation	1	α=.69					
	9						
	14						
	16						
Guilt-Repair	2	α=.54					
	5						
	11						
	15						

Table 2 (continued)

	Item #	Cronbach's α	M	SD	Skewness	Kurtosis	Range
Shame-Negative-Self-Evaluation	3	α=.72					
	6						
	10						
	13						
Shame-Withdraw	4	α=.55					
	7						
	8						
	12						
DERS	Total	α=.91	91.3	20.7	0.34	2.8	50-149
Nonacceptance of emotional responses	11	α=.85					
	12						
	21						
	23						
	25						
	29						
Difficulty engaging in goal-directed behavior	13	α=.72					
	18						
	20R						
	26						
	33						
Impulse control difficulties	3	α=.81					
	14						
	19						
	24r						
	27						
	32						
Lack of emotional awareness	2r	α=.85					
	6r						
	8r						
	10r						
	17r						
	34r						
Limited access to emotion regulation strategies	15	α=85					
	16						
	22r						
	28						
	30						
	31						
	35						
	36						
Lack of emotional clarity	1r	α=.76					
	4						
	5						
	7r						
	9						

CM

The Childhood Trauma Questionnaire Short Version (CTQ-SF [32];) items ask about experiences from early childhood to adolescence, which are rated on a 5-point scale with response options ranging from Never True to Very Often True. The CTQ-SF produces a total score and five CM-related subconstructs—physical, sexual, and emotional abuse, and physical and emotional neglect. The CTQ-SF showed good reliability among this sample. Intraclass correlation coefficients for subscales are: Physical neglect ($\alpha = .71$), emotional abuse ($\alpha = .82$), emotional neglect ($\alpha = .84$), physical abuse ($\alpha = .76$), and sexual abuse ($\alpha = .93$).

Emotion dysregulation

The Difficulties in Emotion Regulation Scale (DERS [33];) is a 36-item self-report measure that was developed to assess emotion dysregulation comprehensively, including items that reflect difficulties in six emotional dimensions: Non-acceptance, Goals, Impulse, Strategies and Clarity [33]. More specifically, Non-acceptance means non-accepting reactions to negative emotions or stress; the Goals dimension contains items reflecting difficulties in engaging in goal-directed behaviors (such as concentrating or accomplishing tasks); the Impulse dimension consists of items that describe difficulties with controlling behaviors under negative emotions; the Awareness (reverse-coded) scale assesses the ability to attend to and recognize emotions; the Strategies dimension includes items that evaluate limited access to regulation strategies; and Clarity measures lack of clarity about one's own emotions(e.g. unable to identify one's emotions). Each item of the DERS is rated on a 5-point scale ranging from 1 "almost never" to 5 "almost always". DERS demonstrated good internal consistency among our sample as indicated by intraclass correlation coefficients for subscales of non-acceptance ($\alpha = .85$), goals ($\alpha = .72$), impulse ($\alpha = .81$), strategies ($\alpha = .85$) and clarity ($\alpha = .85$).

Shame/guilt

The Guilt and Shame Proneness scale (GASP) is a 16-item self-report scale that assesses individuals' tendencies to experience shame and guilt following embarrassing or offensive events across different settings [34]. The GASP consists of two shame subscales (negative behavior-evaluations and repair action tendencies) and two guilt subscales (negative self-evaluations and withdrawal action tendencies). For the two guilt subscales, negative behavior-evaluations items address bad feelings about one's actions, whereas repair items describe behavioral intentions such as correcting one's mistakes (e.g., "you would try to act more considerately toward your friends"). As far as the shame subscales, negative self-evaluations consist of items about feeling bad about oneself, whereas withdrawal items address tendencies to hide from the public (e.g., "you would avoid the guests until they leave"). Each item of the GASP is rated on a 7-point scale, with "1″ indicating "very unlikely" and "7″ indicating "very likely". Finally, internal consistency for GASP was unsatisfactory among our sample. The intraclass correlation coefficients are: Negative behavior-evaluations ($\alpha = .69$), repair action tendencies ($\alpha = .54$), negative self-evaluations ($\alpha = .72$) and withdrawal action tendencies ($\alpha = .55$).

Anger

The original State-Trait Anger Expression Inventory-2 (STAXI-2) is a 57-item self-report measure comprised of six subscales: State Anger, Trait Anger, Anger Expression-In, Anger Expression-Out, Anger Control-In, and Anger Control-Out [35]. We utilized an abbreviated anger scale that included only Trait Anger, Anger Expression-In, Anger Expression-Out, and Anger Control (we used mean scores of both Control-in and out scores, which were also reverse coded). In terms of each subscale, Trait Anger measures the disposition to experience anger with or without provocation; Anger Expression-In assesses the frequency of controlling one's angry feelings; Anger Expression-Out measures how often one takes actions upon his/her anger; and Anger Control measures one's ability to control one's anger by utilizing positive outlets (Control-out) or calming oneself down (Control-in). The internal consistency of each subscale in this sample was adequate. The intraclass correlation coefficients are: Trait Anger ($\alpha = .88$), Anger Expression-In ($\alpha = .71$), Anger Expression-Out ($\alpha = .83$), and Anger Control ($\alpha = .81$).

Analyses

Research question 1: linear regression models

To examine the differential relationships between BPD features, ED, and specific CMs, we conducted stepwise multivariate linear models. The initial model was comprised of five CM types as main predictors. Step two included DERS constructs as additional independent variables. Step three added four anger variables: Trait Anger, Anger Expression-out, Anger Expression-in and Anger Control (this variable was reversed coded). The final step further included four subconstructs of shame/guilt. Finally, performance of different models (e.g. model R^2) were evaluated and compared.

Research requestion 2: SEM

In order to test the indirect effect from CM to higher BPD features through ED, we conducted path analysis with latent factors using the structural equation modeling (SEM) method in R. The structural model was

comprised of the latent predictor CM, the latent outcome variable BPD, and the mediator ED. The measurement model is specified as follows: CM is measured by five subtypes (physical abuse, sexual abuse, emotional abuse, physical neglect and emotional neglect), BPD by four symptomatic categories (affective instability, identity problems, negative emotions and self-harm), and ED by six emotional subconstructs (non-acceptance, goals, impulse, awareness, strategies, and clarity) (Fig. 1). Were model modifications needed, two methods will be used using packages of "aod" and "Rsolnp" in R [36, 37], specifically, (1) Wald statistics (estimated increase in X^2 given a prior estimated path parameter fixed to a known value) and (2) LaGrange Multiplier method (predicted decrease in X^2 given a prior fixed path parameter were to be estimated) [38]. Finally, a *p*-value equals or is less than .05 will be considered significant [39].

Results

Preliminary analyses

To select potential control variables, characteristic differences based on demographic factors (such as race, sexual orientation, marriage status, employment and education) in BPD dimensional scores were assessed using Multifactor Analysis of Variance (ANOVA). Results from Multi-factor ANOVA evidenced no significant between-group differences in BPD scores.

Regression models

Table 3 presents parameters and model fit indices of all our multiple regression models. Results from model 1 indicated that only emotional abuse ($b = .19$, $t = 2.01$, $p = .05$) was significantly associated with higher BPD features. The overall model R^2 was significant,
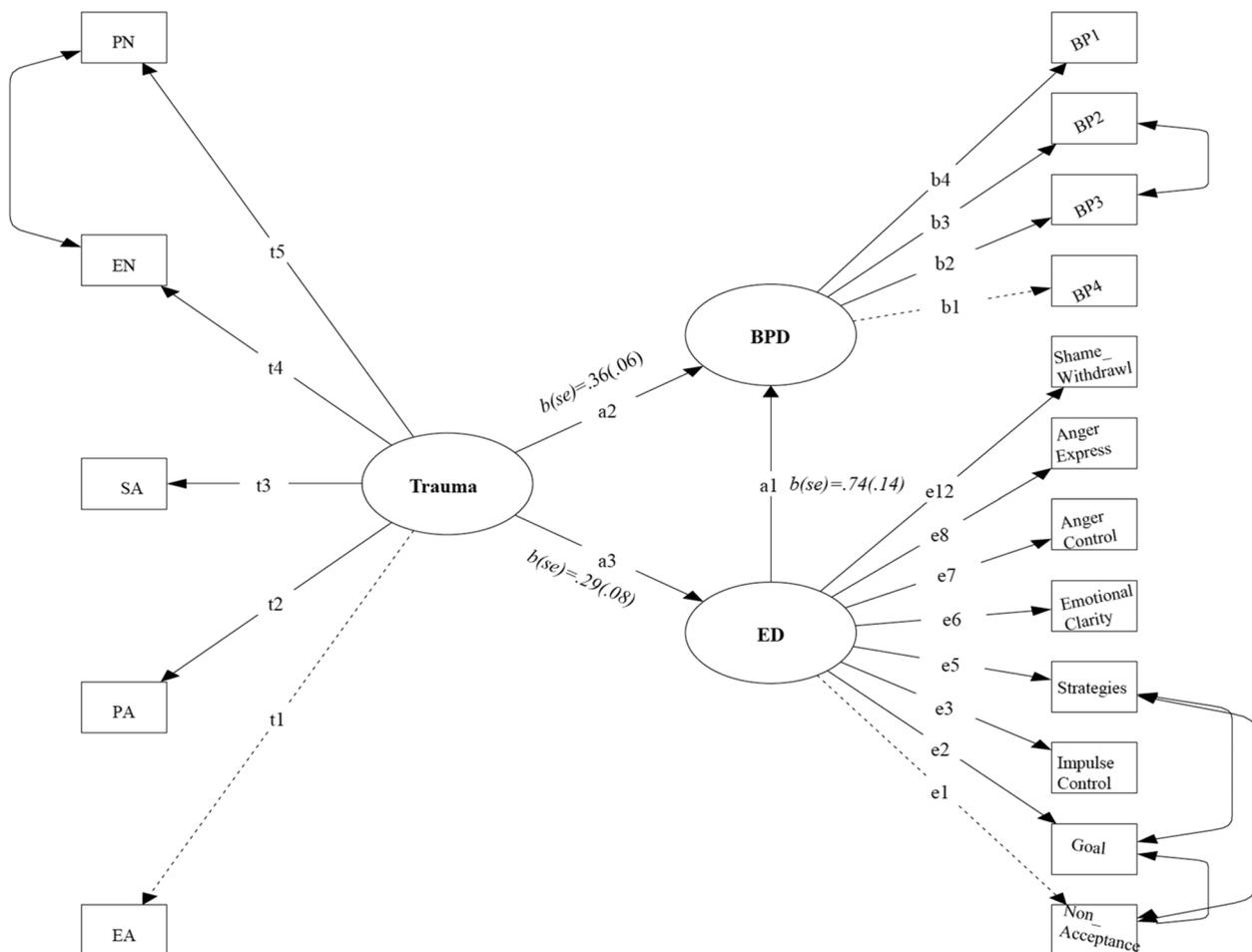

Fig. 1 A Path Diagram of Trauma Predicting BPD Partially Mediated via Emotion Dysregulation Dimensions (PN=Physical Neglect, EN = Emotional Neglect, SA = Sexual Abuse, PA = Physical Abuse, EA = Emotional Abuse, BP 1 = Affective instability, BP 2 = Identity problems, BP 3 = Negative Relations, BP 4 = Self-harm. Measurement model parameters which were omitted here for a more clear and concise display. All parameters were significant except for three ED subconstructs. Parameters of the paths displayed via dotted lines were fixed. Double arrow lines stand for the covariances among subconstructs)

Table 3 Regression Models Predicting BPD Features ($N=144$)

Variables	Model 1				Model2				Model 3				Model 4			
	b	se	t	p	b	se	t	p	b	se	t	p	b	se	t	p
(Intercept)	0.96	1.11	0.86	0.39	−3.88	1.78	−2.18	0.03*	−4.46	2.84	−1.57	0.12	−4.30	3.49	−1.23	0.22
CTQ_EA	0.19	0.10	2.01	0.05*	0.15	0.09	1.76	0.08[a]	0.15	0.09	1.70	0.09[a]	0.17	0.09	1.98	0.05*
CTQ_PA	0.19	0.13	1.43	0.16	0.16	0.12	1.35	0.18	0.10	0.12	0.86	0.39	0.10	0.12	0.88	0.38
CTQ_SA	0.07	0.08	0.88	0.38	0.10	0.07	1.41	0.16	0.10	0.07	1.31	0.19	0.08	0.07	1.17	0.24
CTQ_EN	0.05	0.10	0.54	0.59	−0.02	0.09	−0.25	0.80	0.01	0.09	0.07	0.94	−0.04	0.09	−0.41	0.68
CTQ_PN	0.17	0.13	1.30	0.19	0.13	0.12	1.05	0.29	0.11	0.12	0.89	0.38	0.14	0.12	1.16	0.25
Non-acceptance					0.04	0.08	0.52	0.60	0.02	0.08	0.28	0.78	0.07	0.08	0.82	0.41
Goals					−0.14	0.10	−1.41	0.16	−0.15	0.10	−1.52	0.13	−0.11	0.10	−1.10	0.28
Impulse					0.28	0.08	3.60	0.00***	0.24	0.10	2.38	0.02*	0.19	0.10	1.90	0.06[a]
Awareness					−0.03	0.08	−0.40	0.69	0.00	0.08	0.00	1.00	0.05	0.08	0.69	0.49
Strategies					0.07	0.08	0.92	0.36	0.06	0.08	0.67	0.50	0.10	0.08	1.20	0.23
Clarity					0.21	0.11	1.85	0.07[a]	0.20	0.12	1.68	0.10.	0.14	0.12	1.19	0.24
Trait Anger									0.27	0.81	0.34	0.74	0.49	0.81	0.60	0.55
Anger Control									−0.70	0.68	−1.04	0.30	−0.69	0.67	−1.02	0.31
Anger Expression Out									0.91	0.76	1.19	0.24	0.63	0.79	0.80	0.42
Anger Expression in									0.80	0.74	1.08	0.28	0.71	0.72	0.99	0.32
NBE													−0.08	0.34	−0.23	0.82
GR													0.64	0.41	1.57	0.12
NSE													−0.79	0.32	−2.49	0.01*
SW													−0.24	0.31	−0.79	0.43
R2adjusted	0.18				0.36				0.38				0.41			
F	7.47				8.45				6.88				6.22			
df	5138				11,132				15,128				19,124			
p (ΔR2)					<.001***				0.1				0.05*			

***: $p<.001$; **: $p<0.01$; *$p<.05$

[a] is a marginal significance which is close to 0.05 but larger than 0.05

accounting for approximately 18% of the variance. Adding DERS subconstructs, model 2 showed that the effect of EA became marginally significant and impulsivity ($b=.28$, $t=3.60$, $p<.001$) was significantly correlated with higher BPD scores. There is a significant increase in model R^2, indicating an improvement in model performance. In Model 3, we introduced four additional predictors: Trait Anger, Anger Expression-out, Anger Expression-in and Anger Control (this variable was reversed coded). There was no improvement in the model performance and impulsivity remained significant ($b=.23$, $t=2.38$, $p<.05$) whereas other predictors were not. In the final model, four subconstructs of shame/guilt were added, and results demonstrated that EA ($b=.17$, $t=1.98$, $p<.001$) and Shame (negative self-evaluation; $b=-0.79$, $t=-2.49$, $p<.05$) were significantly associated with BPD scores. The final model was significantly improved from model 3 and 4, accounting for about 41% of the variance. Finally, other types of CM, including physical and sexual abuse, and neglect were not significant across all our models.

SEM

The initial SEM model had unsatisfactory performance ($CFI=.67$, $SRMR=.12$, and $RMSEA=.13$ (90%CI: $.11\sim.14$)). As post hoc procedures, subsequent modifications were performed using: (1) Wald statistics and (2) LaGrange Multiplier method [38]. The stepwise multivariate Wald test in Lavaan [40] indicated that four non-significant paths can be eliminated from the initial model (the predictions of ED by emotional awareness, both guilt subconstructs, and one shame subscale of negative self-evaluation). The LaGrange Multiplier method was subsequently applied for further diagnosis and modification. From the results, five covariances (See Fig. 1 and Table 4) were added iteratively to improve the model performance. In this procedure, only covariances underlying the same factor were selected iteratively (e.g., ED manifest variables were allowed to covary); whereas

Table 4 Standardized parameter estimates for the SEM model

	B	SE	z	p	ß	R^2
Measurement Model						
Trauma						
→ Childhood emotional abuse	1				.78	.61
→ Childhood physical abuse	.73	.09	8.13	.00	.77	.59
→ Childhood sexual abuse	.68	.12	5.66	.00	.52	.27
→ Childhood emotional neglect	.74	.11	6.64	.00	.61	.37
→ Childhood physical neglect	.46	.08	5.79	.00	.54	.29
ED						
→ Non-acceptance	1				.53	.28
→ Goal-directed behavior	.90	.15	6.13	.00	.59	.35
→ Impulse control	1.68	.26	6.36	.00	.84	.71
→ Emotional regulation strategies	1.68	.23	7.43	.00	.71	.50
→ Emotional clarity	.62	.14	4.35	.00	.45	.20
→ Anger control	−.10	.03	−3.99	.00	−.46	.21
→ Ange expression	.49	.08	6.19	.00	.79	.62
→ Shame-withdraw	.15	.04	3.65	.00	.36	.13
BPD						
→ Affective instability	1				.87	.75
→ Identity problems	.81	.09	8.55	.00	.69	.47
→ Negative emotions	.75	.09	8.15	.00	.65	.43
→ Self-harm	.72	.10	7.44	.00	.68	.47
Structural Model						
BPD						
→ Trauma (a2)	.29	.06	5.05	.00	.36	.82
→ ED (a1)	.83	.14	5.88	.00	.74	
ED						
→ Trauma (a3)	.21	.08	2.68	.01	.29	.08
Indirect Effect						
a1*a3	.17	.06	2.86	.00	.21	
Total Effect						
a2 + (a1*a3)	.46	.08	5.70	.00	.57	

cross-loadings (variables measuring across factors: e.g., between ED subconstruct and CM subconstruct) were not allowed given that it will be theoretically misleading.

The modified model was significantly improved from the initial model despite no significant difference from the observed model (ΔX^2=367.57). However, the following indices showed an overall good fit of the final model [*CFI* =.93, *SRMR* =.067, and *RMSEA* =.06 (90%*CI*: .04∼.07)]. As can be seen in Table 4, the final model revealed that three factors were generally well identified with good construct validity. From information presented in Fig. 1 and Table 4, there were significant direct effects of CM on ED (*b* =.36, *z* =5.05, *p* <.001) and ED on BPD (*b* =.74, *z* =5.88, *p* <.001). After accounting for the indirect effect of CM on BPD via ED (Δb =.21, *z* =2.86, *p* <.01), the total effect of CM on BPD remained significant (*b* =.57, *z* =5.70, *p* <.001). In other words,

higher CM significantly predicted heightened BPD symptomatology, partially mediated through ED. In addition, CM showed a significant and unique effect after controlling for the indirect effect via ED.

Discussion

Summary of key findings

By testing direct associations between BPD features, ED constructs and CM types, we have identified that only emotional abuse (relative to other CM types) was significantly associated with high BPD features; further, some ED constructs (such as impulsivity and shame-related negative appraisals) may bear special meanings to BPD features. Our SEM model, by constructing direct and indirect effects simultaneously, further revealed that (1) ED partially mediated the path from CM to BPD features; and (2 the direct effect of CM

remained significant even after accounting for the indirect effect through ED.

CM types and emotional abuse

Although multiple regression results evidenced a significant effect of emotional abuse (EA) on BPD symptomatology, other types of abuse were not significantly associated with BPD features. Emotional abuse significantly predicted BPD features, replicating previous findings on the relationship between childhood emotional abuse and BPD symptoms [41–46]. Commonly posited etiological explanations for this finding have included the presence of emotion dysregulation, attachment disturbance and a dynamic biosocial interaction [41, 42, 47, 48].

Indeed, this finding on emotional abuse could be interpreted to be consistent with Linehan's biosocial theory, in which BPD etiology is conceptualized as a dynamic interplay between inherited emotion regulation vulnerabilities and invalidating environments [18]. Examples of emotional abuse items in the CTQ are: "People in my family called me things like stupid, lazy, or ugly" and "I thought my parents wished I had never been born" [32]. Those verbal assaults are typical of invalidating environments, where belittling of feelings, and suppression of negative emotions frequently happen. Therefore, emotional abuse may be a key feature of invalidating environments that elevates risk for BPD symptoms. Likewise, Rosenstein et al. (2018) posit that emotional abuse is typical of invalidating environment, which accounts for BPD symptomatology [49]. More recent empirical studies also lend support to this line of finding by showing evidence that emotional abuse independently predicts heightened BPD features when controlling for other types of trauma [15, 42, 49], which was specifically related to ED problems (a core BPD characteristic). For instance, from the perspective of ED, researchers suggested that BPD individuals might have an inherited tendency to over-regulate negative emotion to adapt to such invalidating environments.

Inconsistent with a large body of BPD literature, our findings did not support a significant effect of sexual abuse on BPD symptomatology [43, 50–52]. Notably, our participants endorsed the lowest mean score of sexual abuse ($Mean = 7.56$, $SD = 5.14$) relative to other CM types. The comparatively low mean score may be partially explained by the fact that emotional abuse and physical neglect are more prevalent than sexual abuse in the general population [50, 53, 54]. Hence, given the lower rates of sexual abuse in our sample than those in clinical samples, it might be possible that we may not have found a relationship due to limited range on this variable.

Shame and emotion dysregulation

A subtype of shame was shown to have a significant association with BPD features. Specifically, this subtype is a negative self-evaluation which denotes an unfavorable appraisal of self as a result of feeling shame. This interesting finding is in line with attachment theoretical explanations. Griffin and Bartholomew [55] conceptualize adult attachment styles in terms of mental representations of self and others as follows: positive self and other representations (secure pattern), positive self and negative other representations (dismissing pattern), negative self and positive other representations (preoccupied pattern), and negative self and other representations (fearful pattern). From this perspective, shame-negative-self is analogous to negative-self dimension. The function of this particular emotion might resemble that of a preoccupied anxious attachment, which has been consistently marked among people with CM exposure and those with BPD [47, 56, 57]. Further, shame is an example of social emotions, which primarily arise within interpersonal contexts [58]. Socially maladaptive regulation of shame can undermine one's abilities to manage interpersonal relationships and vice versa. Such interrelatedness between interpersonal context and social emotions, hence, is highly compatible with BPD symptomatology.

Finally, our SEM results supported a partial indirect effect of CM on BPD features via elevated ED. This corroborates multiple lines of BPD literature [15, 59–61]. Further, there were studies that investigated how unique aspects of emotion dysregulation might be differentially associated with distinct CM types in accounting for higher BPD features. Researchers found that emotional neglect was related to less adaptive emotion regulation abilities (e.g., less frequent use of cognitive reappraisal), whereas emotional abuse was associated with higher dysfunctional or maladaptive emotion regulation strategies (more frequent use of expressive suppression). Although precise definitions of emotional neglect vary by state laws, emotional neglect is commonly defined as the failure of a parent or caretaker to provide affection or emotional support to the child [62]. Emotional neglect also includes any act that places the child at risk of being exposed to parental substance abuse or domestic violence [62]. These unique influences from particular aspects of ED did not emerge for other CM types [41, 63]. It is noteworthy that the effect of CM remained significant even after accounting for ED, indicating a unique role of CM in exacerbating BPD symptoms that is worthy of further investigation.

Limitations, strengths and moving forward

One limitation of our study concerns the use of self-report measures (with the exception of our interview

measure of BPD features), which can lead to recall biases. In terms of participants, our sample included only females (though the sample is diverse with regard to race and socioeconomic status); hence, generalizability to other genders is limited. Further, our age range is restricted to emerging adulthood, hence generalizability to other developmental stages can be limited. Finally, our study utilizes cross-sectional design, and thus our results only suggest correlations and statistical mediation.

More rigorous designs will be required to obtain more reliable knowledge. For example, future research should address comparing the differential effects between momentary emotional reactions and stable traits in exacerbating BPD symptoms after traumatic exposure in order to gain more knowledge about the specifics of ED. Moreover, different age groups can be recruited (such as adolescents and adults in the late twenties) and members of different racial/ethnic groups to further advance the current knowledge on different developmental ages and the role of culture. In addition, research studies can utilize repeated measures and causal inference techniques to improve the research design.

Despite the limitations, we comprehensively investigated ED, several distinct forms of NA and unique CM types in affecting BPD symptoms during emerging young adulthood. We revealed that emotional abuse in relative to other CM types can be specifically related to BPD features, and trainings on regulating CM-related social emotions, such as shame, can be a potential target for future practice.

Conclusions

Our results highlight a most consistent association between emotional abuse and BPD, indicating its unique role in understanding BPD features in the context of childhood maltreatment. Further, shame-related negative appraisal and ED were found critical when examining the association between CM and BPD, possibly providing promising treatment targets for future practices.

First, early screening of CM-related symptoms and employment of trauma-informed care should be integrated into traditional BPD treatments and in settings where individuals with BPD who are in crisis may be seen, e.g. psychiatric emergency departments and outpatient/inpatient care units. Second, emotional regulation difficulties should be targeted when treating people with CM experiences. Third, it can be especially useful to address key CM-related negative emotions in treatment, such as shame and related maladaptive regulating strategies.

Regarding CM-related care relevant to BPD populations, as inspired by our study, a trauma-informed emotion regulation skills training can potentially include topics such as (1) mindfulness strategies for coping with CM-related emotions, (2) validation of negative emotions, and (3) learning reappraisal of negative experiences. Furthermore, for individuals with BPD without a diagnosis of CM or stress-related disorders, facilitating a supportive, genuine and empathic dialogue at minimum would promote early and accurate screening for CM symptomatology. As noted earlier, emotional abuse and emotion-related invalidation are highly prevalent among BPD populations (with or without a co-occurring trauma-related diagnosis); therefore, emotion regulation skills training targeting emotional invalidation can potentially lead to effective results.

For those with active co-occurring diagnoses, trauma informed treatment work which integrates traditional BPD psychotherapies with trauma-processing narratives, psychoeducation sessions, and exposure-based techniques can be helpful [64–68]. Last but not least, maintaining control of therapy-interfering or other high-risk behaviors, e.g. self-harm, can be critical before implementing any type of trauma care or related treatments. Crises such as high levels of life-threatening (e.g., suicide attempts) and/or therapy-interfering behaviors (e.g., dishonesty with therapist, frequent threatening to quit or non-completion of any homework assigned) before processing traumatic memories and emotions, given that the presence of aforementioned crises might prevent the individuals from effectively discussing and managing emotion about the CM, or they may not have the skills yet to regulate the emotions. To this aim, it will be necessary to conduct an early evaluation of the risks, establish a trusting therapeutic relationship as well as develop action plans to ensure safety [69].

Abbreviations

CM	Childhood Maltreatment
ED	Emotion dysregulation
EA	Emotional abuse
BPD	Borderline Personality Disorder
PGS	Pittsburgh Girls Study
NA	Negative affect
SIDP-IV	Structured Interview for DSM-IV-TR Personality
PAI-BOR	Personality Assessment Inventory-Borderline Features Scale
CTQ-SF	Childhood Trauma Questionnaire Short Version
DERS	Difficulties in Emotion Regulation Scale
GASP	The Guilt and Shame Proneness scale
STAXI-2	State-Trait Anger Expression Inventory-2
SEM	Structural equation modeling

Supplementary Information

Additional file 1: Table 1. Demographic Differences in BPD Scores (BOR). **Table 2.** Demographic Differences in BPD Scores (PAIBOR).

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