Childhood Adversity and Borderline Personality Disorder: A Meta-Analysis

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Data Privacy Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Abstract

Objective: The aim of this meta-analysis was to better understand the magnitude and consistency of the association between childhood adversity and borderline personality disorder (BPD) across case-control, epidemiological and prospective cohort studies.

Method: Following the review protocol (reference: CRD42017075179), search terms pertaining to adversity and BPD, were entered into three search engines. Random effects meta-analysis synthesised the size and consistency of the effects.

Results: 97 studies compared BPD to non-clinical (k = 40) and clinical (k = 70) controls. Meta-analysis of case control studies indicated that individuals with BPD are 13.91 (95% CI 11.11-17.43) times more likely to report childhood adversity than non-clinical controls. This effect was smaller when considering retrospective cohort (OR: 2.59; 95% CI .93-7.30) and epidemiological (OR: 2.56, 95% CI 1.24-5.30) studies. Findings were significant across adversity subtypes with emotional abuse (OR: 38.11, 95% CI: 25.99-55.88) and neglect (OR: 17.73, 95% CI=13.01-24.17) demonstrating the largest effects. Individuals with BPD were 3.15 (95% CI 2.62-3.79) times more likely to report childhood adversity than other psychiatric groups.

Conclusions: This meta-analysis corroborates theoretical proposals that exposure to adverse life experiences is associated with BPD. It highlights the importance of considering childhood adversity when treating people diagnosed with BPD.

Key words

Borderline personality disorder, adversity, trauma, meta-analysis.

Summations

- Patients with BPD were over 13 times more likely to report childhood adversity than non-clinical controls.
- They were also more likely to report childhood adversity then other clinical populations.
- Emotional abuse and neglect were particularly elevated in BPD samples relative to controls.

Limitations

- Most studies employed retrospective assessments of childhood adversity.
- We identified only two prospective design studies in the literature.
- A risk of publication bias was identified for the majority of the analyses. However, the effects remained statistically significant even after controlling for possible publication bias.

Introduction

Borderline personality disorder (BPD) is characterised by affect instability, identity disturbance, interpersonal difficulties and harmful behaviours. In order to meet diagnostic criteria these difficulties must be deemed stable and be having a significant impact on daily functioning (1,2). BPD has been identified as the most common personality disorder in clinical populations (3), and it is associated with significant individual and societal costs (3–8). Given the severe impact of BPD, there is a considerable need to understand its risk factors to inform preventative and therapeutic interventions.

Current treatment options for BPD have demonstrated varied levels of efficacy. A recent meta-analysis reported small to moderate effects for Dialectical Behaviour Therapy (DBT) and psychodynamic therapies, whereas other psychological interventions, including cognitive behaviour therapy, have failed to demonstrate substantial treatment benefit in randomised trials (9). DBT is based on Linehan's Biosocial Theory (10), which emphasises the importance of a child's early experiences in the development of BPD. In particular, it is suggested that early emotional invalidation from caregivers limits opportunities for the child to learn how to experience and control different emotional states. Similarly, psychoanalytic theories emphasis the central role of early experiences and relationships with caregivers in the development of implicit regulation processes around emotion and motivation (11). In the light of the growing evidence indicating that exposure to childhood adversities in an influential determinant of multiple salient features of BPD (e.g. affect instability, emotion regulation difficulties, maladaptive coping strategies such as substance misuse and self-harm; (e.g. 12, 13)), there is a strong theoretical rationale for hypothesising that early adverse life experiences are central to the development of this disorder. Indeed, it has

been suggested that many experiences of BPD may be understood as complex post-traumatic stress disorders (14, 15)).

Childhood adversity is associated with a wide range of negative clinical outcomes in adulthood (16), including a range of severe mental health presentations including mood disorders (7, 8), psychosis (17) and personality disorders (18). A large number of empirical studies have explored the link between different forms of childhood adversity (e.g. emotional, physical, sexual abuse, neglect) and BPD. In addition, narrative reviews have attempted to bring clarity to this question by synthesising and evaluating findings from this growing area of research (e.g.19-22). These informative reviews have generally supported the importance of considering childhood adversity as a prominent contributor of BPD risk, but also raised queries about the specificity and consistency of the relationship across studies.

Despite the large body of research exploring the relationship between childhood adversity and BPD, meta-analytic studies in this area are sparse. A recent systematic review and meta-analysis of potential aetiological and psychopathological factors associated with youth BPD (i.e. in people age 19 or younger, 23) found that young people with BPD are more likely to report a range of childhood adversities relative to controls without BPD, including experiences of sexual and physical abuse, neglect, maladaptive parenting and parental conflict. To date, only one meta-analysis has attempted to synthesise the considerably larger corpus of research that has considered adult samples; this meta-analysis specifically focused on childhood sexual abuse and demonstrated a significant but only moderate association with BPD (24). As many studies assess a range of adverse childhood experiences, there is an urgent need for an updated and more comprehensive synthesis of this literature.

Aims of the study

The primary objectives of this meta-analysis were:

1) To investigate whether exposure to childhood adversity is elevated in adults with a diagnosis of BPD compared to non-clinical and clinical controls (e.g. mood disorder, other personality disorders, psychosis).

2) To investigate which types of childhood adversity were most elevated in BPD samples compared to non-clinical controls.

3) To investigate whether exposure to childhood adversity is elevated in BPD compared to specific types of clinical controls.

Method

The review was carried out in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards. The full review protocol is available on a data repository website (http://www.crd.york.ac.uk/PROSPERO/; reference: CRD42017075179).

Systematic search

Searches were conducted using three electronic databases (Medline, Embase, and PsychInfo) in September 2017 and updated in June 2019. These were restricted to articles published post 1980 (when BPD first appeared as a bona fide diagnosis in diagnostic classification systems) and those written in the English language. Search terms relating to BPD (*borderline* OR personality disorder OR emotionally unstable OR cluster b)* were combined with terms relating to childhood adversity (*Child abuse* OR *physical abuse* OR *sexual abuse* OR *psychological abuse* OR *emotional abuse* OR *neglect** OR *trauma** OR *advers** OR *maltreat** OR *bully** OR *bullied* OR *victim*OR parental loss)*. Where possible, appropriate MeSH terms (i.e. personality disorder in PsychInfo; borderline states in Embase) were used to further expand the database searches. The lead author screened reference lists of previous reviews to identify relevant articles missed through the database search (see supplementary table S1).

The review included studies with samples over 18 years of age with a diagnosis BPD according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-III, DSM-IIIR, DSM-IV, DSM-IV-TR & DSM-5) or International Classification of Diseases (ICD-9 or ICD-10) of Emotionally Unstable Personality Disorder according to the International Classification of Diseases system. Analyses were restricted to the diagnostic construct of BPD, rather than individual features of BPD shared with other diagnostic groups. All studies were required to have a systematic quantitative measure

of childhood adversity defined as reporting neglect, abuse, bullying or the loss of parents before the age of 19. In line with previous meta-analytic syntheses (17), studies that assessed childhood adversity via unsystematic or opportunistic case note reviews were excluded due to possible response bias. In order to meet eligibility, studies were also required to employ case control, prospective cohort or epidemiological designs to investigate the association between childhood adversity and BPD diagnosis. Case control studies were required to have at least one non-clinical or clinical control group.

Screening was carried out by the lead author and occurred in three stages: title level, abstract level and full text level. A second researcher screened one third of titles (85.6% agreement) and abstracts (80.2% agreement). In all cases, discrepancies were due to the overinclusion of reports by the primary reviewer. The whole team screened and discussed the full article level papers until consensus on eligibility was established.

Extracted data included both statistical information to estimate relevant effect sizes (e.g. counts of exposed and unexposed participants across BPD and control groups; sample sizes as well as means and standard deviation of adversity measure; pre-calculated effect sizes) and study relevant descriptors (e.g. year of publication, country, study design, control type, diagnostic classification system, type of adversity). The lead author extracted all of the data with a second author (either JPC or FV) checking information in the eligible papers for accuracy. In cases where the relevant information from which to calculate an effect size or determine eligibility was unavailable, the authors requested further information with the corresponding authors of the primary studies.

The Newcastle Ottawa Assessment Scale (NOAS; 25) was used to assess the methodological quality of the included studies. This scale rates potential methodological bias across three areas: selection (rated on a 0-4 scale), comparability of index (in this

case, BPD participants) and control samples (rated on a 0-2 scale) and assessment of exposure (rated on a 0-3 scale). In order to rate comparability of samples, the NOAS requires the authors to predetermine one or two key matching variables or covariates. Age and gender were selected given evidence suggesting that BPD symptoms alleviate with age (26) and variation in BPD prevalence according to gender (27). All included studies were independently double-rated by two authors and discrepancies were discussed until consensus was reached.

To address our research questions, we conducted a series of random effect meta-analyses using Comprehensive Meta-Analysis V2 software (28). All effect sizes extracted from the primary studies were converted to Odds Ratio (OR) for these analyses. First, we synthesised studies examining whether exposure to childhood adversity is elevated in individuals with BPD compared to non-clinical samples. This was based on effects extracted from studies that exclusively focused on either single types of adversity (i.e. any type of adverse experience considered in this review) or studies which employed a summary measure of multiple childhood adversities. In studies that provided data for multiple individual types of adverse experiences, but no summary exposure score, effect sizes for specific adversities were aggregated to produce a combined effect, which was then included in the analysis. Second, we explored the effect of exposure to specific types of adversity (i.e. sexual abuse, physical abuse, emotional abuse, emotional neglect, physical neglect) on BPD. Direct contrast of these effects was not possible as we were unable to determine if participants had reported multiple forms of abuse resulting in non-independence. Third, we synthesised studies examining whether exposure to childhood adversity is elevated in individuals with BPD compared to clinical samples in general and specific psychiatric groups of interest (i.e. other personality disorders, psychotic disorders and mood disorders). We ensured no overlap between study samples within each analysis.

Across all analyses, individual study effects were screened for potential outliers, defined as studies in which the 95% CI of the study was outside the 95% CI of the pooled effect (29). In order to explore heterogeneity across studies, the Q-test and I^2 were used examine and quantify the amount of observed variance explained by true heterogeneity, rather than sampling error. Visual exploration of funnel plots and the Egger's test were used to explore publication and selection bias. In cases where publication bias was confirmed, the Duval and Tweedie Trim and Fill method was used to correct for the presence of bias and adjust the results for the effect of likely missing effects. Meta-regression was used to test the relationship between NOAS quality ratings and effect sizes.

Results

Figure 1 shows a diagram detailing the flow of papers across each stage of screening. The searches identified 97 eligible studies, considering a combined sample size of 11,366 BPD participants, 3,732 non-clinical controls and 13,128 psychiatric controls. The vast majority of eligible studies employed a case-control design (k = 92). Given the small number of eligible epidemiological (k = 3) and prospective (k = 2) studies all of the meta-analyses conducted on the effect sizes extracted from the primary studies were stratified according to research design (i.e. no attempt was made to integrate effect sizes extracted from case-control, prospective and epidemiological studies into the same analysis).

Overall prevalence of childhood adversity in BPD samples

Forty-two studies provided relevant statistical information to estimate the weighted pooled percentage of participants reporting childhood adversity within BPD samples considered in this meta-analysis. Overall, 71.1% of BPD participants reported at least one adverse childhood experience. Analyses focusing on specific types of adversities indicated that the most common form was physical neglect (48.9%), followed by emotional abuse (42.5%), physical abuse (36.4%), sexual abuse (32.1%) and emotional neglect (25.3%).

Childhood Adversity in BPD and Non-Clinical Samples

Supplementary Table S2 shows the characteristics of studies included in the primary analyses. Forty studies compared individuals with a diagnosis of BPD to non-clinical samples on measures of childhood adversity.

[INSERT FIGURE 1 APPROXIMATELY HERE]

Table 1 shows the summary effects, heterogeneity statistics and publication bias statistics for all analyses comparing individuals with BPD to non-clinical controls. These analyses include both original analyses (i.e. including all eligible studies) and analyses with outliers removed. Where relevant (i.e. when publication/selection bias was evident) trim and fill corrected analyses are also presented. Considerable levels of statistical heterogeneity were observed across all analyses, as indicated by significant Q tests and substantial I^2 statistics (ranging between 27.97% to 98.34%). Furthermore, the Egger's test revealed potential publication bias across most analyses. In the subsequent sections, we describe only analyses that accounted for the influence of publication bias and/or the presence of potential influential cases (i.e. outliers), unless otherwise specified.

Overall Effect of Childhood Adversity

Figure 2 presents a forest plot of the case control studies (k = 29) after the removal of potential outliers (30-40). This analysis indicated that individual with BPD are 16.86 times more likely to report childhood adversity than non-clinical controls (95% CI 13.76-20.66, p <.001). Meta-regression analysis revealed that NOAS quality ratings did not affect the observed effects (β= -.001, SE=.05, p= .999).

Table 1 contains effect sizes for each stage of the analysis. After the inclusion of seven hypothetically missing studies via the Trim and Fill method, the synthesis of case control studies comparing childhood adversity in BPD and non-clinical controls

remained robust and significant; OR= 13.91, (95% CI= 11.11-17.43, p< .001). This indicated that individuals with BPD are over 13 times more likely to report childhood adversity than non-clinical controls. A separate synthesis conducted on two epidemiological studies showed an overall effect size of OR = 2.56 (95% CI 1.24-5.30, p=.011). Similarly, a separate meta-analysis of the two prospective studies showed an overall effect size of OR = 2.59 (95% CI 0.93 -7.30, p=.070), which was non-significant. However, the effect sizes extracted from each individual study showed a significant relationship with variation in the magnitude of the effect: OR=4.99 (95% CI 1.83-13.5, p = .001) and OR=1.70 (95% CI 1.31-2.20, p < .001) respectively. Due to the small number of epidemiological and prospective studies available, it was not possible to conduct heterogeneity and publication bias analyses for these studies.

[INSERT FIGURE 2 APPROXIMATELY HERE]

Effect of Physical Abuse

After the removal of identified outliers (30, 32, 36-37, 53, 56, 64, 68) and for the inclusion of seven potentially missing studies, a pooled effect of OR=7.06 (95% CI 5.26 - 9.48, p<.001) was observed for physical abuse. One epidemiological study and one prospective cohort study examined the association physical abuse and BPD, indicating effects of OR=2.40 (95% CI= 1.70-2.45, p< .001) and OR=2.09 (95% CI= 1.71-2.44, p<.001).

Effect of Sexual Abuse

After the removal of outliers (30, 36-37) and the inclusion of five potentially missing studies, case control studies comparing childhood sexual abuse in BPD and non-clinical controls indicated a pooled effect of OR= 5.96 (95% CI 4.72-7.52, p<.001). Only one epidemiological study and one prospective cohort study examined sexual abuse indicating effects of OR= 2.47 (95% CI=1.42-2.97, p< .001) and OR= 1.46 (95% CI= .67-3.18, p= .340) respectively.

Effect of Emotional Abuse

After the removal of outliers (32, 36-37, 50, 56-57, 59, 64) and the inclusion of two potentially missing studies, case control studies comparing levels of reported emotional abuse in BPD and non-clinical controls led to a pooled effect of OR=38.11 (95% CI= 25.99-55.88, p< .001). One epidemiological study and one prospective cohort study examined emotional abuse indicating effects of OR= 2.31 (95% CI=1.87-2.86, p< .001) and OR= 4.99 (95% CI= 1.83-13.55, p= .002).

Effect of Emotional Neglect

For emotional neglect, seven outliers were removed (32, 36-37, 50, 57, 59, 64) and six potentially missing studies were included. A meta-analysis of case control studies comparing childhood adversity in BPD and non-clinical controls indicated a pooled effect of OR= 17.73 (95% CI= 13.01-24.17, p< .001).

Effect of Physical Neglect

After removal of outliers (32, 36-37, 41, 53, 69) and the inclusion of four potentially missing studies, a meta-analysis of case control studies which compared BPD and non-clinical controls on measures of physical neglect led to a pooled effect of OR = 6.93 (95% CI = 5.23-9.20, p<.001).

[INSERT TABLE 1 APPROXIMATELY HERE]

Childhood adversity in BPD and Clinical Controls

Supplementary Table S2 presents the characteristics of all studies included in analyses comparing BPD to clinical controls. Sixty-nine case control studies and one epidemiology study compared BPD to clinical control samples. Table 2 shows the summary effects, and heterogeneity and publication statistics, for these analyses. The Q and I^2 statistics indicated significant levels of statistical heterogeneity across all analyses. However, publication bias was only evident in analyses that considered pooled clinical controls.

Overall Effect of Childhood Adversity in Studies Comparing BPD and Psychiatric Controls

A forest plot of the 61 case control studies comparing BPD to clinical controls, after the removal of outliers (40, 61, 70-77), is presented in Figure 3. The analysis indicated that individuals with BPD are 3.36 times more likely to report childhood adversity compared to psychiatric controls (95% CI 3.05-3.69, p<.001). Meta-regression

indicated that NOAS quality ratings did not predict the observed effects (β= -.03, SE= .03, *p*= .322). After the inclusion of ten potentially missing effects using the Trim and Fill method, the association between BPD and childhood adversity remained robust; OR=3.15 (95% CI 2.87-3.47, *p*<.001). The single epidemiological study indicated an effect of OR=3.12 (95% CI 2.74-3.70, *p*< .001).

[INSERT TABLE 2 APPROXIMATELY HERE]

[INSERT FIGURE 3 APPROXIMATELY HERE]

Effect of Childhood Adversity in Studies Comparing BPD and Mood Disorders

We conducted analyses exploring levels of childhood adversity in BPD compared to mood disorders. After the removal of three outliers (33, 40, 103), case control studies comparing levels of childhood adversity in BPD compared to mood disorder controls indicated a pooled effect of OR=3.06 (95% CI 2.54-3.80, *p*< .001). Therefore, BPD samples are approximately three times more likely to report childhood adversity than those with mood disorders. This effect was larger when BPD samples were compared to bipolar disorder (k=9, OR=466, 95% CI 3.64-5.97, *p*< .001), rather than other mood disorder samples (k=15, OR=2.86, 95% CI 2.21-3.714, *p*<.001).

Effect of Childhood Adversity in Studies Comparing BPD and Other Personality Disorders

After the removal of outliers (59, 71) childhood adversity in BPD and other personality disorder controls indicated a pooled effect of OR=2.84 (95% CI 2.42-3.33,

p< .001), suggesting greater probability of reported childhood adversity in individuals with a diagnosis of BPD relative to individuals with other personality disorder diagnoses.

Effect of Childhood Adversity in Studies Comparing BPD and Psychosis

After the removal of one outlier (75), studies comparing childhood adversity in BPD and psychosis controls indicated a pooled effect of OR=3.43 (95% CI 2.76-4.37 *p*<.001). There was no evidence of publication bias. This indicates that individuals with BPD are over three times more likely to report childhood adversity compared to individuals with psychosis.

Discussion

This meta-analysis reviewed and synthesised data comparing levels of childhood adversity in individuals with BPD to non-clinical and clinical controls. Findings the available literature suggested a large association between childhood adversity and BPD. Additional analyses indicated that BPD was associated with elevated rates of all included subtypes of adversity, with particularly large effects when considering emotional abuse and neglect. When compared to clinical controls, our meta-analyses indicated that individuals with a diagnosis of BPD are more likely to report experiences of childhood adversity than other psychiatric groups, including patients with mood disorders, psychosis and other personality disorders.

The finding that individuals with a diagnosis of BPD were over thirteen times more likely to report childhood adversity than non-clinical controls is consistent with the strong clinical narrative linking childhood adversity and BPD (21). Furthermore, the relative large effects observed for emotional abuse and neglect are consistent with previous theoretical and empirical research suggesting links to emotional invalidation and rejection sensitivity (10, 121-122). Large discrepancies were found in the magnitude of the association between childhood adversity and BPD across investigations using different study designs. Specifically, the synthesis of statistical findings extracted from case-control studies generally led to considerably larger summary effects than those observed in the small number of epidemiological and prospective cohort studies included in this review. Also noteworthy is that, when pooled, the overall effect size of the two prospective studies was non-significant (p=.070), although each individual study showed a significant relationship with variation in the magnitude of the effect. This may have been due to performing random-effects meta-analysis with a small K, which increases the likelihood of Type I and Type II errors. Further

prospective longitudinal research is therefore required to better understand the exact effect of child adversity on BPD.

The reasons for such marked differences in effect sizes across the literature cannot be identified with confidence at this stage, but could be due to multiple factors. First, it is possible that these discrepancies are due to higher risk of selection bias in case-control studies, which might lead to overestimations of adversity prevalence in BPD samples if, for example, individuals with more severe trauma histories are also more likely to come to the attention of clinical services, and consequently be recruited in clinical research studies. Furthermore, while case-control studies often employ participant selection procedures to ensure that BPD patients are compared to 'healthy controls' known to be free of other psychiatric diagnoses, in epidemiological studies the comparison of interest are members of the general population, where other psychiatric diagnoses linked to adversity exposure may be present. Similarly, in prospective studies, participants exposed to childhood adversity may develop mental health difficulties other than BPD. Lastly, the variation in effect sizes might have been due to differences in measurement, including the use of retrospective reporting and the psychometric properties of the employed assessments. Additional longitudinal and large epidemiological investigations are needed before clearer conclusion can be drawn regarding the above discrepancies, if replicated.

Our findings indicate that patients diagnosed with BPD are more likely report childhood adversity than those receiving other clinical diagnoses. This is somewhat surprising given the high rates of childhood adversity already identified in other clinical groups (16-18, 122, 124). It is potentially explained by overlap between complex PTSD (CPTSD) and BPD criteria, which has led to proposals that BPD could also be conceptualised as a trauma-related disorder (125). Indeed, research has demonstrated comparable levels of sexual or physical abuse and neglect in individuals diagnosed with PTSD and BPD, but also

particularly elevated rates of abuse and neglect when these disorders are comorbid (74). Given the recognition of the C-PTSD diagnosis for ICD-11 and the introduction of new diagnostic criteria for this clinical presentation (126), further research is urgently needed to clarify the relative overlap between these constructs. The potential impact of co-morbidity more broadly also requires careful consideration. Whilst the majority of eligible studies systematically confirmed the absence of BPD in controls, co-morbidity within the BPD sample was common. This is to be expected and may suggest ecological validity, given the high rates of comorbidity in individuals with BPD reported in other research (127-128). However, it is possible that findings reflect an increased rate of comorbidity associated within childhood abuse, rather than BPD per se.

Limitations of the review

This meta-analysis is not without limitation. Our focus on examining the impact of childhood adversity on clinical outcomes in adulthood is in line with previous reviews on other severe mental health difficulties (e.g. 17, 124), and allows for a more direct comparison between the meta-analytic findings observed in this review and those in other diagnostic groups. However, our approach could be criticised for not considering the evidence provided by case-control studies conducted on children and adolescents with BPD, which has been recently synthesised by others (23). As the literature on childhood adversity in BPD youth expands, future meta-analytic reviews could attempt to integrate these bodies of research and examine the impact of childhood adversities and BPD across the life span. Regarding our search strategy, although combining title and abstract searches is standard practice, using separate stages allows for the removal of clearly inappropriate and ineligible studies at an early stage. It is unclear which approach is more appropriate, but this is a possible limitation.

Our analyses revealed high levels of statistical heterogeneity, likely due to high levels of clinical and methodological differences between studies. Although the majority of studies used similar diagnostic criteria, the varied clinical characteristics of the samples could have influenced the exact magnitude of the observed effects (e.g. hospitalisation status; acute or remitted status). Similarly, the measurement of childhood adversity varied considerably across studies, both in terms of the type (e.g. sexual abuse, physical abuse, emotional neglect) and assessment method (e.g. self-report questionnaires, semi structured interviews, court records). Additionally, a risk of publication bias was identified for the majority of analyses within this literature. This may be due to a strong narrative within research and clinical settings around the role played by childhood adversity in the development of BPD (21), which in turn could discourage the publication of evidence to the contrary. This limitation notwithstanding, the observed effects remained strong and significant after correcting for the presence of publication bias using the Trim and Fill method. Similarly, our analyses identified multiple potential 'outlier' studies presenting unusually large or small effects that might bias the results of certain analyses. In all cases, the analyses we conducted after removing suspected outliers led to summary effects that were comparable to those obtained in the analyses of all relevant studies (as indicated by large overlap in CIs), with the exception of the analysis comparing BPD to non-clinical controls on physical abuse, for which a difference in summary effects was more noticeable (OR = 6.82, 95%CI 4.90 – 9.50 and OR = 9.18, 95%CI 7.07 – 11.93, respectively). An additional limitation is that the different types of adversity were non-independent and, as a result, we cannot comment of the specificity of individual adversity effects. It is important to acknowledge that other forms of childhood adversity or genetic factors may also play a role in the development of BPD (129).

There were noteworthy methodological limitations of the primary studies included in this meta-analysis. The majority of studies used self-report, retrospective measures and only

two studies corroborated accounts of adversity with official records. It has been suggested that retrospective measurement is susceptible to false memories and cognitive distortions (130). However, research has suggested that recall bias only explains a small amount of the variance in retrospective childhood adversity assessments (131) and that reporting of childhood abuse within personality disorder samples is largely consistent over time (132). The majority of studies failed to state whether assessors were blind to diagnosis, which may have biased adversity ratings.

Research and Clinical Implications

The findings of this review, in line with other meta-analytic evidence (23), indicate that trauma is highly prevalent in people with a diagnosis of BPD. However, carefully designed longitudinal research, including examination of dose-response relationships, is required before definitive conclusions can be drawn regarding any causal role played by childhood adversity in the development of BPD. Nevertheless, preventing childhood adversity represents a critical area for intervention and the routine assessment of abuse and neglect as part of standard health assessments has previously been advocated (133, 134). The findings support the importance of trauma informed care for individuals accessing mental health services and forensic settings, where prevalence rates of BPD are high (135).

To summarise, the findings of this review, which is based largely on cross sectional research, indicate a strong association between BPD and childhood adversity. This is consistent with the past theoretical literature (10, 21, 136-137, 138), but further research is needed to explore whether this represents a causal relationship and whether any effect is moderated by biological, social and psychological factors. Research exploring the relationships between childhood adversity and specific features of BPD may facilitate

understanding of the current overlap or co-morbidity with other complex post-traumatic presentations.

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TABLES

Table 1. All Random Effect Meta-analyses of Studies Comparing BPD to Non Clinical Control groups

Adversity Type	OR (95% Confidence Interval)					Heterogeneity Tests				*Eggers test*		
	k	OR	Lower	Upper	p	I^2	*Q*	df	*p*	β	SE	p
Case Control Studies												
Any Adversity[1]	40	16.33	9.51	28.02	< .001	98.34	2345.80	39	< .001	7.45	.65	< .001
Any Adversity[2]	29	16.86	13.76	20.66	< .001	54.81	61.96	28	< .001	1.24	.52	.025
Any Adversity[3]	36	13.91	11.11	17.43	< .001							
Physical Abuse[1]	30	6.82	4.90	9.50	< .001	80.17	146.23	29	< .001	3.11	.89	.002
Physical Abuse[2]	22	9.18	7.07	11.93	< .001	36.22	32.93	21	.05	1.86	.67	.012
Physical Abuse[3]	23	7.06	5.26	9.48	< .001							
Emotional Abuse[1]	27	31.41	18.99	51.96	< .001	88.49	225.92	26	< .001	4.22	1.39	.006
Emotional Abuse[2]	19	38.11	25.99	55.88	< .001	63.09	48.77	18	< .001	2.25	1.30	.100

Adversity Type	OR (95% Confidence Interval)					Heterogeneity Tests				*Eggers test*		
	k	OR	Lower	Upper	p	I^2	*Q*	df	*p*	β	SE	p
Sexual Abuse[1]	33	6.60	5.15	8.47	< .001	63.51	87.69	32	< .001	2.19	.69	.003
Sexual Abuse[2]	30	6.76	5.41	8.44	< .001	48.84	56.68	29	.002	1.74	.62	.009
Sexual Abuse[3]	35	5.96	4.72	7.52	< .001							
Physical Neglect[1]	21	7.97	5.21	12.19	< .001	79.87	99.34	20	< .001	1.28	1.22	.306
Physical Neglect[2]	15	7.61	5.74	10.11	< .001	27.97	19.44	14	.149	1.24	.62	.064
Physical Neglect[3]	19	6.93	5.23	9.20	< .001							
Emotional Neglect[1]	26	22.97	15.02	35.15	< .001	83.95	155.81	25	< .001	2.93	1.33	.037
Emotional Neglect[2]	19	23.06	17.21	30.90	< .001	48.73	35.11	18	.009	2.06	.81	.022
Emotional Neglect[3]	25	17.73	13.01	24.17	< .001							
Epidemiology Studies												
Any Adveristy[1]	2	2.56	1.24	5.30	.011	59.87	2.49	1	.114			
Physical Abuse[1]	1	2.40	1.70	2.45	< .001							
Emotional Abuse[1]	1	2.31	1.87	2.86	< .001							
Sexual Abuse[1]	1	2.47	1.42	2.97	< .001							

Adversity Type	OR (95% Confidence Interval)				Heterogeneity Tests				*Eggers test*		
	k	OR	Lower	Upper	p	I^2	*Q*	df	*p*	β	SE	p
Prospective Cohort studies												
Any Abuse[1]	2	2.59	.93	7.30	.070	76.08	4.18	1	.041			
Physical Abuse[1]	1	2.09	1.71	2.44	< .001							
Emotional Abuse[1]	1	4.99	1.83	13.55	.002							
Sexual Abuse[1]	1	1.46	.67	3.18	.340							

[1]Analysis of all relevant studies, [2] Analysis of all relevant studies, outliers removed, [3] Analysis of all eligible studies with outliers removed trim and fill imputation for publication or selection bias. k denotes all imputed and observed studies in the trim and fill analysis.

TABLE 2 All Meta-analyses Results for BPD vs Clinical Control Studies

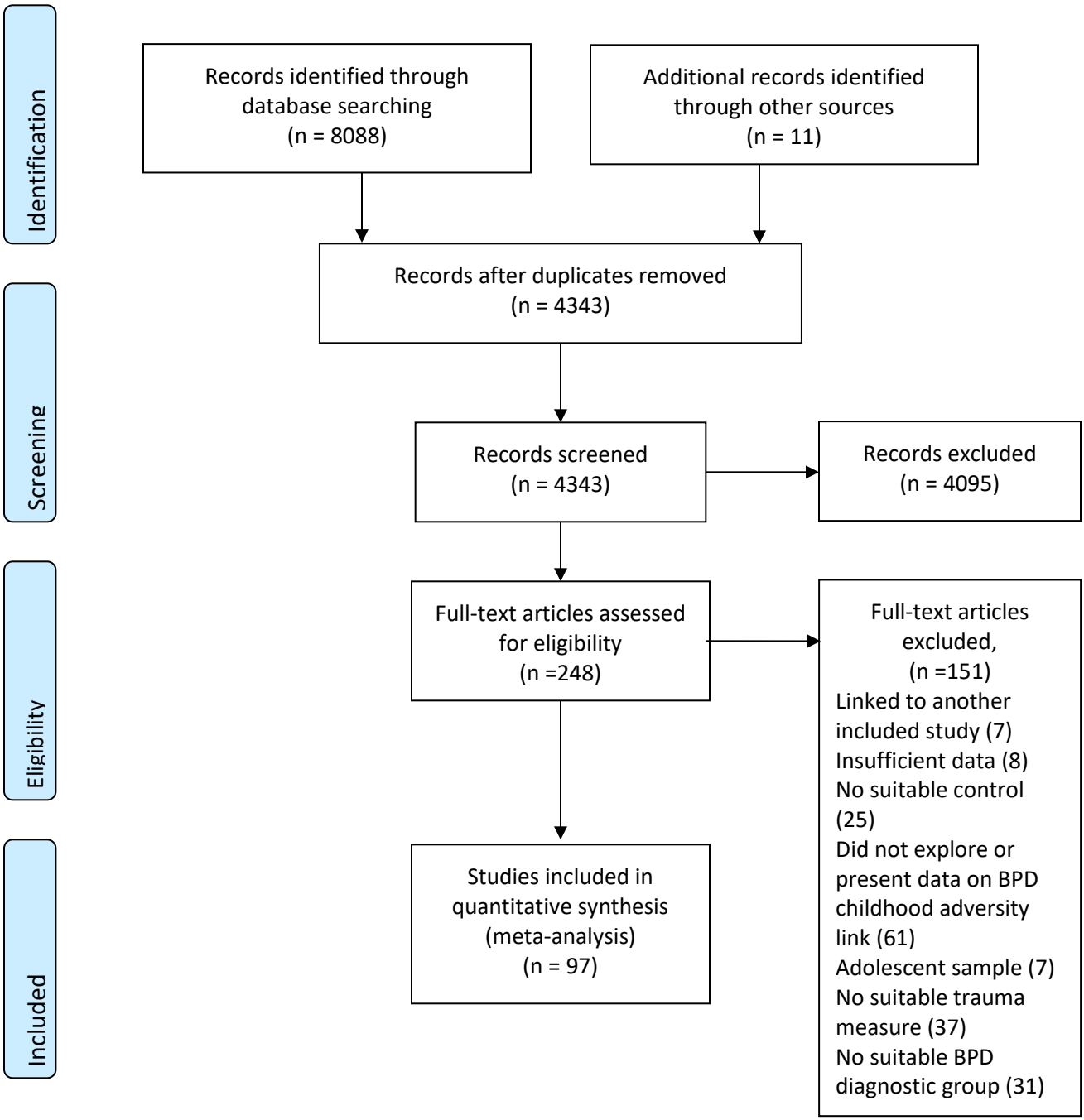
Control	**OR (95% Confidence Interval)**					**Heterogeneity Tests**				***Eggers test***		
	k	OR	Lower	Upper	*p*	I^2	*Q*	df	*p*	β	SE	*p*
Mixed Psychiatric[1]	71	3.30	2.61	3.76	< .001	95.07	1420.63	70	< .001	3.92	.41	< .001
Mixed Psychiatric[2]	61	3.36	3.05	3.69	< .001	49.20	118.10	60	< .001	.71	.30	.023
Mixed Psychiatric[3]	71	3.15	2.87	3.47	< .001							
Personality Disorders[1]	19	2.60	2.14	3.16	< .001	73.56	68.07	18	< .001	.42	.83	.623
Personality Disorders[2]	17	2.84	2.42	3.33	< .001	53.00	34.05	16	.005	.66	.63	.313
Mood Disorders[1]	24	3.42	2.77	4.23	< .001	69.13	74.51	23	< .001	.63	.87	.477
Mood Disorders[2]	21	3.65	3.12	4.27	< .001	30.93	28.96	20	< .001	.01	.61	.985
Psychosis[1]	6	3.97	2.53	6.24	< .001	69.64	16.47	5	.006	1.80	2.19	.456
Psychosis[2]	5	3.43	2.66	4.42	< .001	13.97	4.65	4	.325	2.12	1.66	.291

141. Mixed Psychiatric control (MPC), Other Personality Disorder Control (OPD), Mood Disorder Control (OPD), Psychosis Control (PSY).

142. [1] Analysis of all eligible studies, [2] Analysis of all eligible studies, outliers removed, [3]Analysis of all eligible studies with outliers removed and trim and fill correction for potential publication or selection bias. k denotes all imputed and observed studies in the trim and fill analysis.

FIGURES

Figure 1. Flow Chart of Eligibility Screen



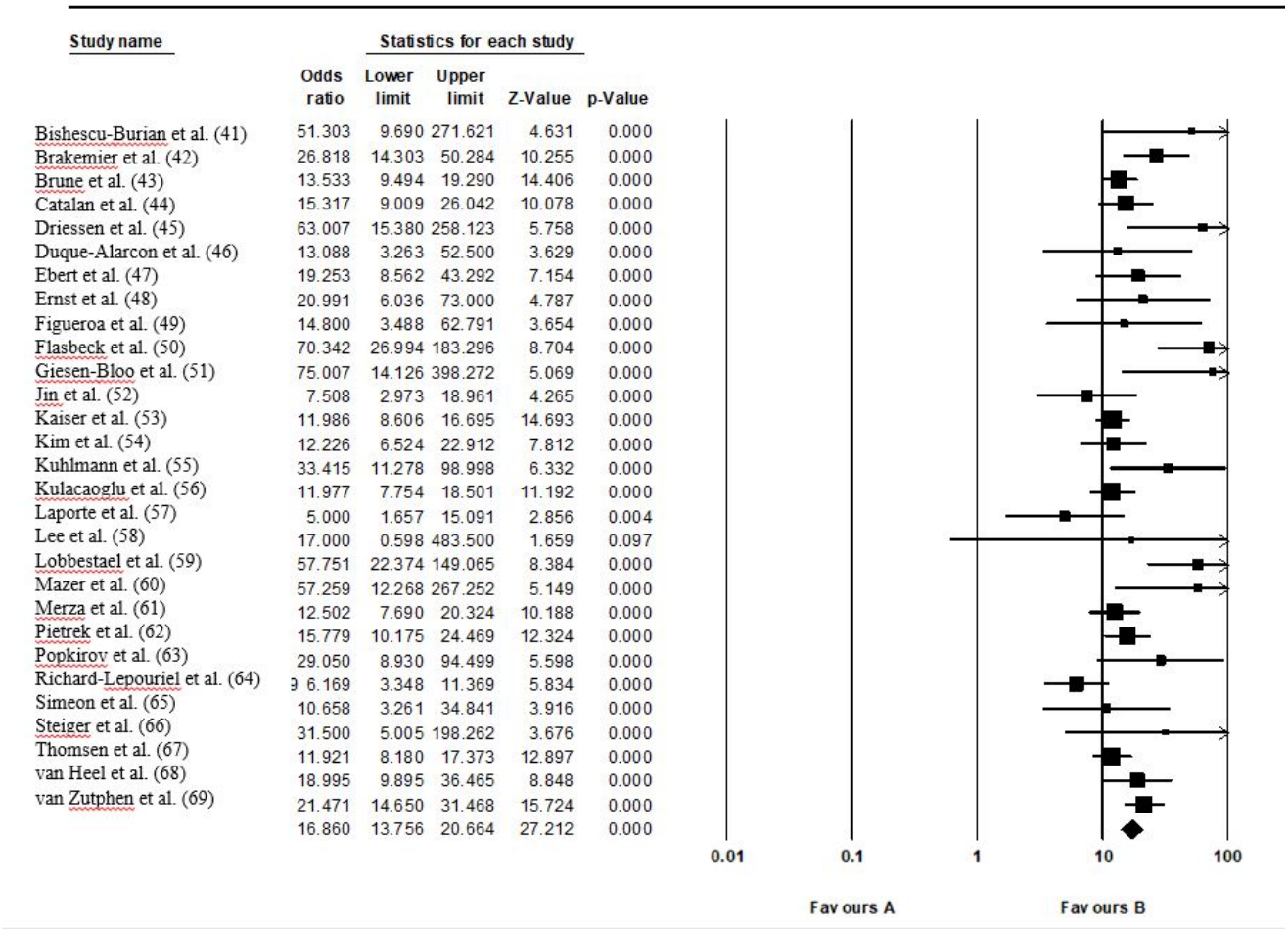


Figure 2. Forest plot with individual effect sizes for case control studies comparing BPD to non-clinical controls for any adversity with outliers removed.

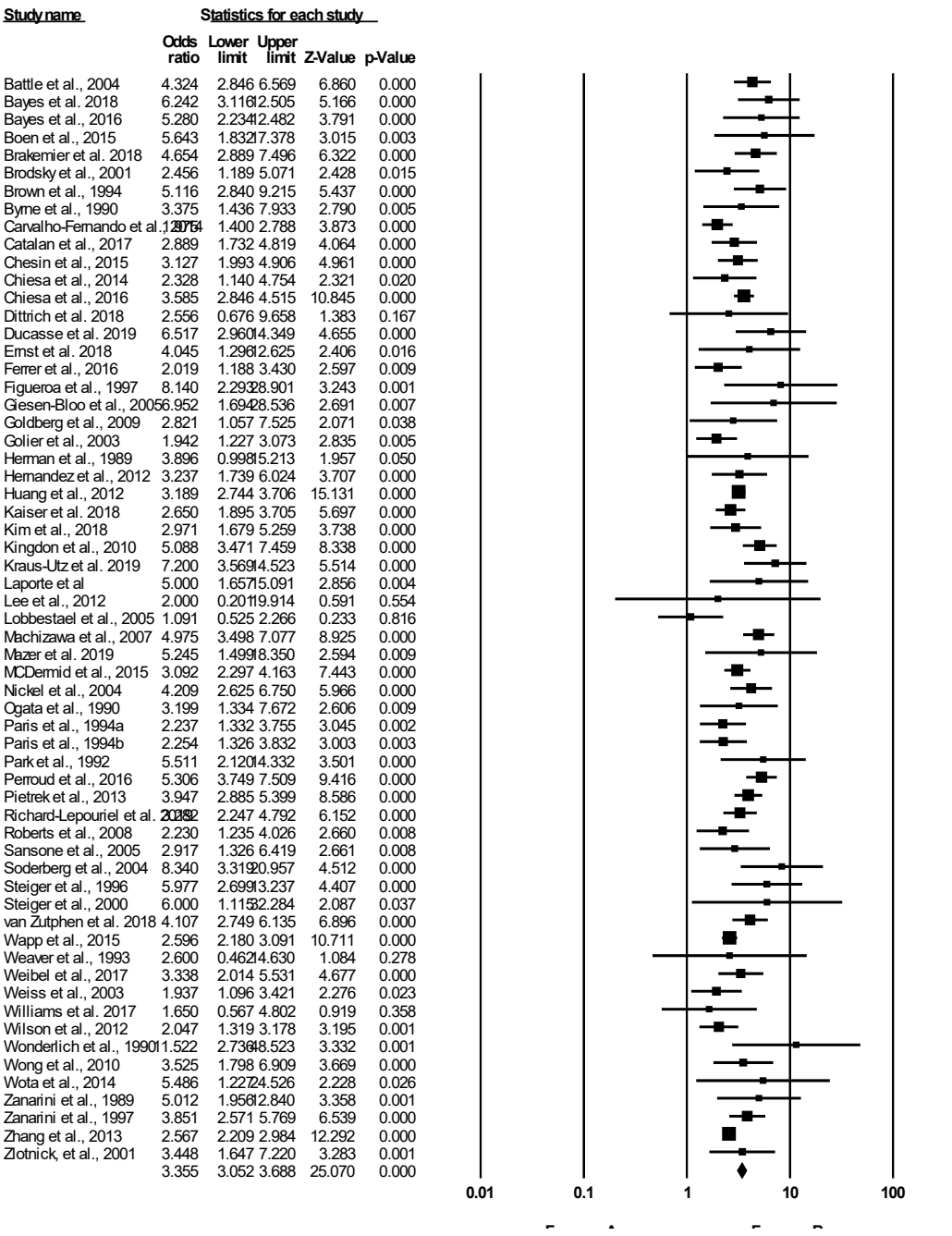


Figure 3. Forest Plot and individual effect sizes for each case control study comparing BPD to a clinical control group, with outliers removed.