Clinical Psychology Review 75 (2020) 101781

Contents lists available at ScienceDirect

Clinical Psychology Review

journal homepage: www.elsevier.com/locate/clinpsychrev

Review

Romantic attachment style and borderline personality pathology: A meta-analysis

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HIGHLIGHTS

- Attachment anxiety has a large meta-analytic correlation with Borderline PD.
- Attachment avoidance is also significantly related to BPD traits.
- Several moderators explain large portions of heterogeneity.
- Attachment disorganization may best reflect BPD dysfunction.

ARTICLE INFO

Keywords:
Borderline personality disorder
Insecure attachment
Romantic attachment
Disorganized

ABSTRACT

Borderline Personality Disorder (BPD) implies profound impairment in interpersonal relationships, particularly romantic relationships (Daley, Burge, & Hammen, 2000). Insecure attachment bears striking resemblance to BPD traits in both empirical and theoretical work (Levy, Johnson, Clouthier, Scala, & Temes, 2015) and may be particularly suited for understanding the BPD-related deficits in romantic functioning. Despite several qualitative reviews concluding that secure attachment is disrupted in those with BPD traits, no consensus has emerged regarding the *form* of this disruption (Levy et al., 2015), with most reviews focusing on whether BPD is best captured as high levels of attachment anxiety or attachment avoidance. The purpose of the current review is to provide a quantitative synthesis of the strength and direction of the associations between attachment insecurity and BPD traits. Searches on PsycINFO and Pubmed resulted in 27 effect sizes that measured BPD and adult romantic attachment on the two primary dimensions of anxiety and avoidance (Fraley, Waller, & Brennan, 2000). Results demonstrated that attachment anxiety correlates most strongly with BPD traits ($r = 0.48$); however, attachment avoidance also evinced a significant effect ($r = 0.30$). Findings from regression analyses indicate that attachment anxiety and avoidance interact, suggesting a particularly strong relationship between attachment disorganization and BPD traits.

1. Introduction

Borderline PD (BPD) is one of the most prevalent personality disorders in clinical settings (Hasin & Grant, 2015; Trull, Jahng, Tomko, Wood, & Sher, 2010) and is defined by affective instability, dissociation, and *unstable relationships with others* (American Psychiatric Association, 2013). BPD criteria (i.e., vacillating between idealization/devaluation of others, unstable sense of self/other, and frantic efforts to avoid abandonment; American Psychiatric Association, 2013) are frequently described when discussing insecure adult attachment[1] (e.g., desiring extreme closeness to others and distancing oneself from all intimacy; Lorenzini & Fonagy, 2013). Attachment theory is a broad framework within which impairments in relating to romantic partners might be contextualized (Levy et al., 2015), although much of the previous literature has focused on attachment generally, without consideration of the attachment figure under study (Cozzarelli, Hoekstra, & Bylsma, 2000). The goal of the current review was to summarize the state of research on the associations between borderline PD and

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[1] Different terms have sometimes been used to describe attachment insecurity. For the current review, we use the descriptive term 'attachment insecurity' to capture fully the dysfunction inherent in disordered attachment, regardless of conceptualization or assessment method. However, when discussing measures or studies that assess attachment categorically, we will use 'attachment style', and when discussing dimensional assessment or description of attachment insecurity, we will use terms related to 'attachment dimension'; this was done in an effort to preserve the implications of previous literature in our discussion.

https://doi.org/10.1016/j.cpr.2019.101781
Received 19 April 2019; Received in revised form 13 September 2019; Accepted 15 October 2019
Available online 31 October 2019

romantic attachment insecurity. We start by reviewing each construct before turning to a discussion of how and why they might be related.

1.1. Borderline personality disorder

Borderline PD is a disorder characterized in the DSM-5 Section II by affective instability, attempts to self-harm, frantic efforts to avoid abandonment, dissociation, chronic feelings of emptiness, rocky/unstable interpersonal relationships, unstable self-image, impulsivity, and anger (American Psychiatric Association, 2013). DSM-5 also includes an alternative model for conceptualizing Borderline PD in its emerging measures and models section, which defines BPD with the traits of unstable self-image and personal goals, rocky interpersonal relationships, unstable affect, and impulsivity. The self (identity, self-direction) and interpersonal (empathy, intimacy) domains are profoundly disordered as well (American Psychiatric Association, 2013).

In addition to being characterized by highly affect-laden and treatment-disrupting behaviors (Linehan, 1993), activities of daily life are often severely impaired in those with BPD (Gunderson et al., 2011; Skodol, Johnson, Cohen, Sneed, & Crawford, 2007). Compared to people without BPD and/or other clinical disorders, individuals with BPD have higher rates of treatment utilization (Ansell, Sanislow, McGlashan, & Grilo, 2007; Tomko, Trull, Wood, & Sher, 2014), as well as higher rates of physical functioning and social problems (Grant et al., 2008), and those with BPD are generally less effective in their various roles (i.e., at work, as a parent, etc.; Gunderson et al., 2011; Skodol et al., 2002. One of the most consistent impairments among those with BPD is dysfunction in romantic relationships, a topic we turn to next.

1.1.1. Romantic functioning in BPD

Romantic relationships in those with BPD are often characterized by instability, conflict, and extremes of idealization and devaluation (American Psychiatric Association, 2013; Chen et al., 2004). Although those with PD pathology in general tend to experience more dissatisfied (Lavner, Lamkin, Miller, Campbell, & Karney, 2016; South, 2014; Ullrich, Farrington, & Coid, 2007) and conflictual (Chen et al., 2004) relationships, those with elevated levels of BPD traits in particular are at greatest risk of distressed romantic relationships characterized by less satisfaction, more conflict, and greater rates of dissolution (Daley et al., 2000; Disney, Weinstein, & Oltmanns, 2012; Lavner, Lamkin, & Miller, 2015; South, Turkheimer, & Oltmanns, 2008; Ullrich et al., 2007). Those with BPD also have a greater likelihood of earlier marriage and marital disruption (Disney et al., 2012; Whisman & Schonbrun, 2009; Whisman, Tolejko, & Chatav, 2007) compared to people without BPD and clinical controls. A recent review concluded that Borderline personality pathology is associated with more—but more time-limited—relationships (Navarro-Gómez, Frías, & Palma, 2017) and individuals with more BPD symptoms tend to partner with individuals who also exhibit more BPD features (Lavner et al., 2015). Finally, individuals with BPD experience intimate conflict and aggression at higher-than-average rates (Edwards, Scott, Yarvis, Paizis, & Panizzon, 2003; Navarro-Gómez et al., 2017; Selby, Braithwaite, Joiner, & Fincham, 2008; Whisman & Schonbrun, 2009). The deficits underlying these interpersonal impairments have been theorized about at length; one of the most prominent and well-regarded theories is attachment, the focus of the current review and the next topic of consideration.

1.2. Attachment theories

Although attachment was originally developed as a theory of infant development, very shortly after its original instantiation attachment theories were leveraged to understand intimate relationships in adulthood (Hazan & Shaver, 1987). Adult attachment theory posits that, while adult attachment patterns are identical to infant attachment styles, infant attachment "sets the stage" for later relationships, the most prominent of which may be a relationship with a romantic partner.

1.2.1. Infant attachment

Theories of infant attachment (Bowlby, 1977) presume that the attachment system has evolutionary origins, when a "secure base" during times of relative peace, and a source for comfort during times of stress, would be adaptive and life-preserving. This system, characterized by specific affective, cognitive, and behavioral patterns, is thought to be an early predecessor of personality. Attachment bonds are classified into three distinct types based on interactions with a primary caregiver: secure, anxious, and avoidant (Ainsworth & Bell, 1970; Ainsworth, Bell, & Stayton, 1971).

These bonds are presumed to lie in "internal working models" (Fairbairn, 1946), which are complex systems that govern expectations regarding: a) whether the self is judged as a person that a close other will respond to sensitively, and b) whether the other person is someone who will respond effectively to a need (Bowlby, 1973). If either of these models are disrupted as a result of inappropriate caregiving, insecure attachment results (Ainsworth et al., 1971). Working models are particularly tenacious because they result from direct experience with close others and tend to be self-sustaining, lasting from childhood well into adulthood (Bartholomew & Horowitz, 1991; Fraley, 2002; Main, Kaplan, & Cassidy, 1985).

1.2.2. Adult romantic attachment

The extension of attachment theory to romantic partners in 1987 was relatively intuitive given that attachment is, in essence, an interpersonal process that dictates how relationships progress throughout the lifespan (Hazan & Shaver, 1987). Those who are anxiously attached to a romantic partner in adulthood display more dependency and jealousy behaviors, whereas those who are avoidantly attached are pessimistic about romantic love in general and avoid close ties altogether (Hazan & Shaver, 1987). Most recently, a focus on disorganized attachment has emerged in the literature (Beeney et al., 2017), which is characterized by the vacillation between, or coexistence of, attachment anxiety and avoidance. This configuration is often described as chaotic and characterized by rapid vacillations between extreme closeness and extreme distance, which creates and sustains unstable and chaotic relationships (Holmes, 2004; Levy et al., 2015; Main & Solomon, 1990).

Following the introduction of romantic attachment theory, researchers developed several ways of assessing romantic attachment insecurity. Often, this was done via a single item describing a prototype of each attachment style (Fraley et al., 2000). The Experiences in Close Relationships (ECR), a scale that has become the predominant measure of adult romantic attachment, was developed in response to concerns about the viability of this method, and measures two dimensions of attachment insecurity: anxiety (e.g., "I often worry that my partner does not really love me") and avoidance (e.g., "I usually discuss my problems and concerns with my partner" – reverse scored; Fraley et al., 2000). The ECR has demonstrated excellent psychometric properties (Favez, Tissot, Ghisletta, Golay, & Cairo Notari, 2016; Graham & Unterschute, 2015; Olssøn, Sørebø, & Dahl, 2010; Schmitt et al., 2004; Sibley & Liu, 2004; Tsagarakis, Kafetsios, & Stalikas, 2007), including internal consistency (Mikulincer & Shaver, 2007a, 2007b), associations with important areas of functioning (Del Giudice, 2011; Favez et al., 2016; Olssøn et al., 2010), test-retest reliability (Mikulincer & Shaver, 2007a, 2007b), and higher information measurement indices compared with other measures (Fraley et al., 2000).

1.3. Borderline PD and romantic attachment insecurity

As a wide-ranging cognitive, affective, and behavioral system, attachment speaks to the essential components of personality – that is, the characteristic ways that people think, feel, and behave (Costa & McCrae, 1992; Hazan & Shaver, 1987; Levy et al., 2015). Since *insecure*

attachment originates from faulty representations of the self and others (Bowlby, 1973), attachment theory also lends itself to contextualizing the interpersonal deficiencies of disordered personality (Grant et al., 2008). The current study innovates in its focus on romantic attachment; however, because much of the extant PD-attachment literature has focused on general attachment orientations, we review this literature as well as the romantic attachment literature below.

Bowlby (1973) originally hypothesized that attachment underlies personality pathology. This was later supported by work that proposed a dimensional representation of attachment and personality pathology (Blatt & Levy, 2003), such that individuals at extreme ends of attachment insecurity are personality disordered and those who are more adaptive in their self/other representations are not. Coincidentally, this is similar to the DSM-5 section III model of BPD which describes severe deficits in self and interpersonal functioning (similar to internal working models) as well as specific traits that make up its phenomenology (similar to attachment styles; American Psychiatric Association, 2013). Thus, in both empirical and theoretical terms PDs and attachment are similar, if not overlapping, constructs; indeed, attachment has the unique position to act as a comprehensive organizing framework for the myriad forms of dysfunction seen in BPD.

The theoretical debate over which form of attachment insecurity is most prominent in individuals with BPD has often taken the form of a tug-of-war between anxiety and avoidance (Levy et al., 2015). That is, empirical consensus regarding attachment insecurity in BPD has not yet emerged (Levy et al., 2015; Lorenzini & Fonagy, 2013). Some work has found robust links between BPD symptoms and anxious attachment using the ECR-R (Nakashi-Eisikovits, Dutra, & Westen, 2002; Scott et al., 2013), while others have found that avoidant attachment may be most characteristic of individuals with elevated levels of BPD (Levy et al., 2015). Still others conclude that a combination of anxiety and avoidance is most characteristic (MacDonald, Berlow, & Thomas, 2013; Scott, Levy, & Pincus, 2009), which suggests fragmented and vacillating working models of the self and other (Beeney et al., 2017). These studies have sought to provide an answer as to which dimension (or style) of attachment is "most like" BPD symptomatology. However, the dissociation and fragmented sense of self in BPD is theoretically consistent with disorganized attachment, and neither anxiety nor avoidance fully explain the range of symptomatology commonly observed in BPD (American Psychiatric Association, 2013; Beeney et al., 2017). Behavioral and emotional manifestations of disorganized attachment will appear familiar to clinicians and researchers who have experience with individuals with BPD, as they are often helpless in the face of their own emotions and lack the proper skills to effectively deal with these emotions – which results in a myriad of risky and maladaptive behaviors (Linehan, 1993). The vacillations in perceptions of close others (i.e., "splitting") are also indicative of cyclic extreme closeness and extreme distance that are characteristic of disorganized attachment (Main & Solomon, 1990; Selby et al., 2008). Traumatic experiences commonly experienced by those with BPD in childhood may be predecessors to fearful/disorganized/unresolved attachment orientations, which are also purportedly caused by traumatic events and/or extended rifts in the attachment relationship (Main et al., 1985).

Attachment represents an integrative system for organizing diverse findings and symptomatology in BPD. Thus, establishing the size of the quantitative relationship between these two theoretical constructs is important for guiding continued research on the topic. Previous qualitative reviews have concluded that BPD is characterized by high levels of insecure attachment (Agrawal, Gunderson, Holmes, & Lyons-Ruth, 2004; Flowers, McGillivray, Galbally, & Lewis, 2018; Lorenzini & Fonagy, 2013), but acknowledge the fact that there exists uncertainty regarding the predominant style of attachment in BPD. The current review seeks to clarify the quantitative relationship between BPD and romantic attachment insecurity, thereby guiding the understanding and treatment of how BPD develops, maintains, and functions in daily life.

1.4. Current study

Interpersonal deficits in BPD and insecure romantic attachment may be alternative ways of conceptualizing the same interpersonal dysfunction in close relationships (Levy et al., 2015) and complement each other in meaningful ways (Bowlby, 1973; Hazan & Shaver, 1987). However, the current literature is unclear on which primary dimension of attachment insecurity is most strongly associated with BPD traits. This ongoing debate has produced qualitative reviews often summarizing the literature and concluding that specific relationships between BPD and attachment anxiety/avoidance are unclear (Levy et al., 2015; Lorenzini & Fonagy, 2013). The current meta-analysis represents a crucial step forward for both the BPD and attachment literatures – since BPD and insecure attachment are characterized by remarkably similar interpersonal dysfunction, understanding the way that these interact in adulthood may provide clues for how to intervene with an individual who has disrupted relationships characteristic of either BPD or insecure attachment. In addition, the large literatures on BPD and attachment (often studied separately) may be integrated if the quantitative relationship between attachment and BPD is strong enough to warrant this. Finally, there is a need to examine attachment patterns related to adult romantic relationships specifically, as interpersonal functioning deficits are dependent upon (and specific to) which attachment figure is studied (Cozzarelli et al., 2000). The current study is innovative in its focus on romantic attachment specifically, as previous reviews have not made distinctions between different types of attachment in adulthood (Levy et al., 2015).

In essence, the current review poses the question: "which form of romantic attachment is most commonly associated with BPD?". Due to the marked similarities between BPD symptomatology and fearful/disorganized attachment (Beeney et al., 2017), it is hypothesized that the *combination* of anxious and avoidant dimensions will correspond most powerfully with BPD. Paradoxically, then, both dimensions may coexist within the BPD construct. Elucidating this empirically, however, will provide important insight into the extant body of research and ground efforts to investigate and treat BPD in a comprehensive framework capable of explaining cognition, emotion, and behavior in close relationships.

Meta-analysis is appropriate for investigatory purposes in the current study for several reasons. First, research into PDs and attachment has increased in prevalence recently, with most of the included studies for this meta-analysis being published in the last 10 years. Second, as the knowledge surrounding the diagnosis of all PDs (and particularly BPD) is growing with the inclusion of the DSM-5 Section III model (American Psychiatric Association, 2013), understanding the mechanisms underlying BPD would be a striking step forward. Finally, although the field is united in a consensus that BPD is characterized by insecurity of attachment, the individual research findings contradict one another. Qualitative reviews may provide a general sense of the findings that a field has accumulated but cannot provide the size of the effect or any interactive effects, which the current study seeks to accomplish.

2. Methods

2.1. Literature search & inclusion details

Literature searches for the current study were conducted on PsycINFO and Pubmed with the goal of finding books, dissertations, and/or peer-reviewed articles, published or unpublished, relating the dimensions of anxiety and avoidance to BPD symptoms. Search terms were: (ECR OR ECR-R OR experiences in close relationships OR RAQ OR reciprocal attachment questionnaire OR Bielefeld Partnership Expectations Questionnaire OR revised adult attachment scale OR RAAS OR AAS OR adult attachment styles OR adult attachment scale OR attachment rating scale OR Marital Q-sort OR AAQ OR adult attachment questionnaire OR current relationship interview OR marital

attachment interview OR couple attachment interview OR secure base scoring system OR SBSS OR Grau Attachment Questionnaire OR GAQ) AND (BPD OR borderline OR borderline pd. OR borderline personality*).

All searches were limited to 1980-present and were also limited to English language only sources. Inclusion criteria were that the study was an original, empirical study (i.e., no reviews or meta-analyses), and BPD was required to be measured dimensionally according to the DSM-5 Section II conceptualization[2] (e.g., via criterion counts or dimensional scores on self-report measures). Although searches were conducted for papers using Section III (American Psychiatric Association, 2013) criteria, no eligible sources were returned so the current review is limited by the literature to Section II definitions of BPD. A sample size criterion of at least $N = 10$ was also imposed, and BPD was allowed to be reported either via self-report or interview methods (i.e., via the SCID).

Between the two searches (PsycINFO and PubMed), 321 sources were returned. 37 articles were replicates between the two searches and subsequently excluded. Of the remaining 284 sources, 214 were excluded based on title and abstract review and 70 were retained for full-text review. Of these, 20 met inclusion criteria and contained information that could be coded as an effect size. Unpublished data from the author's lab (k = 1) was also included. Authors of studies retained for full-text review (k = 70) were contacted by email for unreported and/or unpublished data that exist in their labs.[3] Email solicitations to authors resulted in unpublished data from other labs (k = 4). Finally, a published article was identified through reference reviews of full-text articles (k = 1). Thus, the final sample consisted of 26 studies,[4] comprising 27 unique effect sizes.

Most articles excluded after title review were eliminated because they were non-empirical papers, used replicate samples of an earlier publication, did not assess one of the target constructs (i.e., BPD or attachment), did not provide a useable effect size, did not assess the primary dimensions of attachment as they related to a romantic partner, was not available through university catalogs/interlibrary loan, or did not assess BPD according to a DSM conceptualization. In the case of replicate samples, the first representation of that sample in the downloaded articles was identified and the later ones were excluded.

2.2. Analysis plan

The effect size (ES) chosen for the current study was the Pearson's bivariate r[5] because both constructs are dimensional. When bivariate correlations were not reported, they were calculated from other data reported in the manuscript (i.e., t values, 2 × 2 frequencies, etc) using Wilson's (2011) online calculator. In the case of multiple time-point studies, like those involving treatment or longitudinal growth, only the first time point was coded.

The current study used a mixed-effects model, run separately for attachment anxiety and avoidance. Whereas fixed-effects models assume that all the variation between effect sizes is due to sampling error alone, the mixed effects model assumes that heterogeneity in effect sizes can be attributed to between-study factors (e.g., sample characteristics). That is, these models are best suited when study characteristics can be reliably coded across included studies, as in the current study. Both random and mixed-effects models are assumed to have some grand mean with a distribution of effects around it. In random models, this variability is due to sampling error and some unmeasured random variance component, whereas in mixed models this random component is further divided into systematic (i.e., explained via some study characteristic such as gender distribution) and purely random (or unmeasured) variance. Because of the availability of these study characteristics for coding, and because the Q statistic was expected to be significant (indicating excess variability between effect sizes), this model was chosen (Lipsey & Wilson, 2001).

The meta-analytic methods for the current study require the independence of effects. Because some studies included for the current analysis reported more than one effect size (e.g., if more than one measure of BPD was used), these were transformed to Fisher z' and aggregated prior to their inclusion. Effect sizes were weighted by the inverse of their variance to account for varying sample sizes between studies, or n-3 in the current study. This weighting procedure gives more "pull" to studies with larger sample sizes (Lipsey & Wilson, 2001). To determine if heterogeneity in the distribution of effect sizes is due to sampling error alone, a Q statistic was computed, which provides an estimate of whether the effect sizes are estimating the same population mean (Lipsey & Wilson, 2001). If the Q statistic is nonsignificant, this indicates that sampling error can and does explain any dispersion of effects, which is assumed to be minimal. If it is significant, there is heterogeneity present that may be explained by one or more moderators; the Q statistic was expected to be significant for the current study. Because Q only detects the presence of heterogeneity, I^2 was used as an index of the *size* of heterogeneity of the effects (given by $I^2 = 100*(Q\text{-}df)/Q$ and expressed as a percentage; Huedo-Medina, Sánchez-Meca, Marín-Martínez, & Botella, 2006; Higgins, Thompson, Deeks, & Altman, 2003).

Several study characteristics were coded for later use in moderator analyses. These included mean age, percent female participants, percent Caucasian/White participants, percent of participants in a relationship at the time of the study, sample type (e.g., clinical, prison, community, college, mixed), publication status (coded as 0 for unpublished and 1 for published), journal impact factor (if relevant), year published, measure of BPD, measure of attachment, administration method (e.g., self-report or interview), whether the sample was US-based or not, scale reliabilities,[6] and funding (coded 0 for unfunded or internally funded, 1 if funded externally).[7] In the case of moderator values being reported separately by groups (e.g., age reported separately for men and women) these were aggregated via an online calculator into a weighted average based on the Ns of each group (Arsham, 2015). ES estimates are reported for all groups in the case of categorical moderators (e.g., for US versus non-US samples). Meta-regression analyses using maximum likelihood estimation were run to examine the effect of moderators both together (in a multiple regression framework)[8] and separately (i.e., run in their own models). Model and

[2] When a study was identified for potential inclusion in the meta-analysis and it was unclear if the assessment measure of BPD used adhered to DSM criteria, the first author conducted literature searches on the measure itself to confirm this

[3] See supplemental materials for a drafted sample email.

[4] See Figure 1 for a full schematic of article selection.

[5] Although mean difference analysis is feasible for the current study (Lipsey & Wilson, 2001), and a subset of studies reported distribution of attachment categories among diagnostic groups, these were not meta-analyzed for several reasons. First, because the number of studies reporting this data was small and any analysis would have likely been underpowered. Second, as stated in the original ECR-R validation paper (Fraley et al., 2000) there are substantive conceptual, power- and precision-based concerns with categorizing measures and constructs that are truly dimensional (like attachment; Fraley & Waller, 1998)

[6] No reliability values reported in the selected studies fell below acceptable levels so no effect sizes had to be adjusted.

[7] Missingness and significance level were originally planned to be included in the coding protocol; due to the lack of reporting on these, they could not be reliably coded.

[8] An error message resulted upon initial estimation of the multiple regression models for avoidance which read "Degree of freedom is less than or equal to zero for CHICDF or TCDF". Upon further investigation, the exclusion of the moderator for journal impact factor resolved this error and the model ran normally. This error is said to occur when a model contains as many parameters as pieces of information (in this case, studies providing effect sizes for avoidant

residual Q statistics were utilized to determine if the model explained a significant portion of heterogeneity, as well as the amount of residual heterogeneity. The R^2 statistic was used to determine the proportion of variance that was explained by the model (given by $Q_{model}/[Q_{model} + Q_{residual}]$).

The data were also used to determine if the association between one dimension of attachment (e.g., avoidance) and level of BPD modifies the relationship between the other attachment dimension (i.e., anxiety) and BPD level. If such an interaction was found, it would indicate a tendency towards coexisting attachment representations within BPD. To this end, a particular effect size (for example, the *Z*-transformed correlation of attachment anxiety/BPD) was entered as the dependent variable in a meta-regression using mixed effects modelling and maximum likelihood estimation. The other z-transformed effect size was entered as the continuous moderator (i.e., for this example it would be attachment avoidance/BPD). That is, this analysis indicated if the relationship between one dimension of attachment and BPD changes as a function of the other dimension. Proportion of variance explained and heterogeneity determinations followed the same procedure detailed above. These moderators were solely run in their own models, and each model was estimated separately. All analyses were performed in SPSS using Wilson's (2011) macro.

The risk of replication bias in skewing the size of the effect in the current study was carefully considered. A procedure for correcting effect size estimates based only on significant results was proposed by Simonsohn, Nelson, and Simmons (2014), which assumes that publication bias relies on significance values, not effect sizes. The p-curve is robust to heterogeneity and was demonstrated more accurate to the popular trim-and-fill method in several simulations. For a bigger effect size, the distribution is assumed to be more right-skewed; if *p* values cluster around the 0.05 mark, this is evidence of "p-hacking" (e.g., peeking at results and selectively discontinuing data collection, selectively excluding outliers, etc). A p-curve was rendered via the online calculator; results suggested that there was no publication bias, as the distribution of significance values was extremely right-skewed (see Figs. 2 and 3 for details; Simonsohn et al., 2014; Simonsohn, Nelson, & Simmons, 2017). Funnel plots were also rendered in SPSS via plotting effect sizes (in r units) on the x-axis and sample N on the Y, with an x-axis marker indicating the average ES.

For the current study, power was calculated via the online calculator given by Quintana (2017), based on the formulas provided by Valentine, Pigott, and Rothstein (2010). Using studies included in the meta-analysis of correlations between dimensions of attachment and BPD (for anxiety, k = 27, N = 153.85, r = 0.48; for avoidance, k = 26, N = 155.92, r = 0.30) and assuming a large degree of heterogeneity, power was calculated to be 100% for meta-analytic estimates of both dimensions.

3. Results

Details on included studies are presented in Table 1, and descriptive statistics are listed in supplemental materials. On average, samples were mostly female (67%) and mainly White (40.7%) with approximately one quarter of respondents for whom data was available reporting a current relationship status (29.7%). Average age was 31.94. External funding was reported by 13 studies. Self-report measures of BPD were used in 15 studies, whereas 12 included interview-based assessment of BPD. The revised ECR was used in 12 studies, 13 studies used the original ECR, and 2 studies used other measures that yielded dimensional scores of anxiety and avoidance (one used the Adult Attachment Questionnaire and one used the Adult Attachment Scales; Collins & Read, 1990; Feeney & Noller, 1990). Studies were primarily based in the US (N = 16 studies), with a total of 11 collecting data outside the US. One of the k = 26 studies providing effect sizes was derived from internal lab data – meta-analytic results in the manuscript body are presented with these effect sizes (results without these effect sizes may be found in supplemental materials). As aggregate effect sizes and heterogeneity information were virtually unchanged by the exclusion of these effect sizes, all further analyses proceeded with the inclusion of this data.

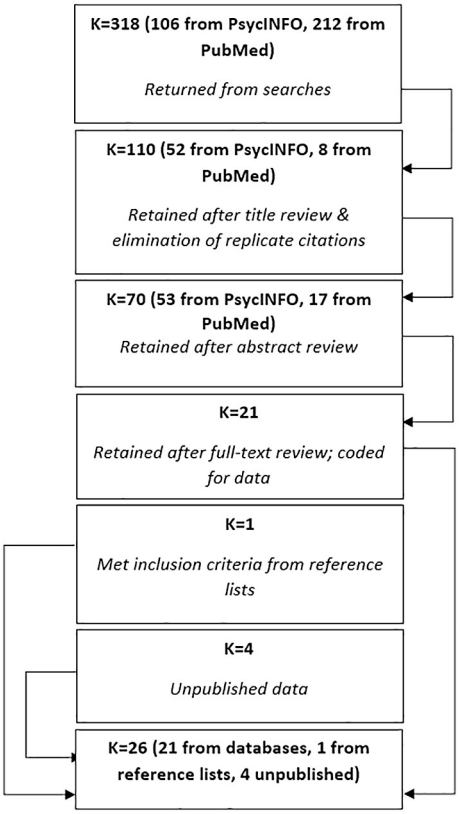


Fig. 1. Schematic of article selection.

3.1. Meta-analytic estimates

Values for meta-analytic estimates are listed in Table 2, along with k, 95% confidence intervals, and significance testing information.

3.1.1. Attachment avoidance

Fixed-effects models indicate a medium effect between BPD traits and attachment avoidance in the full sample (k = 26; r = 0.26). Random effects models resulted in an effect size of r = 0.30. Both effects were statistically significant at $p < .0001$.

3.1.2. Attachment anxiety

Results for attachment anxiety suggest that those with more BPD features tend to experience attachment related anxiety in romantic relationships. Both fixed (r = 0.46) and random (r = 0.48) effects were large and statistically significant at $p < .0001$.

3.1.3. Heterogeneity

Results for attachment related anxiety and avoidance were significantly heterogeneous, as evidenced by statistically significant Q, suggesting that there is more heterogeneity in the current analysis than would be expected by sampling error alone. For avoidance, I^2 suggests that heterogeneity was moderate to large (I^2 = 73.7%; Q (25) = 95.20,

(*footnote continued*)
attachment and BPD). Therefore, this moderator was estimated solely in its own model for attachment avoidance. Individual-model results may be found in supplemental materials.

Table 1
Study Characteristics of full meta-analytic sample, including ESs.

Citation	Total N	Clinical N	Control N	BPD Reliability	Anxiety Reliability	Avoidance Reliability	Avoidance/BPD r	Anxiety/BPD r
Sibcy (2001)	75	75			0.89	0.93	0.28	0.44
Beeney et al., 2015	150	75	75	0.80	0.94	0.92	0.33	0.47
Boldero et al. (2009).	101			0.94	0.93	0.95	0.45	0.62
	131			0.93	0.94	0.93	0.27	0.60
Bowles, Armitage, Drabble, and Meyer (2013).	169			0.87	0.92	0.94	0.35	0.42
De Smet, Uzieblo, Loeys, Buysse, and Onraedt (2015).	631			0.77	0.88	0.89	0.15	0.43
Elliot et al., 2014	26	13	13				0.80	0.79
MacDonald, Berlow, and Thomas (2013).	357	357					0.20	0.43
McKeown (2014).	92			0.67	0.89	0.85	0.51	0.65
Erbe (2015)	29	14	15				0.61	0.75
Meyer, Pilkonis, and Beevers (2004)	176			0.86	0.91	0.92	0.13	0.45
Miller et al. (2010)	361			0.68	0.93	0.93	0.25	0.51
Miller, Morse, Nolf, Stepp, & Pilkonis (2012)	134	63	71	0.82	0.94	0.93	0.30	0.48
Scott et al. (2013)	100	45	55	0.88	0.94			0.67
Bouchard et al. (2009)	70	35	35	0.90	0.90	0.87	0.52	0.62
Hulbert, Jennings, Jackson, and Chanen (2011)	60	60					0.22	0.05
Bartz et al. (2011)	27	14	13				0.65	0.78
MacGregor et al. (2014)	239	239		0.71			0.18	0.18
Lawson and Brossart (2013)	132			0.77	0.80	0.77	0.41	0.31
South Lab Data	198			0.73	0.93	0.93	0.28	0.48
Pilkonis Lab Data I	260			.80			0.28	0.47
Pilkonis Lab Data II	148			.86			0.40	0.49
Aleknaviciute et al. (2016)	81	46	35				0.41	0.57
Joyce, Fujiwara, Cristall, Ruddy, and Ogrodniczuk (2013)	48	48			0.91	0.94	0.20	0.52
Hengartner et al. (2015)	72	72					0.19	0.44
Ogrodniczuk et al. (2008)	197	197					0.11	0.35
Critchfield, Levy, Clarkin, and Kernberg (2008)	90	90		.83	.89	.91	-.16	.08

$p < .0001$). Attachment related anxiety also evinced a large amount of heterogeneity ($I^2 = 76.9\%$; Q (26) = 112.57, $p < .0001$). Thus, the assumption that all effect sizes lie on a common distribution was rejected for the current study. Due to the widespread availability of moderators for coding, a mixed-effects model was adopted to partition variance.

3.2. Categorical moderators

Table 3 includes information on ANOVA results for categorical moderators, in addition to heterogeneity information ($Q_{between}$, Q_{within}, and Q for each category), 95% confidence intervals, k, and significance information. Separate analyses were run for each categorical moderator, and average effect sizes are also presented by group. Notably, due to the few number of studies that included information on which measure was used to assess BPD traits, several measures for assessing BPD had to be grouped to perform moderator analyses. Together, these measures make up the "miscellaneous" category of the BPD assessment moderator: Schedule for Nonadaptive and Adaptive Personality (Clark, 1993), McLean Screening Instrument for Borderline Personality Disorder (Zanarini et al., 2003), International Personality Disorders Examination (Loranger et al., 1994), Zanarini Rating Scale for Borderline Personality Disorder (Zanarini, 2003), Personal Relationships Profile (Straus, Hamby, Boney-McCoy, & Sugarman, 2010), Personality Diagnostic Questionnaire (Taylor, James, Bobadilla, & Reeves, 2008), Personality Structure Questionnaire (Pollock, Broadbent, Clarke, Dorrian, & Ryle, 2001), the Assessment of DSM-IV Personality Disorders (Doering et al., 2007), and one study using unstructured assessments of DSM diagnostic criteria. Additionally, because the Adult Attachment Scales (Collins & Read, 1990) and Adult Attachment Questionnaire (Feeney & Noller, 1990) were only used in one study each, they were combined for the purposes of moderator analyses.

3.2.1. BPD measure

Studies eligible for the moderator analysis (i.e., reporting both the measure of BPD and an ES) showed that the Millon Clinical Multiaxial Inventory (MCMI; Millon, Grossman, & Millon, 2015) had the highest effect size estimate ($r = 0.36$, $p = .002$) while the Wisconsin Personality Disorders Inventory (WISPI; Smith, Klein, & Benjamin, 2003) had the lowest ($r = 0.14$, $p = .25$). Heterogeneity between studies (Q

Table 2
Average ESs by dimension, with Homogeneity tests and 95% CIs.

	Heterogeneity							95% CI				
	k	Q	df	p	I^2	Min ES	Max ES	Mean ES	Lower	Upper	z	p
Avoidance	26	95.20	25	< .0001	73.7	-.16	.80					
Fixed								.26	.23	.29	16.69	< .0001
Random								.30	.24	.36	9.39	< .0001
Anxiety	27	112.57	26	< .0001	76.9	.05	.79					
Fixed								.46	.43	.48	31.37	< .0001
Random								.48	.43	.53	15.04	< .0001

Table 3
Categorical Moderators by dimension, including homogeneity information, average ESs, significance levels, and 95% confidence intervals.

	Avoidance									Anxiety								
			95% CI				Q (df, p) & I^2					95% CI				Q (df, p) & I^2		
	k	*r*	*Lower*	*Upper*	*z*	*p*	*Between/By Group*	*I^2(%)*	*Within*	*k*	*r*	*Lower*	*Upper*	*z*	*p*	*Between/By Group*	*I^2(%)*	*Within*
BPD Measure – 8.4/12.1							3.18 (6, .79)	0/44.6	34.28 (19, .02)							4.69 (6, .58)	0/41.4	34.15 (20, .03)
SCID	7	.34	.22	.45	5.18	< .0001	10.45 (6, .11)	42.6		7	.45	.33	.55	6.67	< .0001	18.24 (6, .01)	67.1	
WISPI	2	.14	-.10	.37	1.15	.25	.13 (1, .71)	0		2	.42	.19	.61	3.43	.0006	.60 (1, .44)	0	
SIDP	2	.34	.13	.51	3.16	.002	.35 (1, .56)	0		2	.48	.28	.64	4.44	< .0001	.009 (1, .93)	0	
MCMI	2	.36	.13	.54	3.05	.002	.35 (1, .56)	0		2	.37	.14	.57	3.06	.002	.36 (1, .55)	0	
BPQ	2	.36	.14	.54	3.18	.002	.77 (1, .38)	0		2	.61	.43	.74	5.67	< .0001	.02 (1, .90)	0	
Misc	8	.28	.16	.38	4.74	< .0001	22.08 (7, .003)	68.3		8	.48	.38	.57	8.22	< .0001	13.02 (7, .07)	46.2	
Multiple	3	.29	.12	.44	3.30	.001	.16 (2, .92)	0		4	.53	.40	.64	7.01	< .0001	1.90 (3, .59)	0	
Attach Measure – 1.3/18.3							.43 (2, .81)	0/31.2	33.43 (23, .07)							7.69 (2, .02)	74/30.2	34.40 (24, .08)
ECR-R	11	.33	.23	.42	6.38	< .0001	5.97 (10, .82)	0		12	.52	.45	.59	12.13	< .0001	7.49 (11, .76)	0	
ECR	13	.29	.19	.38	5.63	< .0001	26.32 (12, .01)	54.4		13	.47	.39	.54	10.38	< .0001	26.53 (12, .01)	54.8	
Other	2	.29	.06	.49	2.49	.01	1.14 (1, .29)	12.3		2	.24	.03	.44	2.20	.03	.38 (1, .54)	0	
Publication Status – 1.1/1.3							.33 (1, .57)	0/26.1	29.77 (22, .12)							.37 (1, .54)	0/18.8	28.32 (23, .20)
Unpublished	3	.36	.14	.55	3.17	.002	2.08 (2, .35)	3.8		3	.54	.34	.70	4.61	< .0001	2.24 (2, .33)	10.7	
Published	21	.30	.22	.37	7.22	< .0001	27.69 (20, .12)	27.8		22	.48	.41	.55	11.35	< .0001	26.08 (21, .20)	19.5	
US vs Non – 4.1/2.6							1.40 (1, .24)	28.6/26.8	32.79 (24, .11)							.86 (1, .35)	0/21.0	31.66 (25, .17)
US	15	.27	.19	.35	6.11	< .0001	15.82 (14, .32)	11.5		16	.46	.38	.53	10.08	< .0001	17.92 (15, .27)	16.3	
Non-US	11	.35	.25	.44	6.57	< .0001	16.97 (10, .08)	41.1		11	.52	.42	.60	9.30	< .0001	13.74 (10, .19)	27.2	
Sample Type – 50.3/45.6							32.25 (4, < .0001)	87.6/40.5	31.91 (19, .03)							23.50 (4, .0001)	83/28.8	28.09 (20, .11)
Clinical	8	.15	.07	.23	3.78	.0002	8.16 (7, .32)	14.2		8	.32	.22	.41	6.18	< .0001	10.75 (7, .15)	34.9	
Mixed	7	.45	.36	.53	9.00	< .0001	16.20 (6, .01)	63		8	.61	.53	.68	11.71	< .0001	9.72 (7, .20)	28	
Prison	2	.46	.32	.57	5.93	< .0001	.58 (1, .45)	0		2	.49	.31	.63	5.02	< .0001	4.58 (1, .03)	78.2	
College	5	.28	.20	.36	6.32	< .0001	5.80 (4, .21)	31		5	.52	.42	.60	9.26	< .0001	2.93 (4, .57)	0	
Community	2	.20	.08	.31	3.34	.0008	1.18 (1, .28)	15.3		2	.45	.30	.58	5.40	< .0001	.10 (1, .75)	0	
Administration Method – 3.4 /.003							1.13 (1, .29)	11.5/24.8	31.91 (24, .13)							.001 (1, .98)	0/20.1	31.28 (25, .18)
Self-Report	15	.28	.19	.36	6.19	< .0001	8.18 (14, .88)	0		15	.48	.40	.56	10.26	< .0001	5.86 (14, .97)	0	
Interview	11	.35	.25	.45	6.23	< .0001	23.73 (10, .01)	57.9		12	.49	.39	.57	8.60	< .0001	25.42 (11, .008)	56.7	
Funding – 1.6/1.2							.27 (1, .60)	0/26.5	16.32 (12, .18)							.20 (1, .65)	0/21.0	16.46 (13, .23)
Unfunded	2	.23	-.02	.46	1.84	.07	.12 (1, .73)	0		2	.43	.17	.64	3.15	.002	.004 (1, .95)	0	
Funded	12	.30	.20	.40	5.55	< .0001	16.20 (11, .13)	32.1		13	.49	.40	.58	8.85	< .0001	16.46 (12, .17)	27.1	

Note. Percent of variance explained is shown in bold next to headings for avoidance and anxiety, respectively.

(6) = 3.18, p = .79, I^2 = 0) was nonsignificant, whereas within categories (Q(19) = 34.28, p = .02, I^2 = 44.6%) it was significant.

For attachment related anxiety, the pattern of results with respect to heterogeneity is largely similar (see Table 3). However, the highest meta-analytic estimate is found for the Borderline Personality Questionnaire (BPQ; Poreh et al., 2006; r = 0.61, p < .0001) while the smallest was found for the MCMI (r = 0.37, p = .002). BPD measure accounted for 8.4% and 12.1% for attachment avoidance and anxiety, respectively ($Q_{between}/[Q_{between} + Q_{within}]$).

3.2.2. Attachment measure

For attachment avoidance, between-group heterogeneity (Q (2) = .43, p = .81, I^2 = 0) was nonsignificant, while within-group heterogeneity (Q(23) = 33.43, p = .07, I^2 = 31.2) was trending and small to medium in size. Attachment measure accounted for 1.3% of the variance in effects for attachment avoidance, but 18.3% for anxious attachment. Heterogeneity between groups for attachment anxiety (Q (2) = 7.69, p = .02, I^2 = 74%) was significant and large, while within groups (Q(24) = 34.40, p = .08, I^2 = 30.2%) it was trending towards significance and small to medium in size.

In terms of effect size estimates, for attachment avoidance they ranged from r = 0.29 (for the original ECR) to r = 0.33 (for the revised ECR; all significant at p < .05), while for anxiety the low was r = 0.24 (p = .03) for "other" attachment measures, and the high was r = 0.52 (p < .0001).

3.2.3. Publication status

For attachment avoidance, between-group (Q(1) = 0.33, p = .57, I^2 = 0) and within-group heterogeneity (Q(22) = 29.77, p = .12, I^2 = 26.1) were nonsignificant. Publication status accounted for 1.1% of the heterogeneity in effects for avoidance and 1.3% for anxiety. Heterogeneity between groups for attachment anxiety (Q(1) = 0.37, p = .54, I^2 = 0) was nonsignificant, indicating that groups were homogenous with respect to one another. Within groups (Q (23) = 28.32, p = .20, I^2 = 18.8%) heterogeneity was also nonsignificant.

Published studies (avoidance r = 0.30, p < .0001; anxiety r = 0.48, p < .0001) tended to have lower effect size estimates than unpublished studies (avoidance r = 0.36, p = .002; anxiety r = 0.54, p < .0001). However, because the between-groups Q was nonsignificant, these estimates are not significantly different from one another (at a level greater than would be expected by sampling error alone; Lipsey & Wilson, 2001).

3.2.4. US vs Non-US samples

Between-group heterogeneity (Q(1) = 1.40, p = .24, I^2 = 28.6; Q (1) = 0.86, p = .35, I^2 = 0) and within-group heterogeneity (Q (24) = 32.79, p = .11, I^2 = 26.8; Q(25) = 31.66, p = .17, I^2 = 21) tests for both anxiety and avoidance, respectively, indicate that the assumption of a common effect size distribution is not violated for studies performed in the US and elsewhere. The moderator accounted for 4.1% and 2.6% of the heterogeneity in attachment avoidance and anxiety, respectively. Effect sizes were slightly higher for non-US studies of attachment avoidance (r = 0.35 for non-US, r = 0.27 for US) and for the dimension of attachment anxiety (r = 0.52 for non-US, r = 0.46 for US).

3.2.5. Sample type

Sample type accounted for 50.3% and 45.6% of the heterogeneity in attachment avoidance and anxiety, respectively. Between group heterogeneity for attachment avoidance (Q(4) = 32.25, p < .0001, I^2 = 87.6) and anxiety (Q(4) = 23.50, p = .0001, I^2 = 83) are both significant, indicating that groups differ from one another. However, within-group heterogeneity for attachment avoidance (Q(19) = 31.91, p = .03, I^2 = 40.5) and anxiety (Q(20) = 28.09, p = .11, I^2 = 28.8) indicate that the groups themselves are mostly homogenous with respect to attachment anxiety but not avoidance. In terms of attachment avoidance, results by group suggest that mixed or prison samples have the strongest relationship between BPD symptoms and attachment avoidance (r = 0.45 and 0.46, respectively), while purely clinical samples have the weakest relationship (r = 0.15). All effect sizes were significant at p < .01. For attachment anxiety, mixed samples (r = 0.61) and college samples (r = 0.52) had the strongest relations with BPD traits, while estimates for clinical samples (r = 0.32) and community samples (r = 0.45) were lower.

3.2.6. Administration method

This moderator accounted for 3.4 and .003% of heterogeneity in attachment avoidance and anxiety effect sizes, respectively. Heterogeneity tests for attachment avoidance were nonsignificant both between-groups (Q(1) = 1.13, p = .29, I^2 = 11.5) and within groups (Q (24) = 31.91, p = .13, I^2 = 24.8). This was a similar case for attachment anxiety, which also evinced nonsignificant heterogeneity between (Q(1) = .001, p = .98, I^2 = 0) and within (Q(25) = 31.28, p = .18, I^2 = 20.1) groups. Interview-based assessments (r = 0.35) demonstrated a stronger relationship to attachment avoidance compared to self-report assessments of PD scores (r = 0.28; both significant at p < .0001). Notably, self-report assessment evinced a similar stronger relationship with attachment anxiety (r = 0.48) compared to interview-based assessments (r = 0.49; all significant at p < .0001).

3.2.7. Funding

Although between-groups tests of heterogeneity for attachment avoidance (Q(1) = 0.27, p = .60, I^2 = 0) and anxiety (Q(1) = 0.20, p = .65, I^2 = 0) are nonsignificant, indicating that the groups do not significantly differ between each other, this moderator accounted for 1.6 and 1.2% of the variability in effect sizes for attachment avoidance and anxiety, respectively. Within-group heterogeneity tests for avoidance (Q(12) = 16.32, p = .18, I^2 = 26.5) and anxiety (Q(13) = 16.46, p = .23, I^2 = 21) were also nonsignificant, indicating that the groups themselves were homogenous. Effect size estimates by group indicated that effect sizes tended to be larger in externally-funded studies for both attachment avoidance (funded r = 0.30, unfunded r = 0.23) and anxiety (funded r = 0.49, unfunded r = 0.43).

3.3. Continuous moderators

Multiple weighted least squared regressions using maximum likelihood estimation were run separately for attachment avoidance and anxiety, and all continuous moderators were entered simultaneously.[9] Table 4 reports k, B (which indicates the change in r for a one-unit increase in the moderator), standard errors, β, p values, 95% confidence intervals, as well as heterogeneity tests for the multiple regression models and residuals. (See Table 5)

3.4. Attachment avoidance

The regression model for this set of moderators explained 36.54% of the variation in effect sizes. The model Q statistic (Q(5) = 6.66, p = .25) and residual heterogeneity (Q(3) = 11.58, p = .009) suggest that any leftover variability in effect sizes for this model after accounting for the moderators cannot be explained by sampling error alone. For this analysis, no moderators emerged as significant predictors.

[9] See supplemental materials for models in each continuous moderator was entered and run separately. Models were also run separately for attachment anxiety and avoidance, resulting in 10 separate models.

Table 4
Mixed effects multiple regression for continuous moderators.

						95% CI			Q (df, p)	
	k	B	SE	β	p	Lower	Upper	R^2 (%)	Model	Residual
Avoidance	9	25.87	49.44			-71.04	122.78	36.54	6.66 (5, .25)	11.58 (3, .009)
Age		-.02	.01	-.78	.08	-.03	.002			
% in Relationship		.01	.01	1.02	.09	-.002	.02			
% Female		.001	.004	.07	.84	-.008	.01			
% White		-.02	.01	-1.15	.12	-.04	.004			
Pub Year		-.01	.02	-.33	.62	-.06	.04			
Anxiety	8	54.60	109.90			-160.81	270.004	79.39	32.07 (6, < .0001)	8.33 (1, .004)
Age		-.01	.01	-.64	.06	-.03	.001			
% in Relationship		.02	.01	2.10	.05	-.0002	.04			
% Female		**-.02**	**.01**	**-1.34**	**< .0001**	**-.03**	**-.01**			
% White		.01	.02	.98	.42	-.02	.05			
Pub Year		-.03	.05	-.55	.63	-.13	.08			
Journal IF		**-.13**	**.04**	**-2.92**	**.0002**	**-.21**	**-.06**			

Note. Both models reported here used maximum likelihood estimation procedures. All significant moderators are bolded.

Table 5
Interaction models for anxiety and avoidance, with the ES for each dimension moderating the ES for the other dimension.

						95% CI			Q (df, p)	
	k	B	SE	β	p	Lower	Upper	R^2 (%)	Model	Residual
Avoidance	26	.73	.12	.75	< .0001	.48	.97	56.67	34.34 (1, < .0001)	26.26 (24, .34)
Anxiety	26	.79	.13	.76	< .0001	.53	1.05	57.6	34.86 (1, < .0001)	25.63 (24, .37)

Note. Models are labelled according to dependent variable.

3.5. Attachment anxiety

The model Q statistic indicates that the model did explain a significant portion (79.39%) of the variability in effect sizes (Q (6) = 32.07, $p < .0001$). The residual Q also remains significant (Q (1) = 8.33, $p = .04$) indicating significant heterogeneity is still present that cannot be accounted for by sampling error alone. Significant moderators for this analysis included % female participants and journal impact factor. More female participants and a higher impact factor were associated with decreases in the correlation between attachment anxiety and BPD.

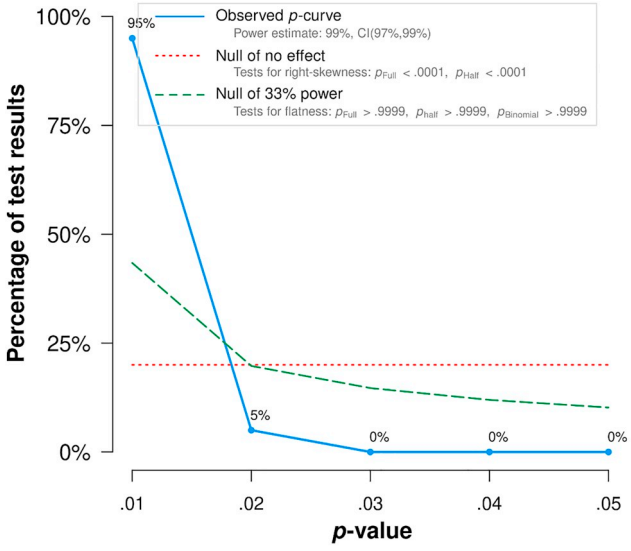
3.6. Interaction analyses

The model for anxious/BPD traits regressed onto attachment avoidance/BPD ESs resulted in a significant effect explaining 57.6% of the variance; the remaining variance was nonsignificant ($Q_{residual}$ (24) = 25.63, $p = .37$). That is, at higher levels of concordance between BPD and the avoidant dimension of attachment, the relationship between anxious attachment and BPD also tends to be stronger. When the inverse analysis was run, the correlation between anxious attachment and BPD explained a significant portion of variance in avoidance/BPD (R^2 = 56.67%). The residual Q statistic for this model was also nonsignificant ($Q_{residual}$ (24) = 26.26, $p = .34$), indicating that after accounting for ESs of the other dimension correlated with BPD, the remaining variance can be explained by sampling error alone. These results suggest that there may be an interaction or bidirectional relationship between BPD and the two dimensions of attachment, such that those who endorse elevated BPD traits will also be elevated on both dimensions of attachment insecurity.

3.7. Publication bias

P-curve analyses were run using the online calculator (Simonsohn et al., 2017). P-curve is expected to be right-skewed if no publication bias exists under the assumption that larger effect sizes will result in a higher number of smaller p values. That is, given a true effect in the population, there will not be a clustering of p values at the higher end of the "significance range" of p = .00–0.05; if this cluster was present, it would indicate either p-hacking procedures or selective publication once significance levels fall just below $p = .05$. The p curves for both attachment avoidance and anxiety indicate no evidence of publication bias, as 95% and 100% of the p values fell at or below 0.01 for attachment avoidance and anxiety, respectively (see Figs. 2 and 3).

Funnel plots run separately for attachment avoidance and anxiety are presented in Figs. 4 and 5. Funnel plots detect the tendency for the literature to "weed out" samples and studies in which the effect is close to 0 and the sample sizes are small (in other words, if publication bias



Note: The observed p-curve includes 20 statistically significant ($p < .05$) results, of which 20 are $p < .025$. There were 6 additional results entered but excluded from p-curve because they were $p > .05$.

Fig. 2. P-curve for avoidance/BPD ESs.

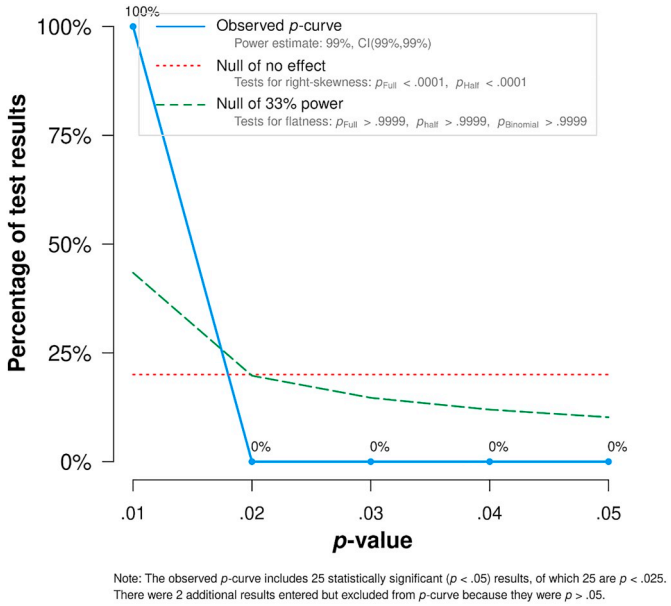


Fig. 3. P-curve for anxiety/BPD ESs.

exists, the leftmost side of the funnel will be devoid of data points). There was no evidence of publication bias for either attachment avoidance or anxiety, and smaller ESs from smaller samples are actually represented at a higher rate in the avoidance funnel plot. For the anxiety funnel plot, effect sizes are located primarily on the lower-right side of the funnel plot, suggesting that larger effect sizes came from smaller samples. However, examination of effect sizes for published vs unpublished data in the case of avoidance (published $r = 0.30$, unpublished $r = 0.36$) and anxiety (published $r = 0.48$, unpublished $r = 0.54$) reveals no appreciable difference and this moderator accounted for only 1.1% and 1.3% of the variability in effect sizes, respectively.

4. Discussion

PDs have been linked to attachment difficulties early and often, and attachment theory complements the empirical literature on BPD etiology (Beauchaine et al., 2019; Bowlby, 1973; Crowell, Beauchaine, & Linehan, 2009; Crowell, Kaufman, & Beauchaine, 2014; Linehan, 1993). Romantic attachment insecurity is strongly, positively linked to BPD traits (Levy et al., 2015) and may, in part, explain the relationship difficulties that individuals with BPD experience at higher rates than healthy (Miano, Grosselli, Roepke, & Dziobek, 2017; Navarro-Gómez et al., 2017) and clinical (Daley et al., 2000) controls. In addition to providing a quantification of the size of the relationship between BPD and the two major dimensions of attachment insecurity, the current meta-analysis hypothesized that the combination of both forms of attachment difficulties would underlie borderline pathology. The hypothesis for the current study was supported; that is, results suggest that both forms of attachment insecurity may co-occur within the context of BPD.

Meta-analytic estimates in the current study indicate that attachment anxiety (r = 0.48) is more strongly correlated with BPD traits than attachment avoidance ($r = 0.30$). Sample type moderated the associations between attachment insecurity and BPD such that clinical samples had some of the weakest relationships between BPD and attachment. Although unusual, clinical samples' ESs may have been limited by ceiling or floor effects for PD symptoms and attachment. Additionally, method of assessing BPD explained a significant amount of heterogeneity. There are numerous self-report, informant-report, and interview-based measures of borderline PD, and each one is administered for different purposes and in different populations. Further clarification of the BPD construct (possibly via the DSM-5 Section III model of PDs; Krueger, Hopwood, Wright, & Markon, 2014), and a united consensus on how to assess it, could ameliorate these concerns.

There was no strong evidence of publication bias either from p-curve analysis, funnel plot analysis, or publication status as a moderator, but the presence of external funding did impact effect sizes in a positive direction. Increased pressure for funded studies to produce large ESs or increased rigor of studies that are scrutinized from their conception (as in the case of government-funded and peer-scored grant proposals) may underlie this effect.

4.1. Why fearful/disorganized attachment?

Chronic instability of emotions, relationships, and self-concept lies

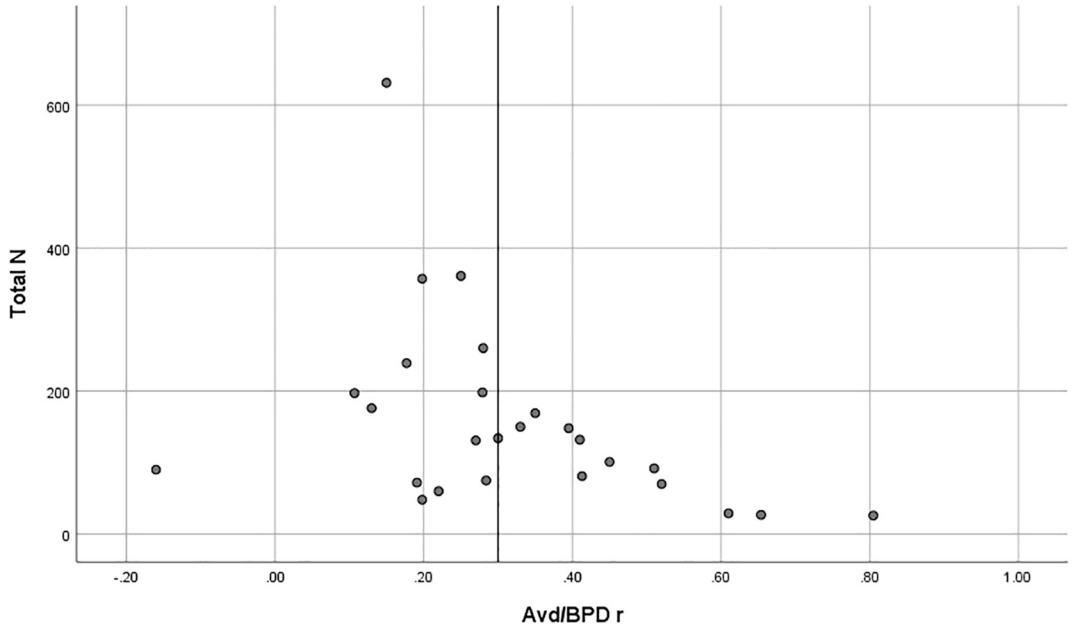


Fig. 4. Funnel plot of Pearson r's between BPD and avoidant attachment scores.

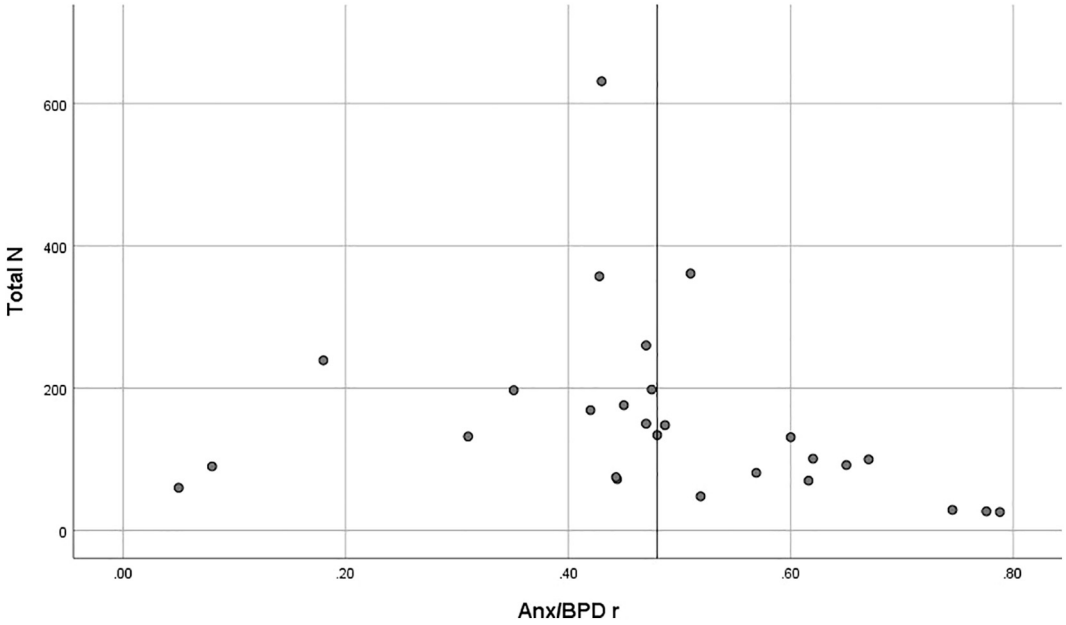


Fig. 5. Funnel plot of Pearson r's between BPD and anxious attachment scores.

at the center of the BPD construct (American Psychiatric Association, 2013; Linehan, 1993). This chaotic instability may best be explained not by attachment avoidance or attachment anxiety, but as a combination of both. Fearful/disorganized attachment representations, understood as a mixture of anxiety and avoidance strategies with associated features of dissociation and a breakdown of coping strategies (Ainsworth et al., 1971), are therefore largely consistent with the phenomenology of BPD. Clinical experience and a wealth of empirical data support the assertion that those with BPD often vacillate between viewing others as good, and oneself as emotionally close to them, and believing that others are antagonistic towards oneself and cannot be trusted (Beeney et al., 2017; Selby et al., 2008). This explains the phenomenon of chaotic and unstable interpersonal relationships and emotionality in those with BPD, as the "rollercoaster" of extreme distance and extreme closeness likely elicits relationship problems and highly-charged emotions.

Other phenotypic features of BPD are not as clearly aligned with instantiations of fearful/disorganized attachment but can be speculated on. For instance, fearful attachment is often characterized as a deep-seated desire for extreme closeness accompanied by a reticence to engage fully with close others. This may explain certain kinds of impulsive behaviors seen in patients with BPD who desire closeness without the possible implications of a deeper romantic relationship (e.g., risky sex; APA, 2013; Tull, Gratz, & Weiss, 2011; Bornovalova, Daughters, & Lejuez, 2010). Anger in BPD is difficult to pin down in terms of a specific BPD-attachment link but may not be a representation of attachment per se as much as it is a behavioral script that facilitates the presence of close others in times of perceived rejection (Sroufe & Waters, 1977). Previous work has differentiated between attachment as a construct and the lower-order behavioral scripts that maintain a particular attachment pattern (Main et al., 1985; Sroufe & Waters, 1977). Anger may not stem directly from the attachment construct itself but rather constitutes a commonly employed behavior by those with BPD to maintain the desired level of closeness with an intimate partner, particularly in an avoidantly-attached state. For instance, previous work has shown that partner support may actually buffer against feelings of anger when avoidant individuals are placed in a stressful context (Rholes, Simpson, & Oriña, 1999). It is possible that avoidantly attached individuals view anger as a more agreeable display of distress rather than openly seeking support from a partner, thereby making anger a function of receiving necessary support without compromising desired closeness. Finally, although chronic feelings of emptiness do not have an established relationship with attachment, they can potentially be conceptualized as the consequence of disorganized attachment. For instance, one can imagine that individuals who vacillate quickly between anxiety and avoidance may have greater difficulty establishing a stable and loving interpersonal relationships, leading to feelings of emptiness.

In sum, avoidance or anxiety examined in isolation do not explain the symptoms experienced by those with BPD traits *or* the pattern of results observed in the current study. Results from the current study suggest that the two attachment representations that have been operationalized as distinct (but correlated) in the extant literature may actually coexist and *vacillate* in the context of BPD. Thus, the broader conversation regarding attachment insecurity in BPD may best be served not by focusing on which dimension is most prominent, but instead on their interaction (American Psychiatric Association, 2013).

4.2. Developmental trajectories

A reasonable question raised by the current findings is whether BPD leads to the development of insecure romantic attachment or whether insecure attachment contributes to the development or maintenance of borderline pathology. Although the current meta-analysis does not have the data to test this question directly, a hypothesized model of attachment and its co-occurring development with BPD will be briefly presented.

First, it is important to note that attachment theory has, from the beginning, conceptualized the construct not as a set of discrete behaviors but as a flexible and pragmatic system for retaining the closeness of caregivers in infancy and close others in adulthood (Bowlby, 1969; Sroufe & Waters, 1977). Indeed, Rothbart and Ahadi (1994) posit that manifestations of psychopathology vary between and within developmental stages, but nonetheless indicate the same general tendencies. For instance, a child who hits their sibling in anger may use substances as an adult, but both of these behaviors are manifestations of disinhibition.

A simple but conceptually sound argument for the primacy of attachment in the later development of personality pathology may be explained via the following: a child's negative temperament (i.e., the developmental antecedent of personality) may itself be a developmental antecedent of BPD (Carlson, Egeland, & Sroufe, 2009; Rothbart

& Ahadi, 1994; Wlodarczyk & Lawn, 2017). This evokes a set of responses from a caregiver which, over time, create a pattern that forms an insecure attachment representation characterized by inconsistent and/or inappropriate response to distress (Ainsworth et al., 1971). This attachment representation is then rooted in experiences with a caregiver that may *also* be developmental antecedents of interpersonal deficits in BPD: vacillations in the relationship, extreme emotional responses, and frantic efforts to avoid caregiver separation (Wlodarczyk & Lawn, 2017). In essence, BPD may not be "caused" by attachment, but at least in childhood, the developmental antecedents of BPD may be indistinguishable from insecure attachment. It's likely that the evocative pattern of extreme parental responding and exacerbation will replicate similarly (although not exactly) in peer and romantic relationships throughout childhood and adolescence, further reinforcing the behavioral scripts and calcifying them into bona fide psychopathology in adulthood (Reich & Zanarini, 2001; Russell, Moskowitz, Zuroff, Sookman, & Paris, 2007; Stepp, Pilkonis, Yaggi, Morse, & Feske, 2009).

Results from previous literature examining attachment anxiety and avoidance separately belie the developmental and transactional elements of disorganized attachment in BPD presented above. Extending this hypothesized model into a fearful/disorganized framework, however, would suggest that inconsistent and chaotic representations of interpersonal relationships evoke reactions from others that may be equally inconsistent (Bell, 1968), and the reciprocal relationship between temperament, caregiver responses, and ensuing strategies for managing relationships with others proceed in this manner into adulthood.

4.3. Strengths & limitations

The current study is interpreted in the context of several notable strengths. First, the study operationalized attachment using a theoretically and empirically sound conceptualization of attachment insecurity (Ainsworth et al., 1971; Fraley et al., 2000; Hazan & Shaver, 1987; Ravitz, Maunder, Hunter, Sthankiya, & Lancee, 2010). A focus on the dimensions of anxiety and avoidance served two complimentary purposes for the current study. First, anxiety and avoidance were (and remain) the primary dimensions of insecurity (Ainsworth et al., 1971; Hazan & Shaver, 1987). Second, these dimensions were chosen because they are the predominant mode of measuring attachment in the literature and evince superior psychometric properties (Fraley et al., 2000; Ravitz et al., 2010). Another strength of the current study was the widespread availability of moderators for coding. This allowed for analyses to occur within a mixed-effects framework which resulted (in some cases) in the reduction of variability between effect sizes to a level explainable by sampling error alone (Lipsey & Wilson, 2001).

Despite these strengths, the current study also contains several limitations. First, the sample of studies was relatively small and some moderator categories were not available in sufficient amounts to allow for their own analysis. This could be improved in future studies by increasing the frequency with which authors report certain methodological and logistical details, if only in supplemental materials. Second, measurement issues complicated the analyses for the current study in significant ways. For instance, the BPD measure moderator category explained relatively large portions of heterogeneity between effect sizes, but there was no particular pattern for which measure produced the most consistent and strong relations with attachment insecurity. This is likely caused by larger issues in measuring personality pathology that have long been discussed in the literature (Hopwood, Kotov, Krueger, et al., 2018; Krueger, 2013; Krueger et al., 2014; Widiger, 2000). Although a growing literature is building around DSM-5 Section III measures (which conceptualize personality pathology on five maladaptive dimensions, with 25 lower-order facets), these measures have not been examined in relation to attachment at a rate high enough to allow for meta-analysis (Fossati et al., 2015). One of the specific measurement issues plaguing the conceptualization of PD is heterogeneity within categories of personality pathology (Widiger & Samuel, 2005). This heterogeneity is significant in the context of the current study because it leads to confusion regarding exactly which part of the larger BPD construct is driving the current effects. Measurement issues have also plagued the attachment literature, with a large proliferation of measures with oft-questionable psychometric properties (Ravitz et al., 2010; Crowell et al., 1995). Although the current study limited its focus to conceptualizations of attachment that are both empirically validated and theoretically sound regarding original attachment theories, this is a larger issue necessitating attention. Next, although a relatively feasible model for common etiological origins of attachment insecurity and BPD has been provided, the current study did not have the data to test it. Future work could seek to test parts of this model using longitudinal and/or observational data. Finally, although co-occurring forms of psychopathology are common in BPD, it was not the explicit focus of the current study. Therefore, since moderator analyses using co-occurring forms of psychopathology were not planned a priori, they were not conducted in the current study.

5. Conclusions

The current study sought to provide a quantitative summary of an oft-divided literature on attachment in Borderline Personality Disorder. Both dimensions of romantic attachment insecurity correlated with BPD symptoms, and these effects were moderated by mode of measurement and sample type. Due to its remarkable similarity to BPD phenomena, fearful/disorganized attachment was hypothesized to best explain the correlation between attachment insecurity and borderline pathology. Findings from our interaction analyses suggest that coexisting dimensions of attachment insecurity covary with BPD, confirming our expectations. Implications for the shared developmental etiology of BPD and attachment were considered, as well as the specific instantiations of disorganized/fearful attachment and how these may manifest behaviorally in an individual with BPD.

In sum, the present meta-analysis was initiated with a question regarding which dimension of attachment, if any, is most strongly associated with BPD. The answer borne out of the current study is, paradoxically, both and neither – all at once. The two dimensions coexist in BPD, but likely interact to produce behavioral, emotional, and cognitive manifestations that may indeed look very little like either of the dimensions examined in isolation.

Role of funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Contributors

Madison Smith designed and conducted the study, and wrote the initial manuscript. Susan South reviewed and edited the manuscript in collaboration with the first author. Both authors contributed to and have approved the final manuscript.

Declaration of Competing Interest

All authors declare that they have no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cpr.2019.101781.

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