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Attachment in individuals with eating disorders compared to community controls: A systematic review and meta-analysis.

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Attachment in individuals with eating disorders compared to community controls: A systematic review and meta-analysis.

Abstract

Objective: Individuals with eating disorders are known to have higher rates of insecure attachment compared to community controls, but the factors underlying this finding are poorly understood. We conducted the first meta-analysis comparing attachment in eating disorder samples compared to community controls that included quality assessment, publication bias and moderation analysis.

Method: We pre-registered our meta-analysis (CRD42019146799) and followed PRISMA guidelines. We searched PsychINFO, Embase, Medline, CINAHL and Scopus for publications. Attachment scores were extracted, and Cohen's *d* calculated for each study using a random effects model.

Results: In total, 35 studies were included in the meta-analysis and six studies were summarized in a narrative review. Eating disorder samples showed higher rates of insecure attachment compared to community controls, with a large effect size, across measurement methods and different attachment dimensions. Blinding of assessors moderated effect sizes for attachment interview studies, but no other moderators were significant.

Discussion: Risk of insecure attachment is elevated in individuals with eating disorders, albeit heterogeneity is high and largely unexplained. Clinicians may need to take this into account in their work, particularly given the association between attachment insecurity and challenges to therapeutic alliance. Future studies comparing eating disorder samples with community controls should control for general psychopathology.

Public significance: Attachment is a broad concept referring to a person's thoughts, feelings and behaviors in relation to close others. This systematic review and meta-analysis found that individuals with eating disorders are lower in attachment security than community controls, regardless of attachment construct or measurement approach. Attachment may be relevant in influencing eating disorder recovery, the development of therapeutic alliance, and potentially clinical outcomes, although more research is needed.

Introduction

Eating disorders (EDs) are associated with some of the highest levels of medical and social disability of any psychiatric disorder (Smink et al., 2014). Anorexia nervosa (AN) has the highest mortality rate among all psychiatric disorders (Arcelus et al., 2011), whilst bulimia nervosa (BN) and other eating disorders are associated with medical complications including cardiac, pulmonary and reproductive problems (Mehler & Rylander, 2015). Attachment theory (Bowlby, 1969; Ainsworth et al., 1978) in its original form proposes that caregiving experiences in early childhood lead to the development of lasting templates, or ‘internal working models’, that influence appraisals of self and other throughout the life-course. Attachment has been extensively researched in the ED field for several decades (see Tasca and Balfour, 2014) and may be of relevance for at least three reasons.

Firstly, attachment has long been conceptualized as a risk factor in the causation of eating disorders (e.g. Treasure & Schmidt, 2013), perhaps most influentially in the work of Hilde Bruch (1973), who emphasized the importance of non-synchronous early caregiving as a risk factor for anorexia nervosa. Evidence in support of the causal role of attachment in eating disorders is weak, and mainly takes the form of case-control studies reporting higher rates of insecure attachment in individuals with eating disorders compared with healthy controls (HC) (e.g. Barone & Guiducci, 2009). Such studies fail to demonstrate the causative role of attachment not only due to their cross-sectional design, but also since the attachment patterns have been shown to lack stability particularly at intervals of more than 15 years (Pinquart et al., 2013). Indeed, evidence linking attachment in the early years to later eating disorders is lacking, although a small body of research points to attachment insecurity in pre-adolescence as a risk factor for eating pathology in non-clinical adolescents (Jewell et al., 2016). A limitation of such studies is the failure to control for psychopathology: in a recent study of this type, Cortés-García et al. (2020) found the predictive role of attachment was non-significant after controlling for depression. Whilst evidence for a causative role for attachment is lacking, numerous theories have been proposed to explain the potential mechanisms by which insecure attachment might put individuals at risk for the development of eating disorders, such as maladaptive emotional regulation (see Faber, Dube & Knauper, 2017, for a review).

Secondly, attachment could be relevant to the course and outcome of psychological treatments of eating disorders. Close family members play a central role in several established eating disorder treatments, such as family therapy for adolescent eating disorders, and caregiver interventions for adults, as recommended in national guidelines such as NICE (2017). Thus, attachment security in patients and family members might moderate the effectiveness of treatment, or alternatively might represent a specific treatment target (Tasca & Balfour, 2014). Emerging evidence suggests that secure attachment predicts positive alliance in eating disorder treatment (Folke et al., 2016; Jewell et al., 2021). There have been few adequately-powered studies of attachment as a predictor of outcome in eating disorders: Jewell et al. (2021) reported null findings in relation to family therapy for adolescent AN, but Rossi et al. (2022) and Illing et al. (2010) both found attachment insecurity to predict higher ED psychopathology in adults with AN and BN receiving cognitive behaviour therapy and day-hospital group therapy respectively. Finally, attachment could be relevant to eating disorder recovery, even in the absence of psychological treatment, since social connection to close others is a consistent theme in qualitative studies of recovery (Bardone-Cone, Hunt, & Watson, 2018; Bohrer, Foye, & Jewell, 2020).

In summary, attachment has promise as a variable that may influence recovery trajectories and clinical outcomes. The concept of attachment has also been proposed as an etiological factor, although strong evidence in favor of this assertion is lacking. The focus of the present study is to investigate the extent to which individuals with eating disorders differ from community controls in their attachments. We contend that the findings of this review are of potential relevance to the issues of treatment adaptation and recovery trajectory, but not to the issue of etiology, for the reasons previously outlined. Additionally, as we explain below, a meta-analysis of case-control studies provides opportunities to investigate potential *moderators* of the relationship between attachment and EDs, thereby generating new insights and theory. However, before we can proceed any further, it is necessary to consider the fraught issue of measurement.

Measuring attachment

The measurement of attachment is complex: whilst there has been a proliferation of available measures, convergence between them is typically low, particularly when comparing self-report and observer-rated measures (Roisman et al., 2007). This has led researchers to question whether

existing measures are in fact tapping different concepts entirely, or perhaps tapping different dimensions of the same higher-order concept (Strauss et al., 2022). Whilst the extent to which attachment measures meaningfully relate to a unitary, over-arching attachment concept remains unresolved, attachment measures can be said to assess four broad higher-order concepts that have been extensively researched. *Attachment security rated by observers* based on tasks or interviews, such as the Adult Attachment Interview (AAI - George et al., 1985) assess unconscious or defensive processes activated by the assessment. By contrast, *attachment security measured by self-report* measures assess conscious appraisals relating to attachment-related thoughts and behaviors. Finally, *attachment avoidance* and *attachment anxiety*, both measured by self-report, derive from Brennan et al.'s (1998) factor analysis of attachment measures that identified these two underlying dimensions. The attachment avoidance construct refers to a tendency in individuals to minimize their own attachment needs and avoid close relationships with others; while attachment anxiety refers to high motivation to engage in close relationships and a fear of abandonment.

Reviews of attachment and eating disorders

Research into attachment in eating disorder populations has been pursued within both the self-report and interview traditions, and this work has been summarized in numerous narrative reviews (e.g. Ward, Ramsay, & Treasure, 2000; Zachrisson & Skårderud, 2010; Tasca & Balfour, 2014). An early focus in the literature was on whether different eating disorder diagnoses were associated with different attachment profiles. Whilst some individual studies have shown trends towards higher prevalence of attachment anxiety in bulimia nervosa and attachment avoidance in anorexia nervosa, reviews by Kuipers and Bekker (2012) and Tasca and Balfour (2014) concluded that there are no clear links between attachment profile and eating disorder diagnosis. Similarly, Jewell et al. (2016) in a systematic review into attachment and eating pathology in child and adolescent samples found self-reported attachment insecurity and eating pathology to be associated both cross-sectionally and prospectively, but found no association between attachment and specific eating disorder subgroups.

To our knowledge, three meta-analyses exist on the topic of eating disorders and attachment. A cross-sectional meta-analysis by Faber et al. (2017) found small but significant correlations in

the range of $r = 0.2$ between attachment and eating pathology, using mostly non-clinical samples. In their moderation analyses, larger effect sizes for both attachment anxiety and avoidance were found for clinical samples as compared with non-clinical ones, although no such effect was found for an overall dimension of security. A moderating effect was found for specific attachment figure, with slightly larger effect sizes found for avoidant relationships with parents ($r = 0.15$) and romantic partners ($r = 0.16$) than for close others ($r = 0.07$), but only for the relationship between attachment avoidance and unhealthy eating, and not for other forms of attachment insecurity.

The cross-sectional relationship between attachment and eating pathology was explored further by Cortes-Garcia et al. (2019), who examined mediators of this relationship. Various mediators emerged as significant, with emotional regulation and depressive symptoms each explaining around 70% of the variance in the relationship between attachment and eating pathology. Gender did not moderate effect sizes in this study. Lastly, Caglar-Nazali et al. (2014), examined a wide range of social and emotional processes in eating disorders compared to controls, including attachment. Their meta-analysis of attachment studies included only eight studies, all of which used self-report, with a pooled estimate of Cohen's d of 0.91 for greater attachment insecurity in ED samples. Attachment anxiety and avoidance were not estimated, whilst studies using the Adult Attachment Interview were synthesized in a narrative review. Quality assessment of studies was not conducted in their review, and moderators were not tested.

Rationale for this review

It is now well-established that attachment insecurity and eating pathology are cross-sectionally associated in eating disorder samples, that ED samples are substantially more likely to be insecure than community controls, and that attachment has some predictive validity in terms of treatment processes such as therapeutic alliance formation. Thus, insecure attachment represents a potentially relevant variable in terms of targeting or adapting treatment. However, findings around attachment and EDs may be influenced by sources of bias which need to be examined. Since Caglar-Nazali et al.'s (2014) seminal meta-analysis, the number of case-control studies has increased substantially, with studies assessing attachment under all four higher-order constructs discussed earlier. This calls both for an updated review and affords new opportunities for

analysis. To date, no meta-analysis comparing ED and HC samples has been conducted for attachment avoidance or anxiety assessed by self-report, or attachment security assessed by interview. Moreover, there is a need to understand potential moderators of the relationship between attachment and eating disorders, which have yet to be investigated in any meta-analysis.

Potential moderators of attachment insecurity in eating disorder samples

The cognitive interpersonal maintenance model (Schmidt and Treasure, 2006) suggests that insecure attachment, along with other interpersonal difficulties, could be maintaining factors for EDs, thereby hampering recovery. If true, it is possible that persons with EDs high on insecure attachment may be more likely to remain ill. Thus, the associated variables of age and duration of illness (Austin et al., 2020) might both moderate the magnitude of the effect size for attachment insecurity when comparing ED and HC samples, such that older patients, with longer duration of illness, display a larger ES. Indeed, the impact of an eating disorder on social functioning, and the social isolation and loneliness associated with severe and enduring forms of ED (Treasure et al., 2015), mean that insecure attachment might also be a consequence of eating pathology, with isolation from important others leading to increasingly insecure attachment representations. If this were true, one would expect reduced effect sizes in adolescent samples with a short duration of illness, as in the study by Wallis et al. (2018), which found no difference in attachment security between adolescents with AN and HCs.

Sampling method may also be a moderator, for similar reasons. Studies that recruit chronically unwell patients, e.g. through convenience sampling, may show larger effect sizes than studies using consecutive sampling. The quality of matching procedures could also be a significant moderator, with more closely matched samples displaying smaller effect sizes than samples matched only on variables such as age and gender. Finally, for interview studies, a lack of blinding procedures, whereby attachment coders are aware of the diagnostic status (ED or HC) of participants, represents another source of bias that might inflate effect sizes.

In the present review we chose not to test gender or attachment figure as moderator variables. With regards to the former, our study samples did not allow us to conduct a methodologically sound test of gender since they were overwhelmingly female, and data were not reported by gender. Regarding the latter, most measures do not yield separate ratings for different attachment

figures, instead providing classifications or scores that pertain to the four attachment constructs outlined previously. Moreover, the ability of attachment measures to discriminate between different attachment figures (such as romantic partners vs. ‘close others’) is unclear and requires greater evidence of construct validity. Aims

The primary aim of this study is to perform a systematic review and meta-analysis comparing attachment in individuals with ED versus HC, investigating overall effect size and publication bias in eight separate analyses as follows:

- Meta-analysis 1 - attachment security as measured by observer-rated measures.
- Meta-analysis 2 - attachment security as measured by self-report.
- Meta-analysis 3 - attachment avoidance in:
 - 3.1 eating disorders
 - 3.2 anorexia nervosa
 - 3.3 bulimia nervosa
- Meta-analysis 4 - attachment anxiety in:
 - 4.1 eating disorders
 - 4.2 anorexia nervosa
 - 4.3 bulimia nervosa

The second aim was to investigate the moderating role of age, sampling method and quality of controls. We hypothesized that higher age, and higher risk of bias in both sampling method and quality of controls would be associated with larger ES. Whilst we considered duration of illness to be a relevant variable, this was not included as a moderator due to lack of consistent reporting of this variable.

Methods

Our review was pre-registered in PROSPERO (CRD42019146799) and followed PRISMA guidelines (Page et al., 2021). The PRISMA checklist for the study is available in Appendix A.

Role of Funding Source

This study was supported through funded research time via a National Institute of Health and Social Care Research (NIHR) Development and Skills Enhancement Award NIHR302102. The funder played no role in any aspect of the study, including the decision to conduct this review.

Search strategy:

We searched for studies in Embase, PsycINFO, Medline, SCOPUS, CINAHL, ProQuest Dissertations and Theses, PsyArxiv and Google Scholar without date restrictions, utilizing a search strategy combining free-text and index terms for eating disorders and attachment. Initial searches were run in May 2019, January 2021, March and September 2022. The final search was conducted on the 11th of November 2022 and is reported in Figure 1, with the search strategy for each database reported in Appendix B.

Screening process:

Studies were imported into Covidence, and all references were screened independently by TJ and KS, with disagreements resolved in consultation with EA. Figure 1 details our PRISMA flowchart with reasons for exclusion at each stage. The reference lists of included studies were manually searched for additional studies meeting inclusion criteria.

Eligibility criteria:

Studies were included if they: a) included an HC group and a clinical ED group, with clinical status confirmed either by a diagnosis made by clinicians working in ED services with reference to specific diagnostic criteria published in either the Diagnostic and Statistical Manual (DSM) or the International Classification of Diseases (ICD) manuals, or by use of published clinical cut-off scores for validated measures of eating pathology, and; b) used a measure of attachment. All measures with a basis in attachment theory were eligible. Studies using the Parental Bonding Instrument (Parker, 1989) or studies of infantile anorexia were excluded. We excluded studies of infantile anorexia since this diagnosis has never been included in either DSM or ICD; and excluded studies using the Parental Bonding Instrument because this measure is not conceptually derived from attachment theory.

Data extraction

For meta-analysis, we extracted mean and standard deviation scores for attachment security, avoidance or anxiety (as relevant) along with sample sizes, for ED and HC groups. For studies reporting attachment by category, such as AAI studies, we extracted the number of participants categorized as secure and insecure for the ED and HC group. Data extraction was conducted in pairs involving TJ, KS, EA, KT-W and SL.

Relevant data were extracted and assigned to the relevant meta-analysis as outlined in the Aims section. A study could contribute data to more than one meta-analysis; for instance, studies reporting measures that assessed both attachment avoidance and anxiety would contribute data to two meta-analyses. Studies utilizing measures that could not be categorized under the four higher order attachment categories used in this study were excluded from meta-analysis but reported under a narrative synthesis. Studies using the Inventory of Parent and Peer Attachment (IPPA - Armsden & Greenberg, 1987) and Attachment Style Questionnaire (ASQ - Feeney et al., 1994) required additional steps to combine means and SDs across subscales, utilizing formulae recommended by Higgins et al. (2022), described in Appendix C.

Risk of bias

We adapted the critical appraisal tool by Fowkes & Fulton (1991), and assessed risk of bias for the following criteria: sampling method (rated as low/moderate/high), quality of controls (rated as low/moderate/high), quality of measures (rated as low/high), and the use of blinding (rated as low/high), as detailed in Appendix D. The quality assessment was performed by three independent researchers. All papers were assessed by at least two researchers (EA, KS, SL, KT-W) and all were assessed by TJ.

Data analysis

Statistical analysis was performed with R version 3.6.0, using the *metafor* package. For dimensional data, Cohen's formula was used. For categorical data, the log odds ratios were calculated and transformed into Cohen's d using the method defined by Hasselblad & Hedges (1995). Effect sizes using Cohen's d can be interpreted as small, medium and large using the values of $d=.2$, $d=.5$ and $d=.8$ respectively (Cohen, 1992). Separate analyses were run for all

eating disorder samples for the four higher order attachment constructs described earlier. Code used for the analysis is available in Appendix E.

For the above calculations, the random effects model was used, as this assumes that the observed estimates of treatment effect can vary across studies because of real differences in the treatment effect in each study as well as sampling variability (Riley, Higgins, & Deeks, 2011).

Heterogeneity between studies (the variation in study outcomes between studies), was examined using *Cochran's Q* test and I^2 . *Cochran's Q* tests the null hypothesis that all studies are evaluating the same effect; a threshold of .1 is recommended in interpreting the *p* value, such that *p* values below this value indicate heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003). I^2 measures the percentage of variability in treatment effect estimates that is due to between study heterogeneity rather than chance (Higgins, Thompson, Deeks, & Altman, 2003). An I^2 value of ~25% was interpreted as low, ~50% as moderate, and ~75% as high (Higgins, Thompson, Deeks, & Altman, 2003).

Publication bias was assessed using Egger's test and the trim and fill method (Duval & Tweedie, 2000) to impute any missing studies and estimate their effect. Meta-regression analyses were conducted for each meta-analysis to examine the possible moderating role of age, sampling method, quality of controls and blinding of outcome assessors in interview studies. Duration of illness was not included as a moderator since our preliminary searches revealed that it was reported in too few studies.

Studies that met our inclusion criteria but were not suitable for meta-analysis, due to the measure not clearly aligning with our four higher order attachment constructs, or other methodological issues, were reported in a narrative synthesis.

Results

Study selection

Our final database search identified 2183 studies, of which 956 were duplicates and were removed. TJ, KS and EA independently screened 1227 studies using title and abstract. From these, the full text was reviewed for 69 studies, out of which 28 studies were excluded, resulting

in 41 studies being included. References of included studies are presented in Appendix F. References of studies excluded at full-text screening stage are presented in Appendix G.

Studies typically used clinical samples drawn from services and assessed by clinicians, with just three studies utilizing cut-off scores applied to community samples to identify cases. The most common sample by diagnosis was AN, with 19/41 studies reporting AN data separately, whilst 15/41 reported findings for mixed eating disorder samples, which often contained individuals with AN. Eight studies reported separate data on BN samples, three studies reported data on binge eating disorder (BED) samples, whilst one study (Pace et al., 2022) identified a clinically significant binge eating group. No studies were identified for other eating disorder diagnoses. Studies mainly used self-report measures to assess attachment, with only eleven studies using interview measures. Participants were predominantly white and female, with many studies excluding male participants. Socio-economic status (SES) was not reported in 16 studies, and across the remaining studies it was reported in inconsistent ways, most typically by years of education or employment status (or the same variables reported for parents), although some reported composite measures of SES. This inconsistent reporting makes synthesis of SES challenging, but broadly speaking samples tended to be biased towards those of higher SES, such as those with university education. Studies were exclusively conducted in Western countries. Duration of illness was only reported in 17/41 studies.

Risk of bias

Our ratings for risk of bias are presented in Appendix H. For sampling, 4/41 studies were rated as low risk of bias, 17/41 as moderate risk, and 20/41 as high. Typically, sample sizes were smaller than 64 in each group. Consecutive sampling of clinical samples was rare, and no community samples were recruited from population studies employing random sampling methods. For the control group, there was a spread of quality, with 18/41 at low risk of bias, 7/41 rated moderate, and 16/41 rated as high risk of bias. In general studies did not match ED and HC samples on many variables, with none matching for psychopathology. For measures, the majority of studies utilized measures with reasonable psychometric support, with only 8/41 receiving a high risk of bias rating, and the others receiving a low risk of bias. Of the eleven studies using interview measures, seven received a low risk of bias, and four received a high risk of bias.

Data availability

The data used for the meta-analyses is publicly available in Appendix I, available as Excel files at <https://osf.io/pfhgu/> (Jewell, 2022).

Narrative synthesis:

Six studies could not be included in the meta-analysis due to non-standard reporting of results, or issues pertaining to measurement or methodology. Broberg, Hjalms & Nevoven (2001) compared attachment in ED and HC groups utilizing a Swedish version of the Relationship Questionnaire (Bartholomew and Horowitz, 1991). Since the assignment to secure or insecure status was based on a cluster analysis of the dataset, without evidence of convergent validity with other attachment measures, the study was not included in the meta-analysis. Batista et al. (2018) used the ECR-R (Fraley, Waller & Brennan, 2000) but presented a total score rather than the standard attachment avoidance and anxiety sub-scales, thereby precluding its use in the meta-analysis. We excluded three studies due to concerns about measures. Kenny & Hart (1992) and Datta et al. (2021) both used measures that lacked evidence of convergent validity data with another attachment measure. Sommer et al. (2021) used a German version of the Relationship Styles Questionnaire (Griffin & Bartholomew, 1994), a measure which yields scales that do not map clearly onto our four higher-order attachment constructs, and is known to have poor psychometric properties (Justo-Núñez et al., 2022). Finally, we excluded Lehoux & Howe's (2007) study comparing women with BN with their sisters as a control group from the meta-analysis, since it differed in methodology to all other studies.

Broadly speaking, all studies found significantly higher rates of insecure attachment in the ED samples as compared with HC groups, although there were some non-significant findings. Datta et al. (2021) found their AN group showed no differences on four out of nine subscales, whilst Sommer et al. (2021) found their sample with BED and obesity to have elevated insecurity scores compared to both obese and non-obese HC group on two out of four scales, elevated scores compared to non-obese HC for one scale, with no difference between groups for one scale (see Table 1 for details). Finally, Lehoux & Howe (2007) found their BN sample to have elevated rates of insecure attachment to fathers, but not mothers, in comparison to their sisters.

Meta-analysis 1: Attachment security assessed by interview

Eleven studies investigated attachment utilizing interview measures of attachment (see Figure 2, Panel A). ED samples were significantly less secure than HC samples, with a pooled effect-size of $d = 1.02$ (95% CI: .72 to 1.32, $p < .001$). Heterogeneity was significant and moderate ($Q = 18.91$, $p = 0.04$; $I^2 = 48.24\%$). Egger's regression test showed significant funnel plot asymmetry ($z = 3.58$, $p < .001$). The trim and fill method led to three studies being imputed (see supplementary figure S1, Panel A). With the addition of these studies to the model, the total effect size was estimated at $d = .91$ (95% CI = .64 to 1.19).

Meta-analysis 2: Attachment security assessed by self-report

Sixteen studies investigated attachment utilizing self-report measures of attachment (see Figure 2, Panel B). ED samples were again significantly less secure than HC samples, with a pooled effect-size of $d = .88$ (95% CI: .62 to 1.14, $p < .001$). Heterogeneity was significant and high ($Q = 96.06$, $p < .001$; $I^2 = 84.93\%$). Egger's regression test did not show significant funnel plot asymmetry ($z = .65$, $p = .52$), and the trim and fill method led to no studies being imputed (see supplementary figure S1, Panel B).

Meta-analysis 3.1: Attachment avoidance assessed by self-report in eating disorder samples

Sixteen studies investigated attachment avoidance using self-report measures (see Figure 3, Panel A). ED samples were significantly higher than HC in attachment avoidance, with a pooled effect size of $d = .87$ (95% CI: .69 to 1.06, $p < .001$). Heterogeneity was significant and high ($Q = 66.16$, $p < .001$; $I^2 = 77.58\%$). Egger's regression test showed significant funnel plot asymmetry ($z = 2.85$, $p = .004$). The trim and fill method led to two studies being imputed (see supplementary figure S1, Panel C) and an adjusted pooled effect size of $d = .81$ (95% CI: .61 to 1.00, $p < .001$).

Meta-analysis 3.2: Attachment avoidance assessed by self-report in anorexia nervosa samples

Twelve studies investigated attachment avoidance in AN (see Figure 4, Panel A). Individuals with AN were significantly higher than HC in attachment avoidance, with a pooled effect size of $d = .90$ (95% CI: .70 to 1.09, $p < .001$). Heterogeneity was significant and moderate-high ($Q = 28.29$, $p = .003$; $I^2 = 62.75\%$). Egger's regression test was not significant ($z = 1.75$, $p = .080$) and

no missing studies were imputed using the trim and fill method (see supplementary figure S2, Panel A).

Meta-analysis 3.3: Attachment avoidance assessed by self-report in bulimia nervosa samples

Eight studies investigated attachment avoidance in BN (see Figure 4, Panel B). Individuals with BN were significantly higher than HC in attachment avoidance, with a pooled effect size of $d = .86$ (95% CI: .62 to 1.10, $p < .001$). Heterogeneity was significant and moderate-high ($Q = 17.05$, $p = .017$; $I^2 = 62.36\%$). Egger's regression test showed significant funnel plot asymmetry ($z = 2.02$, $p = .043$). The trim and fill method led to two studies being imputed (see supplementary figure S2, Panel B) and an adjusted pooled effect size of $d = .74$ (95% CI: .45 to 1.02, $p < .001$).

Meta-analysis 4.1: Attachment anxiety assessed by self-report in eating disorder samples

Sixteen studies investigated attachment anxiety using self-report measures (see Figure 3, Panel B). ED samples were significantly higher than HC in attachment anxiety, with a pooled effect size of $d = .95$ (95% CI: .76 to 1.13, $p < .001$). Heterogeneity was significant and high ($Q = 64.95$, $p < .001$; $I^2 = 76.37\%$). Egger's regression test showed significant funnel plot asymmetry ($z = 3.00$, $p = .003$). The trim and fill method led to three studies being imputed (see supplementary figure S1, Panel D) and an adjusted pooled effect size of $d = .83$ (95% CI: .61 to 1.04, $p < .001$).

Meta-analysis 4.2: Attachment anxiety assessed by self-report in anorexia nervosa samples

Twelve studies investigated attachment anxiety in AN (see Figure 5, Panel A). Individuals with AN were significantly higher than HC in attachment anxiety, with a pooled effect size of $d = 1.07$ (95% CI: .87 to 1.27, $p < .001$). Heterogeneity was significant and moderate-high ($Q = 32.89$, $p < .001$; $I^2 = 64.77\%$). Egger's regression test was not significant ($z = 1.75$, $p = .081$) and no missing studies were imputed using the trim and fill method (see supplementary figure S2, Panel C).

Meta-analysis 4.3: Attachment anxiety assessed by self-report in bulimia nervosa samples

Eight studies investigated attachment anxiety in BN (see Figure 5, Panel B). Individuals with BN were significantly higher than HC in attachment anxiety, with a pooled effect size of $d = 1.02$ (95% CI: .82 to 1.22, $p < .001$). Heterogeneity was non-significant and moderate ($Q = 11.89$, $p =$

.104; $I^2 = 41.57\%$). Egger's regression test was not significant ($z = .98, p = .327$). The trim and fill method led to one study being imputed (see supplementary figure S2, Panel D) and an adjusted pooled effect size of $d = .98$ (95% CI: .79 to 1.18, $p < .001$).

Moderator analysis

For attachment security assessed by interview, blinding of assessors to the diagnostic status of participants was a significant moderator accounting for 100% of heterogeneity ($\tau^2 = 0.000$, SE = 0.0477; test for residual heterogeneity: $QE(df = 9) = 9.2232, p = 0.417$; test of moderators: $QM(df = 1) = 9.686, p = 0.002$). No moderating effect was found for age, sampling or control group quality for any of the eight meta-regression analyses conducted.

Discussion

Our eight meta-analyses found higher rates of attachment insecurity in ED samples, of large effect size, across all four higher-order attachment constructs (attachment security, avoidance and anxiety as measured by self-report; attachment security as measured by interview).

Publication bias as assessed by the trim and fill method was present in five out of eight analyses; our adjusted estimates taking publication bias resulted in small reductions in effect size of around $d = .1$. Our results are in line with Caglar-Nazali et al.'s (2014) earlier findings, but we were able to provide separate analyses of different attachment constructs and to investigate the role of potential moderators. Contrary to hypotheses, none of the putative moderators except for blinding had a significant effect on the outcome. In terms of control group matching and sampling, the lack of a moderating effect for either variable can be seen as reassuring that the finding of higher attachment insecurity in ED samples as compared with HC is not an artefact of biased research methodology.

Our findings suggest that across the four attachment constructs examined there is moderate-to-high heterogeneity, which in the case of attachment security measured by interview was accounted for entirely by blinding of assessors. Whilst we had anticipated larger effect sizes in studies that did not report blinding procedures, we actually found some of our lowest estimates of effect size in such studies, two of which reported on binge eating samples (Maxwell et al., (2017) with $d = 0.38$, and Pace et al., (2022), with $d = 0.65$). This suggests that our finding of a moderating effect through blinding for interview studies may be confounded by diagnosis.

Moreover, heterogeneity was not explained by any of our putative moderators for self-report measures. Caution is therefore warranted in interpreting our reported effect sizes. Bryan et al. (2021) have argued that attentiveness to sources of heterogeneity should be a research priority. In this discussion, we highlight how our findings can be used to inform theory and research that might help to account for the considerable heterogeneity that exists in attachment and ED research.

The lack of a moderating effect for age in our analyses suggests that the association between attachment insecurity and eating disorders may not be affected by developmental changes across the lifespan, or by the ‘scarring’ effects of eating disorders on psychosocial functioning. Our review leads us to an alternative hypothesis, which is that ED samples who are unwell at the time of assessment may be likely to report high levels of attachment insecurity *at any age*, since psychopathology such as depression may influence attachment representations to a considerable degree. Evidence in support of this view comes from several sources. Firstly, Cortes-Garcia et al.’s (2019) meta-analysis found depressive symptoms and maladaptive emotion regulation to mediate the relationship between insecure attachment and eating disorder symptoms, with a large effect size. Secondly, four studies in the present review also included psychiatric samples in addition to HC groups (Evans & Wertheim, 2005; Fonagy et al., 1996; Gander et al., 2018; Orzolek-Kronner, 2002). Whilst we only extracted data from HC groups for the meta-analyses, it is striking that all but one of these studies found no differences in attachment between ED and psychiatric controls. The exception to this was the AAI study by Fonagy et al. (1996), who found no differences in terms of attachment categories but found two differences on continuous subscales of the AAI: relative to depression, anxiety and substance abuse groups, ED participants had higher scores for idealization of parents, and lower scores for reflective self. Finally, the one study that included a recovered ED group found no differences between the recovered ED sample and the HC group (Datta et al., 2021).

Thus, the weight of evidence favors the hypothesis that attachment insecurity is closely associated with concurrent psychopathology. Rather than conceptualize this in terms of a single disorder, such as depression, we consider it more compelling to think of this issue in terms of a general factor of psychopathology, or p factor (see Caspi & Moffitt (2018) for a review). Since researchers utilizing case-control designs have not controlled for general psychopathology in

their comparisons of ED and HC samples, it is currently unclear whether our findings of greater attachment insecurity (in all its forms) in ED samples is specific to this disorder or reflects insecure attachment being a transdiagnostic risk factor.

One further methodological weakness of the included studies is the lack of consideration of autism spectrum conditions (ASC). Rates of ASC are raised in ED samples, particularly in AN, with estimates of 20-37% of AN patients scoring above threshold for an ASC (Westwood & Tchanturia, 2017). Unfortunately, attachment measures have been developed using neurotypical populations, and their use in individuals with ASC, whether using interview or self-report, is problematic (Davis & Kramer, 2021) and could lead to inflated estimates of attachment insecurity in ED samples. Relatedly, whilst the attachment measures used by studies in this review were generally rated as having a low risk of bias, it should be noted that more in-depth reviews of the psychometric properties of attachment measures have identified multiple gaps in evidence for the adequacy of such properties (Jewell et al., 2019; Justo-Núñez et al., 2022). It is notable that no studies in the review assessed attachment beyond the individual's own account via interview or self-report. Measures incorporating observer-rated assessment of family or dyadic functioning (e.g. (Obsuth et al., 2014) have yet to be researched in ED samples and might tap important aspects of attachment not assessed by more standard methods.

Research implications

Our study suggests several avenues for future research. Firstly, future case-control studies comparing ED and HC groups must be adequately powered and also control for variables including duration of illness, ASC and psychopathology, such as depressive symptoms and emotional regulation (Cortes-Garcia et al., 2019). To investigate the association between attachment and the p factor, future research is required using diverse clinical samples encompassing a range of diagnostic categories. Whilst best practice in the measurement of p has yet to be established, researchers should include both broad measures of psychopathology and measures of (impaired) functioning (Smith et al., 2020). The measurement invariance of attachment measures in ED samples requires investigation, as does the role of ASC on the measurement of attachment in such samples. Qualitative research, including with individuals with ASC, is indicated to understand how attachment measures are understood in ED populations. Our review found a lack of diversity in population samples, meaning that little or

nothing is known about attachment and EDs in males, sexual and gender minorities, those of lower SES, diverse ethnicities, or non-Western populations. Future studies should sample these under-studied groups and include more thorough reporting of demographic variables, including SES, duration of illness, ethnicity, gender and sexual minority status, and presence of ASC. Research with BED samples should be prioritized as this population has been under-studied.

Studies utilizing observational methods for in-vivo assessment of parent-adolescent interaction are needed, particularly for adolescents, given the central role played by parents in family therapy of EDs. Longitudinal studies assessing attachment across multiple time points are needed to elucidate whether and how attachment might change over time, and whether such changes precede, or are merely correlated, with changes in psychopathology including eating disorder symptomology.

Further research is also required to investigate the predictive value of attachment in terms of treatment outcomes, and the mechanisms that might underlie this. Understanding how attachment might inform patient preferences for treatment such as choice of modality, would be a beneficial step, again requiring qualitative research to help build a theoretical model that can be of use to clinical practice. Finally, the involvement of individuals with lived experience in aspects such as research design or interpretation are strikingly absent in the attachment and ED field. Future studies must address this through meaningful collaboration with experts by experience.

Clinical Implications:

Our findings suggest that individuals with EDs at any age are highly likely to experience raised levels of attachment insecurity, which could impact on the development of therapeutic alliance (Folke, Daniel, Poulsen & Lunn, 2016). Understanding insecure attachment patterns in the therapeutic context could help clinicians to identify, or even anticipate, therapeutic ruptures, and seek to proactively repair these. In addition, it is possible that attachment may be a worthwhile treatment target. For instance, helping patients to understand their own attachment histories, and their current ways of responding to distress in close relationships, could play a helpful role, and would be consistent with evidence-based models such as Focal Psychodynamic Therapy (Zipfel et al., 2014). Our analysis of attachment avoidance and anxiety in AN and BN suggests that, at group level, both groups have a similar profile, with slightly larger effect sizes in both groups for

attachment anxiety. This confirms the need to avoid preconceptions about attachment style and diagnosis. In treatment settings, considering attachment as a factor in formulation and choice of treatment may be indicated, although research is needed to provide stronger evidence for the role of attachment in treatment selection.

Limitations:

This study has some limitations which should be borne in mind when interpreting our results. Firstly, our estimates for attachment insecurity may be inflated or inaccurate due to the multiple methodological weaknesses outlined in this discussion. Of particular note, the majority of individual studies in the meta-analysis are under-powered, thereby reducing confidence in the pooled effect sizes obtained in our meta-analyses (Hedges & Pigott, 2001). Secondly, the high degree of between-study heterogeneity means that our estimated effect sizes when adjusting for publication bias should be interpreted cautiously (Higgins et al., 2022). Thirdly, our meta-analysis of attachment security using interviews collapsed all insecure attachment categories into a single category, resulting in a loss of nuance in terms of types of insecurity. Furthermore, we could not examine duration of illness as a moderator, due to inconsistent reporting of this variable. Additionally, there is a lack of studies examining eating disorder diagnoses other than AN and BN. Participants in our included studies were predominantly white, female, of higher SES and exclusively recruited within Western countries, thereby limiting the external validity of our findings.

Conclusion:

This study extends previous findings showing elevated rates of insecure attachment in individuals with EDs compared to HCs, through eight meta-analyses of four higher order attachment constructs, and a novel analysis of moderating factors. ED samples were found to be significantly less secure than controls across all meta-analyses, with effect sizes of large magnitude. Publication bias was found to be present in five out of eight analyses, leading to small decreases in effect size. We found no moderating effect for age, sampling method or quality of community controls. Clinicians should be mindful of the potential for higher attachment insecurity in their clients, which could have a bearing on the formation of therapeutic alliance. More research is needed to determine if attachment represents a worthwhile treatment target or could be utilized to personalize treatment. Future studies need to control for

psychopathology, investigate the measurement invariance of attachment instruments in ED samples and include measurement and matching for ASC.

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