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The relationship between attachment insecurity and experiences on the paranoia continuum: a meta-analysis

Attachment and the Paranoia Continuum

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Abstract Word Count 228

Text Body Word Count 5380

This article was written for the British Journal of Clinical Psychology

Abstract

Objectives Attachment has long been theorised to play a key role in the development of paranoia. Associations between both constructs have been reported over the last decade, but have ranged widely in magnitude to date. The present study is the first publication to synthesise existing literature and provide a meta-analytic estimate of the attachment-paranoia relationship. **Methods** A systematic search of studies available up to January 2019 was conducted using EMBASE, MEDLINE, CINAHL, PsycINFO, OpenGrey and ProQuest Dissertations & Theses Global. This yielded 26 studies which met inclusion criteria (N=10,539; mean age range 16-47; 45% male). Data were analysed using random effects models with restricted maximum likelihood variance estimator. Age and sex were examined as moderators in meta-regressions. **Results** Paranoia was significantly associated with attachment anxiety (r = .38; 95% CI: 0.32, 0.44; $p < .0001$; I^2 = 88%; k = 26) and attachment avoidance (r = .24; 95% CI: 0.18, 0.29; $p < .0001$; I^2 = 79%; k = 26).   The strength of these associations did not differ between clinical and non-clinical participant samples. Neither age nor sex moderated identified relationships. **Conclusions** There is a moderate association between both constructs of interest. These findings suggest that attachment insecurity may be an active agent in the etiology and/or maintenance of experiences on the paranoia continuum. Implications for psychological treatment, e.g. consideration of attachment status in formulations, are briefly discussed. **Keywords** Attachment, Paranoia, Psychosis, Meta-Analysis

Practitioner Points

- Paranoia is associated with both attachment anxiety and attachment avoidance
- These associations are of similar strength for people with and without psychosis
- Attachment may contribute to the development and/or maintenance of paranoia
- It may be helpful to consider attachment in psychological therapies for psychosis

1. Introduction

1.1 Paranoia Conceptualisation

Paranoia is defined by concerns about being vulnerable to the malevolent intent of others. It is characteristically underpinned by interpersonal themes, but can vary widely in specific content, from thoughts of being laughed at by others to thoughts of being the target of a conspiracy (Freeman & Garety, 2014). Paranoia is understood to occur on a continuum, extending from experiences which are common to experiences which are clinical (Strauss, 1969). First proposed by Strauss, this conceptualisation stands in contrast to earlier views of paranoia as a discrete phenomenon, i.e. one which is either present or absent. With improving precision of measurement, recent studies have been able to identify that nearly 30% of individuals in the general population experience elevated levels of paranoia (Freeman et al., 2019). While these can be precipitated by stressors, such experiences are typically transitory and not associated with mental health difficulties (Ellett, Kingston, & Chadwick, 2018; van Os, Hanssen, Bijl, & Ravelli, 2000). However, more persistent paranoia has also been found to raise the risk for psychosis and can predict transition to diagnoses over time (Poulton et al., 2000; Wilcox et al., 2014). Paranoia is indeed one of the most prevalent symptoms of psychosis and can be identified in over 70% of first episodes (Coid et al., 2013). Factors which contribute to its development are still not well understood however.

1.2 Attachment Theory Framework

In recent years, attachment theory has provided a lens through which the etiology of paranoia can be considered. Attachment theory proposes that early experiences with caregivers shape how we operate in interpersonal contexts throughout the lifespan, i.e. we develop implicit templates for how we perceive, form expectations of, and behave towards others (Fraley & Shaver, 2000; Mikulincer & Shaver, 2007). If stressors impinge on the quality these and lead to circumstances in which our needs cannot be met consistently, attachment insecurity is more likely to develop. Forms of attachment insecurity can be found in about 40% of the general population, but are twice as prevalent in individuals with mental health difficulties, including psychosis (Bakermans-Kranenburg & van Ijzendoorn, 2009; Carr, Hardy, & Fornells-Ambrojo, 2018). Attachment insecurity is thought to manifest on two dimensions in adulthood, i.e. attachment anxiety and attachment avoidance. As these are conceptualised as orthogonal to each other, individuals would fall somewhere along both.

1.3 Attachment Insecurity

Attachment anxiety is characterised by worry about relationships. Individuals at the high end of this dimension tend to be concerned about others' perceptions of them and fear being rejected (Campbell & Marshall, 2011; Mikulincer & Shaver, 2003). Attachment avoidance is characterised by withdrawal from relationships. Individuals at the high end of this dimension tend to be uncomfortable with closeness and seek independence from others (Mikulincer & Shaver, 2003; Mikulincer & Shaver, 2012). In both cases, caregivers have likely been experienced as unreliable, most typically in

times of need (Berry, Danquah, & Wallin, 2013). Carried into adulthood, this fosters a sense of being unsure of others and compromises the ability to develop trust (Bentall & Fernyhough, 2008; Larose & Bernier, 2001; Mikulincer, 1995). Not surprisingly, individuals with these attachment patterns can be more likely to interpret interactions with others negatively and anticipate a degree of threat in these (e.g. Bentall et al., 2009; Freeman et al., 2013). Research suggests that this may present one possible mechanism through which paranoia is fostered and later maintained (Read & Gumley, 2010).

1.4 Mixed Evidence of Associations

The relationship between attachment insecurity and paranoia has been a topic of interest since the publication of the first review (Berry, Barrowclough, & Wearden 2007). Over the last decade, a growing number of studies have investigated associations between both constructs in different samples, e.g. comprised of the general population (Meins, Jones, Fernyhough, Hurndall, & Koronis 2008), individuals meeting Ultra High Risk criteria for psychosis (Russo et al., 2018), and those with established psychosis diagnoses (Strand, Goulding, & Tidefors, 2015). Across these, paranoia has been found to be correlated with both attachment anxiety and attachment avoidance. The strength of identified associations has varied considerably so far however, ranging from small ($r = 0.08$; Pearce et al., 2017) to large ($r = 0.61$; Darrell-Berry et al., 2017). Such variability is likely attributable to some study-level differences, e.g. in sample sizes and used measures. To date, this has unfortunately prevented clear conclusions about the degree to which attachment insecurity and paranoia are associated.

1.5 Aims of Meta-Analysis

A recent meta-analysis identified a small relationship between attachment insecurity and positive psychotic symptoms; these were combined in a group category and derived from a sample of 11 studies (Carr et al., 2018). The present meta-analysis aimed to expand on this by specifically estimating the association between attachment insecurity and paranoia across the continuum. In doing so, the following key questions were posed: **(1)** What is the strength of the association between attachment anxiety and paranoia? **(2)** What is the strength of the association between attachment avoidance and paranoia? **(3)** Does the strength of these associations differ between clinical and non-clinical samples? Research has also highlighted evidence of differences in the expression of paranoia, e.g. large scale population surveys have identified that paranoia is more prevalent in men than women, with a tendency towards younger age at first onset as well as higher severity (Freeman et al., 2011; Johns et al., 2004). In view of these findings, it seemed appropriate to consider the possible influence of such variables and address the following as the final question in this meta-analysis: **(4)** Is the strength of the above associations moderated by demographic variables, specifically sex and age?

2. Methodology

2.1 Protocol Registration

In line with Preferred Reporting Items for Systematic Reviews and Meta-Analyses, the protocol for this meta-analysis was registered before any review processes were carried out (PRISMA; Moher, Liberati, Tetzlaff, & Altman, 2009). It was published on PROSPERO (registration number CRD42018112607) in November 2018. The protocol was not amended following preregistration.

2.2 Search Strategy

A database search of studies published before January 2019 was conducted by one reviewer using EMBASE, MEDLINE, CINAHL and PsycINFO. Unpublished literature was searched for using OpenGrey and ProQuest Dissertations & Theses Global. To perform electronic searches with high sensitivity, variations of the following keywords were used in a two-component search strategy- (attachment AND (psychosis OR schizophrenia OR paranoia OR delusion OR schizotypy)). To identify studies which may have been missed, references in reviews covering related areas were also examined. After removal of duplicates, studies were screened by title and abstract to exclude clearly irrelevant reports. To reduce the risk of relevant studies being missed, screening was intentionally over-inclusive at this stage. The remaining studies were examined by full text to determine compliance with eligibility criteria. Where required, authors were contacted to provide additional information to resolve ambiguity, e.g. in cases where both attachment and paranoia were assessed, but associations not reported. Despite taking particular care to conduct above processes as reliably as possible, we acknowledge that relying on a single reviewer constitutes a limitation.

2.3 Eligibility Criteria

Studies were included in the meta-analysis if they (1) assessed both paranoia and attachment using validated measures; (2) provided information on correlations between measures of paranoia and attachment, either within the paper or via correspondence; and (3) were written in English or German.

There were no exclusion criteria regarding study design. For studies examining interventions or using experimental procedures, only baseline data were considered. Studies were excluded if more than one third of the sample comprised participants with neurodevelopmental disorders or psychosis identified as secondary to other presentations, e.g. substance abuse or neurodegenerative conditions.

Included studies were categorised as comprising clinical samples if participants were described as having an At Risk Mental State, meeting Ultra-High-Risk criteria, experiencing first episode psychosis, holding another diagnosis of psychosis, or presenting with other diagnoses of mental health difficulties. Included studies were categorised as comprising non-clinical samples if participants were described as healthy volunteers or recruited from the general population.

2.4 Data Extraction

Due to resource restrictions, data extraction was performed by one reviewer using an electronic data collection form. As this approach may be associated with methodological concerns, data extraction was duplicated and checked for errors. Where any ambiguity was encountered, discussions were held between RM and KG. Information on the following variables was extracted for each included study: **(a)** Setting by Country; **(b)** Sample Mean Age; **(c)** Sample Size; **(d)** % Sample Male; **(e)** Sample Type; **(f)** Paranoia Measure; **(g)** Attachment Measure; and **(h)** effect size. For studies reporting on more than one participant sample, information was extracted for each cohort.

2.5 Risk of Bias Assessment

The risk of bias across studies was assessed with a tailored adaptation of the Agency for Healthcare Research and Quality tool (AHRQ, available in Appendix 1; Williams, Plassman, Burke, Holsinger, & Benjamin, 2010). In adapting the AHRQ, we selected methodological domains most likely to influence estimates of the attachment-paranoia relationship at study level. These are presented in Table 3. Each study received a grading and corresponding score for every domain, i.e. Yes=2, Partial=1, No=0, Unclear=0, or Not Applicable=excluded from scoring. We then calculated the degree to which each study achieved its maximum total score. This was expressed as a percentage, with lower values reflecting higher risk of bias. All included studies were assessed by the first reviewer RM. To ensure that ratings were reliable, a subset of eight studies (31%) was independently assessed by AW.

2.6 Publication Bias

Presence of publication bias was initially assessed through visual examination of a funnel plot, i.e. effect size plotted against standard error (Sterne & Egger, 2001). In the absence of publication bias, a funnel plot can be expected to form a symmetrical shape. Asymmetry was also statistically assessed using the Egger Test, a linear regression analysis (Egger, Smith, Schneider, & Minder, 1997).

2.7 Meta-Analytic Model

All statistical analyses were conducted in the software environment R version 3.6.1 using the 'metafor' package (Viechtbauer, 2010). As eligible studies were anticipated to be methodologically heterogeneous, a random effects model was used, with a restricted maximum likelihood estimator to estimate between-study variance (Borenstein, Hedges, Higgins, & Rothstein, 2010). To index the proportion of effect size variability attributable to heterogeneity across studies, the I^2 statistic was computed and compared to thresholds specified in the Cochrane Handbook, i.e. <40% low and >75% high (Higgins & Green, 2011; Higgins & Thompson, 2002). Since methodological differences were likely to be significant across included literature, heterogeneity was expected to be high.

2.8 Effect Size Extraction

Pooled effect size estimates were computed for the association between paranoia and both attachment dimensions, i.e. attachment anxiety and attachment avoidance. If studies provided correlations between paranoia and attachment styles, the following strategy was adopted: correlations reported for preoccupied attachment and paranoia contributed to analyses for the anxiety dimension; correlations reported for dismissive attachment and paranoia contributed to analyses for the avoidant dimension.

Effect sizes were extracted as Pearson's correlation coefficient r. If studies reported Spearman's correlation coefficient r_s, a conversion table was used to approximate r for reported values (Rupinski & Dunlap, 1996). For studies reporting linear regression data, the standardised regression coefficient ($β$ value) was used as an indicator of effect size (Nieminen, Lehtiniemi, Vähäkangas, Huusko, & Rautio, 2013). Where studies did not report any metrics of association, these were requested from authors.

To adjust for bias in the r distribution, all extracted correlations were converted to Fisher's Z prior to any further analyses (Hedges & Olkin, 1985). Each included study sample provided one correlation for effect size computations. If studies reported multiple correlations for the paranoia-attachment relationship, a simple average was computed for subsequent analysis (Hunter & Schmidt, 2004). The magnitude of obtained effect size estimates was interpreted according to conventions outlined by Cohen, i.e. small = 0.10, moderate = 0.30, large = 0.50 (Cohen, 1988).

2.9 Meta-Regression
In order to assess whether age and gender moderated above effect size estimates, meta-regression analyses were performed using below models. Within these, the effect size (ES) estimate was entered as an outcome variable, with v designating error variance.

$ES = β_0 + β_1 \text{(age)} + v$
$ES = β_0 + β_1 \text{(sex)} + v$
$ES = β_0 + β_1 \text{(age)} + β_2 \text{(sex)} + v$

3. Results
3.1 Literature Characteristics
As shown in Figure 1, literature search yielded an initial pool of 3,434 records. Three of these were written in German and identified via a search of reference lists. After removal of duplicate entries, a total of 2,401 records were screened; 116 of these were examined by full text. The final sample comprised 26 studies which met eligibility criteria. All included studies were composed between 2008 and 2019. Six of these were unpublished doctoral dissertations. Despite extended criteria, only English-language studies were identified to be suitable for inclusion.
3.2 Study Characteristics
Table 1 displays information on relevant study characteristics. 20 of the 26 included studies (77%) were conducted in the United Kingdom; the remaining studies were

completed in Germany, Israel, Portugal, Spain, Sweden and the USA respectively. Overall, included studies comprised 10,539 participants (M=351.30, SD=1056.43, range 32–5877). More than half of this total was accounted for by a study which analysed US data from the National Comorbidity Survey (Sitko, Bentall, Shevlin, & Sellwood, 2014). The mean age reported for participant samples ranged from 16 to 47 years (M=28.97, SD=9.92). For one sample, the mean age was not obtainable. On average, samples were comprised of nearly 45% male participants (M=44.60, SD=21.98, range 11%–100%).

3.3 Sample Type Characteristics

The 26 included studies presented data for 30 independent samples. A total of 12 samples were categorised as clinical. Seven of these consisted of participants with established psychosis, identified to be part of a schizophrenia spectrum diagnosis; two samples specifically consisted of participants with first episode psychosis (i.e. Fish, 2010; Jones, 2015); one sample comprised participants with self-reported clinical levels of psychosis (i.e. Pearce et al., 2017); one sample comprised participants with Ultra-High-Risk of psychosis experiencing attenuated symptoms (i.e. Russo et al., 2018). In one study, participants were described to have various mental health difficulties (i.e. Dunne, 2011). As this was the only clinical sample in which no participants experienced psychosis or a related presentation, it was excluded from subsequent subgroup analyses. A total of 16 samples were categorised as non-clinical; these all consisted of participants described as student volunteers or recruits from the general population.

3.4 Sample Type Differences

There was a significant difference in sample mean age between sample types (t(26)= 2.14, p = 0.042), with clinical samples (M=33.58, SD=9.94) having a higher average age than non-clinical samples (M=25.88, SD=9.02). There was also a significant difference in percentage of male participants between sample types (t(26)=2.69, p = 0.012), with clinical samples (M=56.58, SD=17.68) being comprised of a higher proportion of men than non-clinical samples (M=35.56, SD=22.35).
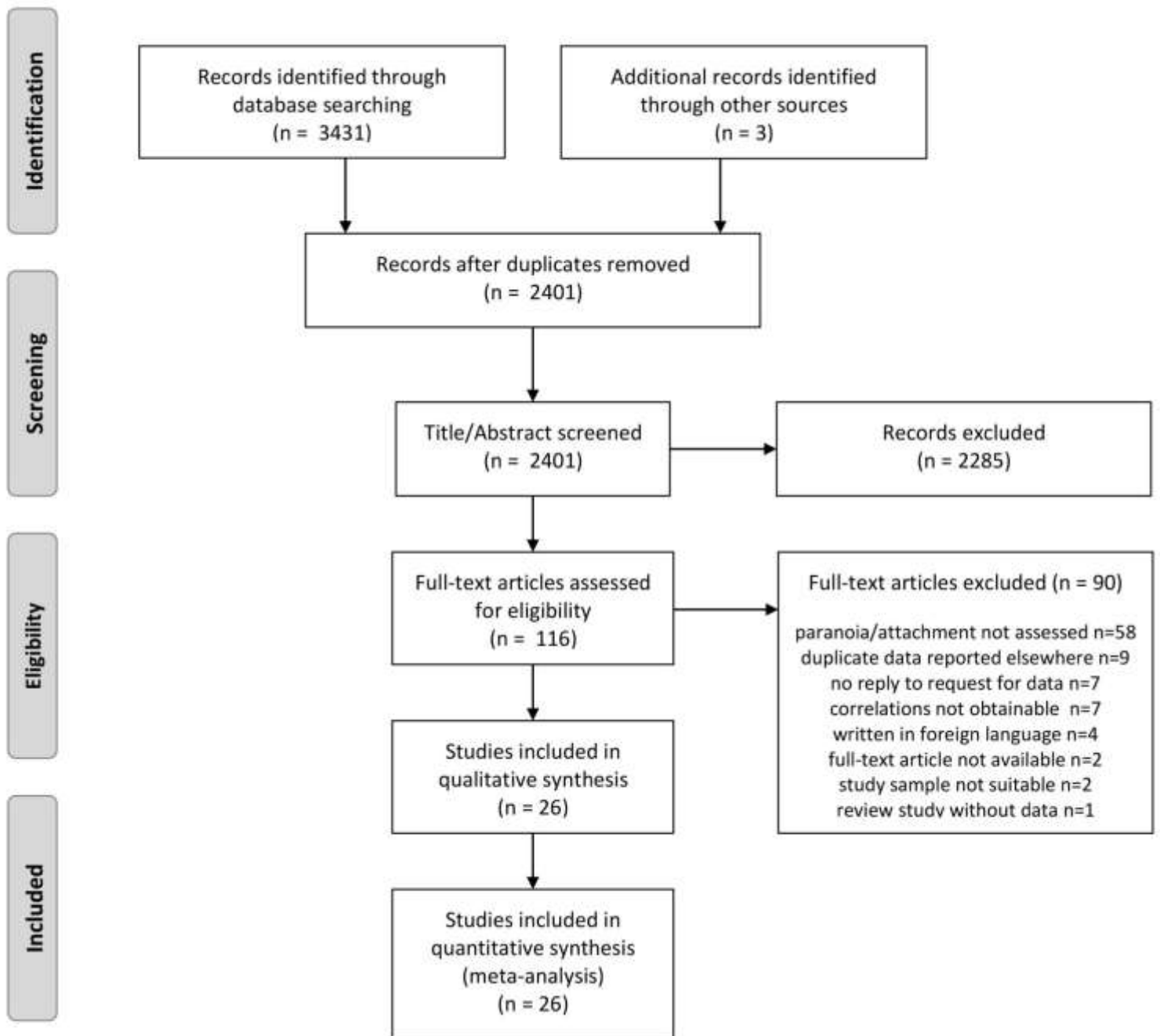
Figure 1. Prisma Flow Chart depicting literature screening process.

3.5 Construct Measurement

Table 2 presents an overview of all measures used across the 26 included studies. Attachment was assessed using eight different measures. All of these were validated for use in adults and relied on self-report. For all measures, respondents made numerical ratings on Likert-type scales, with higher scores indicating higher levels of attachment insecurity. In 18 studies, which make up nearly 70% of the study pool, attachment was assessed along the dimensions of avoidance and anxiety. In the remaining eight studies, respondents were presented with three to four descriptions of attachment styles and rated the degree to which they identified with each, e.g. on a scale from 1 (disagree strongly) to 7 (agree strongly). Paranoia was assessed using 10 different measures. While 80% of these drew on self-report, the remaining measures were administered and scored by an interviewer. Only four of the identified measures were solely designed for the assessment of paranoia, but were used in a total of 14 studies, i.e. >50% of the study pool.

3.6 Risk of Bias

Independent ratings conducted by two reviewers yielded a Cohen's kappa of 0.83 prior to consensus discussion; this was indicative of strong interrater reliability. As shown in Table 3, a total of 19 out of 26 studies achieved percentage ratings below 80% and were thus considered to display at least moderate risk of bias. More than half of studies showed bias in participant recruitment, e.g. due to how studies were advertised, attracting individuals who self-selected. As most studies did not report a priori power calculations to justify their sample sizes, there was also a risk of findings biasing decisions about continuation of recruitment. Less than half of studies provided information regarding missing data or handling approaches. Whilst primarily a reporting issue, this raised concerns about the risk of biased findings.

3.7 Attachment Avoidance & Paranoia
3.7.1 Effect Size Estimate

The pooled effect size estimate for the above, computed drawing on 30 independent attachment-paranoia correlations, was $r = .24$ (95% CI: 0.18, 0.29; $p < .0001$). This was interpreted as small to moderate in magnitude, indicating that higher levels of attachment avoidance are significantly associated with higher levels of paranoia. As anticipated, heterogeneity was high ($Q = 218.32$, $p < .0001$, $I^2 = 78.60\%$), with almost 79% of effect size variability being attributable to between-study differences. Figure 2 presents a forest plot of extracted effect sizes for the avoidance dimension.

3.7.2 Publication Bias

Visual examination of the funnel plot for the avoidance dimension pointed towards a symmetric distribution of effect sizes (Figure 3). The Egger test corroborated this, confirming that funnel plot asymmetry was not significant ($z = 0.56$, $p = 0.57$). This suggested that the pooled effect size estimate of the attachment-paranoia relationship for the avoidance dimension is likely unaffected by publication bias.

3.7.3 Subgroup Analysis by Sample Type

As planned, a subgroup analysis was conducted to determine whether the above effect size estimates differed across included sample types. Results indicated that the difference between estimates for clinical samples ($k = 11$, $N = 791$, $r = .22$) and non-clinical samples ($k = 16$, $N = 3631$, $r = .26$) was not statistically significant for the avoidance dimension ($b_1 = 0.042$, SE $= 0.063$, $z = 0.67$, $p = 0.50$).

3.7.4 Meta-Regression

To assess whether demographic variables moderated the association between attachment and paranoia, meta-regression analyses were conducted. Within single predictor models, neither age ($\beta = -0.0031$, 95% CI $= -0.0089$, 0.0027; $p = 0.30$) nor sex ($\beta = -0.0017$, 95% CI $= -0.0044$, 0.0010; $p = 0.21$) were found to be significant moderators. These findings did not change when both variables were entered into one multi-predictor model ($p = 0.40$). This suggests that neither age nor sex account for much of the effect size heterogeneity in the avoidance dimension ($I^2 = 67.13\%$).
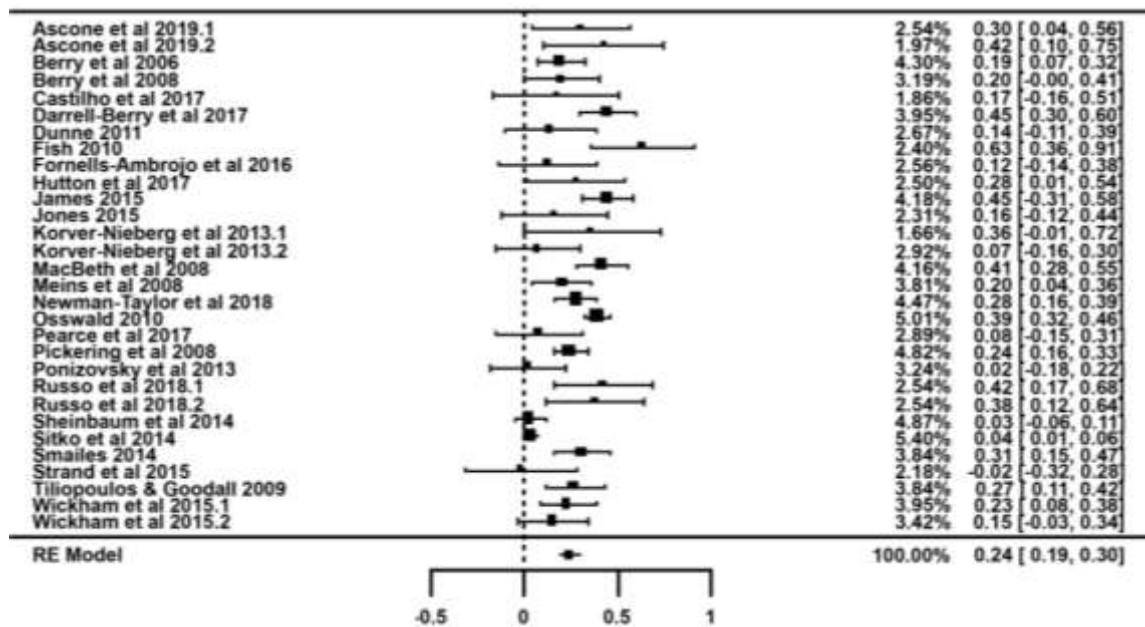

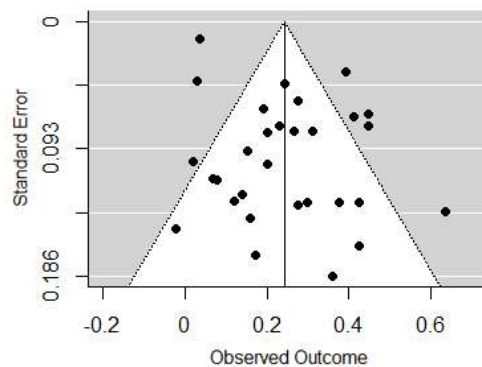**Figure 2.** Forest Plot of Extracted Effect Sizes for Avoidance Dimension as Fisher's Z

Figure 3. Funnel Plot of Extracted Effect Sizes for Avoidance Dimension

3.8 Attachment Anxiety & Paranoia
3.8.1 Effect Size Estimate
The pooled effect size estimate for the above, computed drawing on 30 independent attachment-paranoia correlations, was r = .38 (95% CI: 0.32, 0.44; p <. 0001). This was interpreted as moderate to large in magnitude, indicating that higher levels of attachment anxiety are significantly associated with higher levels of paranoia. As predicted, heterogeneity was high again (Q = 458.31, p < .0001, I^2 = 87.73%), with nearly 88% of effect size variability being attributable to between-study differences. Figure 4 presents a forest plot of extracted effect sizes for the anxiety dimension.

3.8.2 Publication Bias
Visual examination of the funnel plot for the anxiety dimension also indicated a symmetric distribution of effect sizes (Figure 5). The Egger test supported this once again, confirming that funnel plot asymmetry was not significant (z = -0.73, p = 0.47). This suggested that the pooled effect size estimate of the attachment-paranoia relationship for the anxiety dimension is also likely unaffected by publication bias.

3.8.3 Subgroup Analysis by Sample Type
As above, a subgroup analysis was conducted to determine whether the above effect size estimates differed across included sample types. Results indicated that the difference between estimates for clinical samples (k = 11, N = 791, r = .34) and non-clinical samples (k = 16, N = 3629, r = .42) was also not statistically significant for the anxiety dimension (b_1 = 0.086, SE = 0.079, z = 1.09, p= 0.28).

3.8.4 Meta-Regression
As above, the same meta-regression analyses were repeated. Within single predictor models, neither age (β = -0.0065, 95% CI = -0.0131, 0.0002; p = 0.06) nor sex (β = -0.0018, 95% CI = -0.0051, 0.0016; p = 0. 30) were found to be significant moderators. These findings did not change when both variables were entered into one multi-predictor model (p = 0.14). This suggests that neither age nor sex account for much of the effect size heterogeneity in the anxiety dimension (I^2 = 76.15%).

3.9 Effect Size Comparison
A separate analysis compared the effect sizes obtained for each attachment dimension. Results indicated that both estimates differed significantly in magnitude (b_1 = -0.156, SE = 0.047, z = -3.36, p < .001), with paranoia being more strongly associated with attachment anxiety (r = .38) than attachment avoidance (r = .24).

3.10 Additional Unplanned Analyses
To assess whether meta-analytic findings were sensitive to the type of effect size reported in primary research, studies which reported attachment-paranoia correlations as Spearman's r_s were removed in a sensitivity analysis. Results indicated that adjusted effect size estimates did not differ significantly from original findings (avoidance dimension r = .22, b_1 = 0.020, SE = 0.042, z = 0.47, p = 0.64; anxiety dimension r = .36, b_1 = 0.019, SE = 0.052, z = 0.37, p = 0.71).

For three included studies, two attachment-paranoia correlations were reported and averaged for analysis (Korver-Nieberg et al., 2013; Newman-Taylor et al., 2018; Wickham, Sitko, & Bentall 2015). When these were removed in a second sensitivity analysis, both adjusted effect size estimates were identical to our original findings (avoidance dimension $r = .24$; anxiety dimension $r = .38$).

As noted above, eight studies assessed attachment as styles as opposed to dimensions. When these were removed in a final sensitivity analysis, both adjusted effect size estimates rose slightly, but did not significantly differ from original findings (attachment anxiety $r = .40$, $b_1 = -0.030$, SE = 0.056, $z = -0.53$, $p = 0.59$; attachment avoidance $r = .28$, $b_1 = -0.044$, SE = 0.042, $z = -1.05$, $p = 0.29$).

A meta-regression was performed to establish if risk of bias accounted for any effect size variability. It emerged as a significant moderator for the avoidance dimension ($\beta = 0.0057$, 95% CI = 0.0016, 0.0099; $p = 0.007$; $I^2 = 68.58\%$), but not for the anxiety dimension ($\beta = 0.0052$, 95% CI = -0.0006, 0.0110; $p = 0.08$; $I^2 = 85.03\%$).

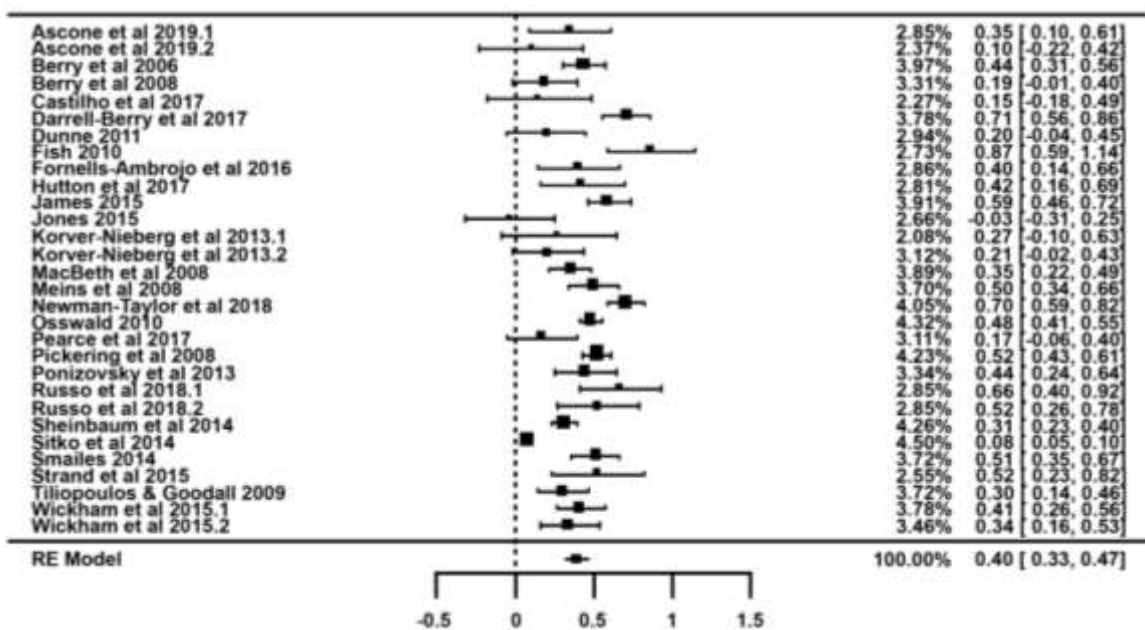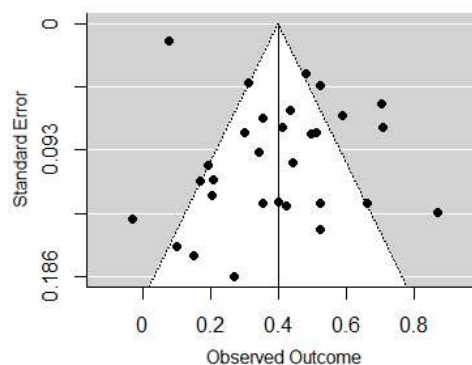**Figure 4.** Forest Plot of Extracted Effect Sizes for Anxiety Dimension as Fisher's Z

Figure 5. Funnel Plot of Extracted Effect Sizes for Anxiety Dimension

Table 1. Summary of study characteristics (26 included studies with 30 independent samples)

	Study	*N*	Setting	% male	Mean Age	Paranoia Measure	Attachment Measure	Effect Size *r* Avoidance	Effect Size *r* Anxiety
non-clinical	Ascone et al. 2019	40	Germany	33	40	PCL	RSQ	0.40	0.10
	Berry et al. 2006	244	UK	28	21[a]	PS	PAM	0.19	0.41
	Fornells-Ambrojo et al. 2016	61	UK	100	23	PS	RQ[c]	0.12	0.38
	Hutton et al. 2017	59	UK	20	21	PS	ECR-R	0.27	0.40
	James 2015 [†]	221	UK	22	36	GPTS	ASQ	0.42[d]	0.53[d]
	Korver-Nieberg et al. 2013	78	UK	64	16	GPTS[b]	PAM	0.07	0.21
	MacBeth et al. 2008	213	UK	22	20	PS	RSQ	0.39[d]	0.34[d]
	Meins et al. 2008	154	UK	44	21	SPQ	RQ	0.20	0.46
	Newman-Taylor et al. 2018	296	UK	11	20	PS/PCL[b]	ECR	0.27[d]	0.61[d]
	Osswald 2010 [†]	722	UK	37	25	PS	PAM	0.37	0.45
	Pickering et al. 2008	503	UK	30	21	PADS	RQ	0.24	0.48
	Russo et al. 2018	60	UK	43	23[a]	SSI-BV	PAM	0.40	0.58
	Sheinbaum et al. 2014	546	Spain	17	21	SPQ	RQ[c]	0.03	0.30
	Smailes 2015 [†]	160	UK	14	21	PADS	RQ	0.30	0.47
	Tiliopolous & Goodall 2009	161	UK	32	47	SPQ	ECR	0.26	0.29
	Wickham et al. 2015	113	UK	52	38	PANSS/PADS[b]	RQ	0.15	0.33
clinical	Ascone et al. 2019	60	Germany	37	40	PCL	RSQ	0.29	0.34
	Berry et al. 2008	96	UK	68	44	PANSS	PAM	0.20	0.19
	Castilho et al. 2017	37	Portugal	81	37	PCL	ECR-RS	0.17	0.15
	Dunne 2011 [†]	66	UK	26	39	SPQ	RQ[c]	0.14	0.20
	Fish 2010 [†]	55	UK	64	23	SSI-BV	PAM	0.56[d]	0.70[d]
	Jones 2015 [†]	51	UK	59	22	PANSS	RQ[c]	0.16[d]	-0.03[d]
	Korver-Nieberg et al. 2013	32	UK	61	17	GPTS[b]	PAM	0.35	0.26
	Pearce et al. 2017	77	UK	27	40	CAPE	RQ[c]	0.08[d]	0.17[d]
	Ponizovsky et al. 2013	100	Israel	70	40	PANSS	RQ[c]	0.02	0.42
	Russo et al. 2018	60	UK	52	20[a]	SSI-BV	PAM	0.36	0.48
	Strand et al. 2015	47	Sweden	64	43	SCL-90-R	RQ[c]	-0.02[d]	0.48[d]
	Wickham et al. 2015	176	UK	70	38	PANSS/PADS[b]	RQ	0.23	0.39
mixed	Darrell-Berry et al. 2017	174	UK	40	23	GPTS	PAM	0.42	0.61
	Sitko et al. 2014	5877	USA	50	NA	UM-CIDI	AAQ[c]	0.04	0.08

Notes: [†]unpublished doctoral dissertation. *N* denotes sample sizes for which correlations were derived. [a] For these samples, only median age was reported and used in analyses. [b] Due to use of multiple measures, two correlations were extracted and averaged. [c] Attachment was assessed as a style, i.e. preoccupied and dismissing. [d] Originally reported as Spearman's r_s.   **Paranoia Measures**: CAPE (Community Assessment of Psychotic Experiences; Stefanis et al., 2002); GPTS (Green Paranoid Thoughts Scale; Green et al., 2008); PADS (Persecution and Deservedness Scale; Melo et al., 2009); PANSS (Positive and Negative Syndrome Scale; Kay et al., 1987); PCL (Paranoia Checklist; Freeman et al., 2005); PS (Paranoia Scale; Fenigstein & Vanable, 1992); SCL-90-R (Symptom Checklist; Derogatis, 1997); SPQ (Schizotypal Personality Questionnaire; Raine, 1991); SSI-BV (Schizotypal Symptoms Inventory-Brief Version; Hodgekins et al., 2012); UM-CIDI (University of Michigan Composite International Diagnostic Interview; Wittchen & Kessler, 1994). **Attachment Measures**: AAQ (Adult Attachment Questionnaire; Hazan & Shaver, 1987); ASQ (Attachment Style Questionnaire; Feeney et al., 1994); ECR (Experiences in Close Relationships; Brennan et al., 1998); ECR-R (Experiences in Close Relationships- Revised; Fraley et al., 2000); ECR-RS (Experiences in Close Relationships- Relationship Structure; Fraley et al., 2011); PAM (Psychosis Attachment Measure; Berry et al., 2006, validation study); RQ (Relationship Questionnaire; Bartholomew & Horowitz, 1991); RSQ (Relationship Scales Questionnaire; Griffin & Bartholomew, 1994).

Table 2. Summary of measure characteristics

	Measure	Focus	Description	Internal Consistency [‡]
Attachment	AAQ	romantic relationships	3 items, describing distinct attachment styles, each rated on 4-point scale	α not available
	ASQ	general relationships	40 items, assessing attachment dimensions avoidance/anxiety, rated on 6-point scale	α = .86 both dimensions
	ECR	romantic relationships	36 items, assessing attachment dimensions avoidance/anxiety, rated on 7-point scale	α ≥ .90 both dimensions
	ECR-R	romantic relationships	36 items, assessing attachment dimensions avoidance/anxiety, rated on 7-point scale	α ≥ .93 both dimensions
	ECR-RS	close relationships	9 items, assessing attachment dimensions avoidance/anxiety, rated on 7-point scale, ratings made for each relationship, i.e. mother, father, romantic partner, best friend.	α ≥ .83 both dimensions
	PAM	close relationships	16 items, assessing attachment dimensions avoidance/anxiety, rated on 4-point scale, designed for individuals with psychosis, used in both clinical and non-clinical samples	α ≥ .75 both dimensions
	RQ	general relationships	4 items, describing distinct attachment styles, each rated on 7-point scale (4 studies), scores can also be computed for attachment dimensions avoidance/anxiety (7 studies)	α not available
	RSQ	close relationships	30 items, assessing attachment dimensions avoidance/anxiety, rated on 5-point scale	α ≥ .68 both dimensions
Paranoia	CAPE	general psychotic experiences	42 items, assessing different psychotic experiences, 5 items on paranoia subscale, assessing paranoia frequency, rated on 4-point scale	α = .77 subscale
	GPTS	paranoia continuum experiences	32 items, assessing social reference & social persecution, rated on 5-point scale	α ≥ .90 full scale
	PADS	paranoia continuum experiences	10 items, assessing social persecution & perceived deservedness, rated on 5-point scale	α ≥ .84 full scale
	PANSS[†]	clinical psychotic experiences	30 items, semi-structured interview, one suspiciousness/persecution item in positive symptoms subscale, scored on 7-point scale	α ≥ .70 subscale
	PCL	paranoia continuum experiences	18 items, assessing social reference & social persecution, rated on 5-point scale	α ≥ .75 full scale
	PS	paranoia in general population	20 items, assessing social suspicion and social persecution, rated on 5-point scale	α ≥ .93 full scale
	SCL-90-R	general psychopathology	90 items, assessing various symptoms experienced over 7 days, rated on 5-point scale, paranoid ideation subscale consists of 6 items	α = .80 subscale
	SPQ	schizotypy in general population	74 items, assessing schizotypy, 8 items on paranoia subscale, rated yes/no	α ≥ .76 subscale
	SSI-BV	schizotypy in general population	20 items, assessing schizotypy, 6 items on paranoia subscale, rated on 5-point scale	α ≥ .85 subscale
	UM-CIDI[†]	general psychopathology	Semi-structured interview, 3 paranoia items rated as Yes (score 1) or No (score 0)	α not available

Notes: [†]interview-based measure scored by interviewer; [‡]Cronbach's alpha corresponds to lowest value reported across studies or information from available validation data. **Paranoia Measures**: CAPE (Community Assessment of Psychotic Experiences; Stefanis et al., 2002); GPTS (Green Paranoid Thoughts Scale; Green et al., 2008); PADS (Persecution and Deservedness Scale; Melo et al., 2009); PANSS (Positive and Negative Syndrome Scale; Kay et al., 1987); PCL (Paranoia Checklist; Freeman et al., 2005); PS (Paranoia Scale; Fenigstein & Vanable, 1992); SCL-90-R (Symptom Checklist; Derogatis, 1997); SPQ (Schizotypal Personality Questionnaire; Raine, 1991); SSI-BV (Schizotypal Symptoms Inventory-Brief Version; Hodgekins et al., 2012); UM-CIDI (University of Michigan Composite International Diagnostic Interview; Wittchen & Kessler, 1994). **Attachment Measures**: AAQ (Adult Attachment Questionnaire; Hazan & Shaver, 1987); ASQ (Attachment Style Questionnaire; Feeney et al., 1994); ECR (Experiences in Close Relationships; Brennan et al., 1998); ECR-R (Experiences in Close Relationships- Revised; Fraley et al., 2000); ECR-RS (Experiences in Close Relationships- Relationship Structure; Fraley et al., 2011); PAM (Psychosis Attachment Measure; Berry et al., 2006, validation study); RQ (Relationship Questionnaire; Bartholomew & Horowitz, 1991); RSQ (Relationship Scales Questionnaire; Griffin & Bartholomew, 1994).

Table 3. Summary of Risk of Bias Assessments

Study	Sample Recruitment	Sample Size[a]	Sample Description	Attachment Assessment	Paranoia Assessment	Missing Data	Adequate Analysis	% of maximum total score
Ascone et al. 2019	PARTIAL	PARTIAL	PARTIAL	YES	YES	NA[d]	YES	75
Berry et al. 2006	NO	PARTIAL	YES	YES	YES	UNCLEAR	YES	64
Berry et al. 2008	YES	PARTIAL	YES	YES	PARTIAL[c]	PARTIAL	YES	79
Castilho et al. 2017	PARTIAL	PARTIAL	YES	YES	YES	UNCLEAR	YES	71
Darrell-Berry et al. 2017	YES	PARTIAL	YES	YES	YES	NA[d]	YES	92
Dunne 2011[†]	YES	NO[b]	PARTIAL	YES	YES	YES	YES	79
Fish 2010[†]	YES	PARTIAL[b]	YES	YES	YES	YES	YES	93
Fornells-Ambrojo et al. 2016	PARTIAL	PARTIAL	YES	YES	YES	YES	YES	86
Hutton et al. 2017	NO	PARTIAL	PARTIAL	YES	YES	UNCLEAR	YES	57
James 2015[†]	PARTIAL	YES[b]	YES	YES	YES	YES	YES	93
Jones 2015[†]	YES	YES[b]	PARTIAL	YES	PARTIAL[c]	NA[d]	YES	83
Korver-Nieberg et al. 2013	YES	PARTIAL	PARTIAL	PARTIAL[e]	PARTIAL[e]	UNCLEAR	YES	57
MacBeth et al. 2008	NO	PARTIAL	PARTIAL	YES	YES	UNCLEAR	YES	57
Meins et al. 2008	NO	PARTIAL	YES	YES	YES	UNCLEAR	YES	64
Newman-Taylor et al. 2018	NO	PARTIAL	YES	YES	YES	NA	YES	75
Osswald 2010[†]	PARTIAL	YES[b]	YES	YES	YES	NA[d]	YES	92
Pearce et al. 2017	YES	PARTIAL	YES	YES	YES	PARTIAL	YES	86
Pickering et al. 2008	NO	PARTIAL	PARTIAL	YES	YES	YES	PARTIAL[f]	64
Ponizovsky et al. 2013	YES	PARTIAL	YES	YES	PARTIAL[c]	UNCLEAR	PARTIAL	64
Russo et al. 2018	YES	PARTIAL	YES	YES	YES	UNCLEAR	PARTIAL	71
Sheinbaum et al. 2014	NO	PARTIAL	PARTIAL	YES	YES	UNCLEAR	YES	57
Sitko et al. 2014	YES	PARTIAL	PARTIAL	YES	PARTIAL[e]	UNCLEAR	YES	64
Smailes 2015[†]	PARTIAL	PARTIAL	YES	YES	YES	YES	PARTIAL[f]	79
Strand et al. 2015	YES	NO[b]	YES	YES	YES	UNCLEAR	YES	71
Tiliopolous & Goodall 2009	NO	PARTIAL	YES	YES	YES	UNCLEAR	PARTIAL	57
Wickham et al. 2015	YES	PARTIAL	YES	YES	PARTIAL[c]	YES	PARTIAL	79

Notes: Studies marked [†] are unpublished doctoral dissertations; [a] the majority of studies did not report a priori power calculations and were consequently downgraded; [b] a priori power calculation reported; [c] study downgraded for single item measure; [d] study reported there was no missing data; [e] unclear if measure suitable for population; [f] type of correlation coefficient not reported and therefore assumed to be Pearson's r.

4. Discussion

4.1 Effect Size Estimates

Our results suggest that paranoia is associated with both attachment dimensions. Analysis also indicated that respective estimates differ significantly in magnitude, with paranoia being more strongly associated with attachment anxiety (r = .38) than attachment avoidance (r = .24). This is somewhat surprising, especially since expectations of the reverse were expressed in initial reviews (e.g. Berry et al., 2007; Korver-Nieberg, Berry, Meijer, & de Haan, 2014). As the corpus of literature has since expanded however, the present findings are derived from a much larger data pool. It is also of note that recent reviews in this field have described patterns which are in line with the above (Carr et al., 2018; Lavin, Bucci, Varese, & Berry, 2019).

Our findings suggest that attachment anxiety is more strongly implicated in paranoia than attachment avoidance. It is conceivable that the discrepancy in effects merely represents a difference in reporting however, i.e. compared to individuals high on attachment anxiety, those high on attachment avoidance may be more inclined to underreport paranoia. Studies describing links between the latter dimension and tendencies toward symptom minimisation support this, both in the general population and in those with psychosis (Gumley, Taylor, Schwannauer, & MacBeth, 2014; Mikulincer & Shaver, 2007). This may be attributable to deactivating coping strategies, through which individuals with high attachment avoidance manage distress by denying it (Mikulincer & Shaver, 2003).

A perhaps even more compelling caveat pertains to the final meta-regression, conducted as a post-hoc analysis to test the robustness of our main estimates. It revealed that the strength of the attachment-paranoia relationship rose with decreasing risk of bias in the avoidance dimension. This finding does not only indicate that the present effect size of r = .24 was influenced by study level methodology, but also that it likely represents an underestimate. In view of this, the difference in effect size magnitudes described above might for the most part only be the product of artifact. We would therefore urge readers to exercise caution in drawing inferences about this finding.

It is notable that effect size estimates were not found to differ across samples, i.e. magnitudes were comparable for those comprising the general population and those comprising individuals with psychosis. This indicates that attachment insecurity has a similar bearing on paranoia irrespective of whether it meets a diagnostic threshold. This is in line with research which identified factors such as trauma to be similarly implicated in paranoia across different severity levels (e.g. Valmaggia et al. 2015). By extension, this finding also provides further evidence in support of the continuum model, according to which there is continuity between common and clinical experiences of paranoia (Elahi, Perez Algorta, Varese, McIntyre, & Bentall, 2017).

4.2. Interpretation of Associations

As this meta-analysis predominantly synthesised cross-sectional data collected at a single time point, it is not possible to draw conclusions about the directionality of identified associations, even if these are presumed to be causal in nature. As longitudinal studies highlight, the experience of mental health difficulties can lead to subsequent rises in both attachment anxiety and attachment avoidance (Cozzarelli, Karafa, Collins, & Tagler, 2003; Solomon, Dekel, & Mikulincer, 2008). In the case of paranoia, such changes may be especially likely due to the coping strategies individuals tend to resort to, e.g. withdrawal may be used to avoid the threat others pose, but also have a detrimental impact on relationships over time (Hajduk, Klein, Harvey, Penn, & Pinkham, 2018). For this to occur, the experience would not need to be severe, but simply enduring. It is consequently conceivable that both phenomena are associated due to paranoia promoting attachment insecurity.

Across existing literature, a perhaps more frequently considered view focuses on attachment insecurity promoting paranoia (Bentall et al., 2014). Evidence in support of it mainly derives from longitudinal studies which report links between attachment insecurity in childhood and various forms of psychopathology in adulthood (e.g. Pascuzzo, Moss, & Cyr, 2015; Sroufe, Egeland, Carlson, & Collins, 2005). More recently, the relationship between both phenomena was also investigated in an experience sampling study, involving daily repeated measurements over a week (Sitko, Varese, Sellwood, Hammond, & Bentall, 2016). Data showed that increases in attachment insecurity predicted subsequent increases in paranoia, both in individuals with psychosis and those recruited from the general population. While the sample of 20 N per group was small in this study, its findings corroborate a possible causal pathway. To further improve our understanding of observed associations, more research involving data collection over more than one time point is required.

4.3 Suggested Mechanisms

Literature has suggested several mechanisms through which attachment insecurity may have a bearing on paranoia, either by fostering its development or maintaining it. One of these pertains to the impact of how the self and others are conceptualised, e.g. high attachment anxiety is assumed to entail a negative view of the self, while high attachment avoidance is assumed to entail a negative view of others (Pietromonaco & Feldman Barrett, 2000). At the most extreme ends, this can culminate in self-concepts centred on vulnerability and other-concepts centred on malevolence. If carried into adulthood, these can function as lenses through which the social environment is processed (Bretherton & Munholland, 2008). Studies suggest that the sequelae of this may manifest in various ways, e.g. others are more likely to be perceived as hostile and their actions interpreted as ill intentioned (Collins & Feeney, 2004; Pereg & Mikulincer, 2004). Over time, such tendencies can heighten the anticipation of threat from others and promote paranoia. While this is by far not the only possible route, it is supported by recent research and fits well into existing paranoia models (Freeman & Garety, 2000; Raihani & Bell, 2017).

4.4 Clinical Practice Implications

Our findings indicate that there is at least moderate likelihood that individuals who present with paranoia in mental health settings may exhibit attachment insecurity. This should be expected to have a bearing on how individuals relate to the social environment, including services more broadly and clinicians more specifically (Taylor, Rietzschel, Danquah, & Berry, 2015). It is likely that great care may be required to develop a therapeutic relationship in which such individuals can experience trust and safety. By extension, our findings also suggest that consideration of attachment may be valuable in the treatment of psychosis, particularly if paranoia is a significant part of its experience. This is in line with previous reviews which proposed attachment to play a role in psychosis recovery (e.g. Gumley et al., 2014). If individuals are receptive to this, information on attachment status could be incorporated into formulations during therapy, e.g. to make sense of why paranoia may have developed and/or continues to be a problem.

4.5 Strengths and Limitations

We need to highlight several issues which may limit the conclusions drawn from present findings. Firstly, it is of note that the assessment of attachment was not consistent across studies, i.e. some used ratings on attachment dimensions (70%) while others used ratings on attachment styles (30%). While we tried to combine these in the most sensible way, our solution was somewhat artificial and may have resulted in some loss of information. To examine this, eight studies employing non-dimensional attachment assessment were removed in a sensitivity analysis. Even though results suggested that this did not significantly skew our effect size estimates, we still need to highlight this as a limitation.

Another issue relates to the exclusive reliance on self-report in assessing attachment across studies. It has been questioned whether self-report is a valid assessment approach for those who experience psychosis, especially if paranoia is a principal part of it (Bell, Fiszdon, Richardson, Lysaker, & Bryson, 2007). As research suggests, such individuals are more inclined to view others negatively and show biased recollection for threatening information (Pinkham, Harvey, & Penn, 2016; Taylor & John, 2004). In conjunction, these epiphenomena could lead to negatively distorted accounts, with those with more severe paranoia reporting higher levels of attachment insecurity. While plausible, this does not seem to be supported by research however, e.g. when currently unwell CMHT patients with paranoia were compared to those in remission, there was no significant difference in accounts of previous relationship histories (Rankin, Bentall, Hill, & Kinderman, 2005). This suggests that presence of paranoia, even if part of a diagnosable presentation, should not necessarily render reports of attachment unreliable. Our present findings do also not corroborate this, specifically as the magnitude of associations was not observed to differ between general population samples with less severe paranoia and psychosis samples with more severe paranoia.

With the inclusion of unpublished literature, this meta-analysis aimed to capture a more comprehensive pool of studies. This marks an advance on previous publications and has allowed us to obtain results which are reasonably representative of the status quo of research in this field. This is also supported by our analyses, according to which present findings were likely not affected by publication bias. Of course, it cannot be denied that this meta-analysis inadvertently included studies which are methodologically diverse and exhibit varying degrees of risk of bias. This has likely resulted in high levels of heterogeneity ($I^2 > 75\%$), which indicate that reported associations between attachment and paranoia are notably inconsistent across studies. The underlying reasons for this could unfortunately not be entirely determined within the remit of the present meta-analysis. While this is not a rare phenomenon (Higgins, 2008), we would still like to advise readers to exercise caution in interpreting present findings.

5. Conclusion

The link between paranoia and attachment has been a topic of interest for more than a decade. Drawing on 26 studies, the present meta-analysis is the first to provide an estimate of this relationship. Results showed that paranoia is associated with both attachment anxiety and attachment avoidance. The strength of these associations is similar for those in the general population and those with psychosis. While several limitations require caution in drawing conclusions, these findings suggest that attachment insecurity likely plays a contributory role in the presence of paranoia.

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Studies marked with an asterisk were synthesised in the meta-analysis

Appendix A

PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	✓
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	✓
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	✓
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	✓
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	✓
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	✓
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	✓
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	✓
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	✓
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	✓
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	✓
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	✓
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	✓
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	✓
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	✓
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	✓

RESULTS				
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	✓
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	✓
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	✓
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	✓
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	✓
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	✓
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	✓
DISCUSSION				
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	✓
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	✓
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	✓
FUNDING				
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	✓