

RUNNING HEAD: ADULT ATTACHMENT AND SOCIAL ANXIETY

A systematic review of adult attachment and social anxiety

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Abstract

Background: Attachment has been implicated in the development of social anxiety. Our aim was to synthesise the extant literature exploring the role of adult attachment in these disorders.

Method: Search terms relating to social anxiety and attachment were entered into MEDLINE, PsycINFO and Web of Science. Risk of bias of included studies was assessed using an adapted version of the Agency for Healthcare Research and Quality assessment tool. Eligible studies employed validated social anxiety and attachment assessments in adult clinical and analogue samples. The review included cross sectional, interventional and longitudinal research.

Results: Of the 30 identified studies, 28 showed a positive association between attachment insecurity and social anxiety. This association was particularly strong when considering attachment anxiety. Cognitive variables and evolutionary behaviours were identified as potential mediators, concordant with psychological theory.

Limitations: Due to a lack of longitudinal research, the direction of effect between attachment and social anxiety variables could not be inferred. There was substantial heterogeneity in the way that attachment was conceptualised and assessed across studies.

Conclusions: The literature indicates that attachment style is associated with social anxiety. Clinicians may wish to consider attachment theory when working clinically with this population. In the future, it may be useful to target the processes that mediate the relationship between attachment and social anxiety.

Keywords: Social Anxiety; Attachment; Review; Social Phobia; Adults

Highlights

- Adult attachment is associated with social anxiety.
- Cognitive and behavioural variables may mediate adult attachment and social anxiety.
- Insufficient evidence exists to infer causality in these relationships.
- Attachment is a varied construct measured using a range of techniques.

Introduction

Social anxiety is the fear of or anxiety in response to social interactions or performance situations that is out of proportion to the actual threat of this experience (NICE, 2013). It is reported as the second most common anxious condition with a lifetime prevalence of 6.7% - 10.7% in western countries (Fehm, et al., 2005; Kessler, Petukhova, et al., 2012). When considered on a continuum, less pervasive/distressing social anxiety, in the form of shyness or behavioural inhibition, may extend to more than half of the population during adolescence/early adulthood (Aderka, et al., 2012; Henderson, et al., 2014). At greater severities, social anxiety has high comorbidity with other psychosocial problems, such as depression (Beesdo et al., 2007) and other anxiety conditions (Kessler, Avenivoli, et al., 2012). It is also associated with impairments to quality of life (Wittchen & Jacobi, 2005), romantic relationships (Sparrevohn & Rapee, 2009) and friendships (Davila & Beck, 2002). Numerous therapeutic approaches to treating social anxiety have now been evidenced (Mayo-Wilson et al., 2014). Though there is evidence of efficacy for pharmacological (Standardised Mean Difference [SMD] = -0.91 , 95% CI = -1.23 to -0.60) and psychological treatment (SMD = -1.19 , 95% CI = -1.56 to -0.81 ; Mayo-Wilson et al., 2014), understanding underlying psychological mechanisms associated with the development and maintenance of social anxiety might provide an opportunity for earlier intervention/prevention and developing more effective treatments. This review focuses on one potential mechanism, attachment.

Attachment theory posits that humans are motivated to form affective bonds with others when vying for safety, comfort and protection (Bowlby, 1988). We form 'internal working models' (IWMs) from interpersonal interaction, which generate implicit rules for understanding ourselves, others and how the two interact. Primary caring relationships are considered central to the development of IWMs (Bowlby, 1988), but peer and romantic relationships are also potentially important (Hazan & Shaver, 1987; Pierce & Lydon, 2001;

Davila & Sargent, 2003; Fraley, et al., 2013). Sensitive and attuned interactions with caregivers and important others, particularly in response to distress, can result in secure attachment, and IWMs of self as loveable and able, and others as caring and reliable. Neglectful or abusive interactions with others can result in insecure attachments and IWMs of self as worthless and inept, and/or others as abusive and untrustworthy (Bretherton & Munholland, 1999). Attachment style throughout life can be characterised by IWMs about self and others, guiding individual behaviour based on the extent to which a person seeks or avoids attachment experiences (Brennan, et al., 1998).

Insecure attachment styles have traditionally been divided into anxious-ambivalent and avoidant attachment styles (Ainsworth et al., 1978; Hazan & Shaver, 1987). Notably, the terms preoccupied and dismissive have also been used to refer to anxious and avoidant patterns in adults, respectively. One of the first assessments of attachment in adulthood, the Adult Attachment Interview (AAI; Main, Goldwyn & Hesse, 2003) relies on an assessment of the quality and form of individual's interview narratives. Other approaches have focused on self-report appraisals of attachment experiences (e.g., Bartholomew, 1990; Brennan, et al., 1998).

Theory links attachment styles to differences in IWMs of self and other (Bartholomew, 1990; Ravitz, et al., 2010). Anxious attachment style is characterised by negative IWMs of self (i.e. seeing self as unlovable) whilst avoidant attachment style is characterised by negative IWMs of others (i.e., seeing others as untrustworthy; Ravitz, et al., 2010). Dimensional models see anxiety and avoidance as the two main continua of attachment experience, which underlie the presence of specific styles (Bartholomew, 1990; Brennan, et al., 1998). A more severe, 'fearful-avoidant' attachment style has also been suggested, characterised by high levels of both attachment avoidance and anxiety (Bartholomew, 1990).

Past research describes the desire for attachment as fundamental to human experience (Baumeister & Leary, 1995). IWMs that embody expectations of rejection from others may understandably result in anxiety in social situations, despite still feeling a drive for attachment. Inasmuch as this IWM informs how social situations are viewed and interpreted, insecure attachment may result in a hypervigilance to signs of rejection or threat, and biased threat-related appraisals in social situations. Thus, attachment may play a key role in the development of social anxiety.

Vertue (2003) posits a unifying theory linking evolutionary, self-presentation and learning theories of social anxiety through the lens of attachment to explain the origins, development and maintenance of social anxiety. Vertue's hypothesises that early life experiences can result in IWMs of self as inferior, undesirable, low in social-status (Ollendick & Benoit, 2012; Brumariu, et al., 2013), and models of others as rejecting. These activate evolutionary behaviours of submission to and avoidance of others, which induce and reinforce anxiety in social domains (Weisman, et al., 2011). This in turn could influence adult attachment security reinforcing avoidance and overestimation of social risks (Fralely et al., 2013). Conceptually, this theory compliments cognitive models of social anxiety (Clark & Wells, 1995), wherein underlying schemata of self and others result in appraisals of social situations as threatening, leading to self-monitoring and avoidant safety behaviours.

Child and adolescent samples have demonstrated the importance of attachment alongside parenting style, social competence and behavioural inhibition in the development of social anxiety (Cunha, et al., 2008; Brumariu & Kerns, 2008; 2010). Early adulthood has been associated with a spike in anxious symptomology, which may be related to significant social and environmental change during this period (Copeland, et al., 2014). Understanding how attachment may influence the development and maintenance of social anxiety in adulthood could lead to more effective assessment and intervention, alleviating suffering and

minimising the potential development of comorbid problems (Stein et al., 2001; Beesdo et al., 2007). This literature review aims to evaluate the evidence in the extant literature of an association between adult attachment and social anxiety symptoms.

Method

The protocol is pre-registered and available on the PROSPERO data repository website: http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42016032991 registration number: CRD42016032991.

Study Eligibility

Eligible studies included: i) an adult sample, with a mean age of 18 years or older; ii) a quantitative self-report or interview measure of attachment and social anxiety or a clinical diagnoses of social anxiety disorder; iii) analysis of the relationship between attachment and social anxiety; iv) a cross-sectional, intervention, or longitudinal study design; and v) publication in English. We included studies measuring attachment prior to adulthood providing that social anxiety was measured in adulthood. Qualitative studies, reviews, editorials and case studies/case series were excluded. Studies explicitly considering social anxiety as related to autistic spectrum conditions were also excluded from this review.

Search strategy

Electronic searches of MEDLINE, PsycINFO and ISI Web of Science databases (from earliest records until January 2016) were conducted using the following search terms, combined with Boolean operators: Attach* AND (“Soc* Anx*” OR “Soc* Phob*” OR “SAD”).

Initially, two reviewers (RM, AC) independently screened titles and abstracts of all identified articles. They then further screen the selected full articles with disagreements arbitrated by a third reviewer (PT). In addition to article identified through the systematic search, the authors checked the reference lists and citing articles of all included studies. The corresponding authors of included articles and two experts in the field were approached regarding any additional published or unpublished papers that might fit the inclusion criteria (Appendix A). RM also contacted the authors of all identified conference abstracts.

Risk of Bias

Included studies were assessed using a methodological quality assessment tool for observational research, adapted from one used by the Agency for Healthcare Research and Quality (AHRQ; Williams, et al., 2010; Appendix B) and elsewhere (Taylor, Hutton & Wood, 2014).

FIGURE 1 AROUND HERE

Results

Due to in the wide variety of measures and definitions of attachment (13 different measures) and social anxiety (15 different measures), aggregation of effect sizes would be limited by high heterogeneity and low precision and so meta-analysis was not used here. Therefore, the results were synthesised narratively. Studies were grouped into four (not mutually-exclusive) categories. These included: Studies that compared social anxiety between attachment groups or attachment between social anxiety and control ($k = 13$); studies that examined within group associations ($k = 23$); studies that produced a moderation or

mediational model of the relationship between attachment and social anxiety ($k = 10$); and longitudinal studies ($k = 3$).

Study Characteristics

Attachment and social anxiety were rarely the primary focus of included papers and only sample sizes, measures, data and outcomes relevant to this review are reported. Table 1 summarises the characteristics of the studies included in this review. Sample sizes ranged from $n = 51$ to $n = 8080$. Most studies took place in the USA, with others occurring in western (UK, Sweden, Switzerland, Netherlands, Italy, Germany, Canada) and middle-eastern (Turkey, Israel) countries, with one study in China. Different forms of the Experiences in Close Relationships scale (Brennan, et al., 1998) were the most common means of assessing attachment (used in $k = 13$ studies). In total 13 measures of attachment were used, including one behavioural measure (Strange situation, Ainsworth et al., 1978) and one interview measure (Attachment Style Interview, ASI; Bifulco et al., 1998). Measures of social anxiety also varied with the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987) used in $k = 10$ studies and the Social Interaction Anxiety Inventory (SIAS; Mattick & Clarke, 1998) used in $k = 9$ studies. In total, 15 measures of social anxiety were used, including two interview measures collectively used in $k = 5$ studies.

Of the different conceptualisations of attachment, $k = 14$ studies used a dimensional model of attachment anxiety and attachment avoidance (Brennan, et al., 1998). Bartholomew's (1990) categorical model of secure, preoccupied, fearful and dismissive attachment styles was the theoretical basis for $k = 9$ studies. Models of attachment conceptualising secure, anxious-ambivalent and avoidant styles (Ainsworth et al., 1978; Hazan & Shaver, 1987; Collins, 1996) were the basis for $k = 3$. Two studies conceptualised attachment on a single continuum from insecure to secure attachment. Bifulco and colleagues

(2006) used an interview assessment of attachment, and conceptualised ‘Secure, Enmeshed, Fearful, Angry-dismissive, Withdrawn’ attachment styles.

TABLE 1 AROUND HERE

Risk of Bias

The risk of bias assessment for each study is presented in Table 2. Common methodological problems included justification of sample size, lack of clarity or justification for recruitment population or strategy, and control or consideration of confounding variables in analyses. All but one study failed to justify their sample size using a power analysis and may have been underpowered, raising the probability of a type-II error. In some cases large sample sizes mean that power was unlikely to have been an issue (e.g., Mickelson, et al., 1997; McDermott et al., 2012). However, six studies included participant numbers below 90, and two of these also used structural equation modelling, a technique requiring larger samples (Weisman, et al., 2011 – $n = 87$; Gajwani, et al., 2013 – $n = 51$). Not having stated a power calculation for statistical analyses, these results must be interpreted with caution.

Several studies ($k = 15$) recruited participants exclusively from undergraduate university courses which increased the possibility of cohort effects (i.e. level of education, socio-economic status, ethnicity). Several studies ($k = 12$) failed to control for covariates associated with social anxiety and/or attachment. For example, though depression was highly associated with social anxiety and attachment in the included literature ($k = 7$), other studies failed to control for this association, meaning the relationship between social anxiety and attachment may be confounded by uncontrolled variables.

Measures of attachment and social anxiety occasionally lacked rigour ($k = 9$), with some studies using older scales or subscales not intended for individual use. Most studies assessed attachment and social anxiety at one time point using self-report questionnaires, limiting researcher-related bias. However, studies using face-to-face measures ($k = 5$), or assessing at sequential time points ($k = 3$), without discussing blinding of assessors researchers may have influenced responding or interpretation. Assessors may have been biased in their ratings based on their understanding of participants' attachment styles or social anxiety. Additionally, few papers ($k = 8$) stated whether the assumptions underlying their analyses were met. Consequently, it is unclear whether their analyses are appropriate and results valid.

TABLE 2 AROUND HERE

TABLE 3 AROUND HERE

Attachment and Social Anxiety

In total, 28 studies reported some significant association between attachment and social anxiety. Effect sizes ranged from negligible, $d = 0.00$, to large, $d = 1.76$ and $r = .616$.

Between group differences. Six studies compared attachment across groups defined by clinical 'caseness' for social anxiety. In five of these, people meeting diagnostic criteria for social anxiety were significantly more likely to be insecurely attached in comparison with healthy control groups ($OR = 18.5$; $d = 0.49 - 1.38$; Eng et al. 2001; Lionberg, 2003; Weisman et al., 2011; Michail & Birchwood, 2014). However, Kashdan and Roberts (2011) observed no difference in attachment to therapeutic group and therapist between depressed service-users with or without social anxiety. This difference may be due to the specific focus

on attachment to therapeutic group, as opposed to romantic partners or parents, as in other studies. In particular, people with social anxiety reported higher attachment anxiety ($d = 1.15 - 1.45$), lower comfort in closeness with attachment figures ($d = 1.15 - 1.44$) and lower ability to trust and depend on attachment figures than healthy controls ($d = 0.45 - 1.02$). A large effect size ($OR = 18.5$) was found in a small sample of individuals at ultra-high risk for psychosis (Michail & Birchwood, 2014). This estimate was based on a low cell count and so lacks precision and may not be reliable.

One well-powered study compared differences in social anxiety between anxious and avoidant attachment style groups, finding no difference between these groups, but a significant association of both with social anxiety ($b = .52$, $p < .001$; Mickelson, et al., 1997). However, the categorical assessment of attachment used in this study was very limited (Shi, et al., 2013).

Two studies did not show a significant difference in attachment anxiety between social anxiety groups and other anxiety disorder groups (Lionberg, 2003; Weisman et al., 2011). However, elevated attachment avoidance ($d = 1.15$; Weisman et al., 2011) and reduced comfort with closeness to attachment figures ($d = -0.71$; Lionberg, 2003) continued to distinguish socially anxious individuals from other anxiety groups.

In seven studies attachment was grouped into secure, preoccupied, dismissive and fearful styles, with comparisons made between these groups. Significant differences in social anxiety measures between groups suggested a relationship between attachment and social anxiety. When styles were directly compared ($k = 2$), fearful attachment and secure attachment demonstrated the greatest difference in social anxiety scores ($d = 0.88 - 1.76$) with greater social anxiety in the fearful attachment group and less in the secure attachment group (van Buren & Cooley, 2002; Gajwani, et al., 2013). Secure attachment groups also tended to have lower levels of social anxiety than preoccupied/anxious ($d = 0.86 - 1.30$), and

to a lesser extent dismissive/avoidant attachment groups ($d = 0.36 - 0.51$) suggesting dismissive/avoidant attachment has a weaker relationship with social anxiety scores.

Within group differences. Fourteen studies explored cross-sectional correlations between attachment and social anxiety. All found a significant relationship, wherein attachment insecurity was positively correlated with social anxiety. Where attachment was considered on a single continuum from insecure to secure ($k = 7$), attachment was positively associated with social anxiety with correlations ranging from $r = .17$ to $r = .62$.

Significant effects disappeared when four studies controlled for other covariates (e.g., social comparison, submissive behaviour, depression, parenting style), with associations between overall attachment security and social anxiety ranging from $\beta = -.11$ to $\beta = -.23$ (Anhalt & Morris, 2008; Aderka et al., 2009; Parade, et al., 2010; Gajwani, et al., 2013). Anhalt and Morris (2008) reported the lowest effect size between attachment to parents and social anxiety, when controlling for ratings of perceived parenting style and perceived attitudes towards parenting. Arguably, these constructs could be thought to significantly overlap with or even mirror parental attachment. Additionally, attachment to parents in young adults may play a less important role in adult social anxiety.

Findings were inconsistent when considering attachment anxiety and avoidance separately ($k = 9$). Overall effects were slightly larger between social anxiety and attachment anxiety ($r = .23 - .52$; $\beta = .06 - .41$) than attachment avoidance ($r = .02 - .49$; $\beta = .06 - .33$). However, when controlling for cognitive features (i.e. flexibility, locus of control, repetitive thinking), or evolutionary behaviour variables (i.e. submissive behaviour; social comparison), studies ($k = 3$) found slightly higher associations between social anxiety and attachment avoidance ($\beta = .16 - .33$) in comparison with attachment anxiety ($\beta = .06 - .21$; Weisman et al., 2011; Dağ & Gülüm, 2013; Gülüm & Dağ, 2013).

In one study differences in effect size between attachment anxiety ($\beta = .11$) and attachment avoidance ($\beta = .10$) are negligible (Boelen, et al., 2014). Boelen et al. (2014) found that when inhibitory intolerance of uncertainty, comparable to behavioural inhibition, and neuroticism were controlled, attachment anxiety and avoidance had no remaining relationship with social anxiety.

Where attachment was broken into secure, preoccupied, dismissive and fearful styles ($k = 5$), having a secure attachment style was strongly, negatively associated with social anxiety ($k = 4$; $r = -.42 - -.44$; $\beta = -.27 - -.48$). Fearful attachment style was positively associated with social anxiety ($k = 5$; $r = .09 - .45$; $OR = 23.2$). However, two studies found non-significant relationships between social anxiety and fearful attachment style (Darcy, et al., 2005; Nikitin & Freund, 2010). Nikitin and Freund (2010) found the strongest predictor of social anxiety was secure attachment with a non-significant effect for fearful attachment, when controlling for social approach and avoidance motivation, as well as the other attachment categories.

Moderation and mediation. Nine cross-sectional studies tested indirect effects wherein the relationship between attachment and social anxiety was mediated by other variables. Significant indirect effects were reported with mediators including cognitive flexibility (Dağ & Gülüm, 2013), depression (Gajwani et al., 2013), social comparison, submissive behaviour (Aderka et al., 2009), locus of control, repetitive thinking (Gülüm & Dağ, 2013), hope (McDermott et al., 2015), social approach motivation and social avoidance motivation (Nikitin & Freund, 2010), and perceived social support (Roring, 2008). The association or overlap between these potential mediators was not fully assessed, however.

In contrast with Gajwani et al. (2013) who suggested depression mediates the link between attachment and social anxiety, other research has suggested that social anxiety mediates the relationship between attachment and depression (Eng et al., 2001; Aderka et al.,

2009; Weisman et al., 2011). These contrasting findings likely reflect the limitations of testing mediational effects in cross-sectional data, where direction of effect cannot be established.

One study found that the relationship between attachment and social anxiety was moderated by race, with Caucasian students found to have less association between social anxiety and attachment than other ethnicities (Parade, et al., 2010). High attrition and lack of control for social anxiety limit the generalisability of these findings. The university in which this study took place could have influenced the role of race in attachment and social anxiety, as non-Caucasian students were a minority group (70% Caucasian; Parade, et al., 2010).

Longitudinal studies. Three studies explored the relationship between adult attachment and social anxiety over time suggesting a small effect size ($r = .17 - .25$). Bifulco et al. (2006) selected participants with a greater risk for psychosocial difficulties due to traumatic earlier life-experiences. They reported a small but significant relationship between attachment and social anxiety in participants with no prior experiences of social anxiety ($r = .17$). Bohlin and Hagekull (2009) found no significant association between attachment measured in infancy using the 'strange situation' (Ainsworth et al., 1978), and adult social anxiety. In this study the correlation between infant attachment and social anxiety in adulthood (21 years) was likely attenuated by the time delay between assessments.

Despite a positive association between attachment and social anxiety, and the observed moderating effect of race on this relationship, the third study failed to control for social anxiety at assessment time one, meaning this finding is essentially cross-sectional despite the longitudinal design.

Discussion

This review synthesises literature exploring the relationship between attachment and social anxiety. Of the 30 identified studies, 28 showed a positive association between attachment insecurity and social anxiety. Effects became less consistent when adjusting for covariates. Longitudinal evidence that attachment style impacts on social anxiety was extremely limited, making the direction of relationships unclear and causality impossible to establish. The findings suggest that attachment experiences and learned behaviours may play a key role in the development of social anxiety.

Attachment security was typically linked to lower social anxiety, whilst insecure attachment was associated with greater social anxiety across studies. There was some indication that preoccupied or anxious attachment styles were more strongly associated with social anxiety than dismissive or avoidant attachment styles, though this was not directly compared using post-hoc analyses. Attachment anxiety therefore may play a more substantive role than avoidance in the relationship between attachment and social anxiety. This is consistent with findings between attachment and social anxiety in children and adolescents (i.e. Brumariu & Kerns, 2008; 2010; Brumariu, et al., 2013). However, when both attachment anxiety and avoidance are high, as in fearful attachment styles, an even stronger association with social anxiety was observed. Several studies found that when controlling for cognitive or evolutionary behaviour variables, attachment anxiety was no longer significantly predictive of social anxiety, whilst attachment avoidance maintained a significant relationship (Weismann et al., 2011; Dağ, & Gülüm, 2013; Gülüm & Dağ, 2013). This may indicate the relationship between social anxiety and attachment anxiety is a function of cognitive or evolutionary variables, though the direction of this effect is not clear from cross-sectional data. This possibility is supported by the reviewed studies that tested mediational models involving these variables.

One study (Roring, 2008) posits perceived social support as a potential mediator of the relationship between attachment and social anxiety, though the size of this relationship is not reported. This link may be understood through attachment style influencing the quality of actual interpersonal relationships, resulting in fewer contacts, lower trust or greater dependency, all of which could affect actual social support. Equally attachment style may exert an influence over the perception of social support, as mistrust of others, or feelings of inadequacy could colour the interpretation of social events as less supportive. Further research in this area will illuminate the role of actual and perceived social support to greater effect.

Findings support an attachment-based theoretical conceptualisation of social anxiety, which incorporates evolutionary and cognitive underlying factors (Vertue, 2003). Attachment anxiety theoretically involves negative IWMs of self, which could lead to social anxiety both by informing expectations of social rejection (i.e., informing threat appraisals) and also guiding behavioural tendencies to avoid feared rejection by exaggerating affect (not necessarily consciously). In this review cognitive and evolutionary variables (e.g. cognitive flexibility; intolerance of uncertainty; social comparison; behavioural inhibition) were suggested as potential mediators of the relationship between attachment anxiety and social anxiety, in line with cognitive and evolutionary theories of social anxiety (i.e., Gilbert, 2000; Clark & Wells, 1995). In contrast, people high in attachment avoidance theoretically hold negative IWMs of others (e.g., others as untrustworthy) which could inform expectations of rejection or hostility. This could explain links to social anxiety observed in the included literature, which are contradictory to child and adolescent research into attachment and social anxiety (Brumariu & Kerns, 2008; 2010). As fearful attachment styles theoretically involve negative IWMs of both self and other (Ravitz et al., 2010) its association with social anxiety may occur via both the pathways outlined above. As such, contextual influences that vary

moment-to-moment warrant greater focus in trying to understand the association between attachment and social anxiety.

The included studies also support research suggestions (Ruscio, 2010) to conceptualise a continuum of social anxiety symptoms based on severity of symptoms, functional impairment and distress. Clinical levels of social anxiety were associated with greater attachment insecurity, particularly fearful attachment styles. However, common processes were observed underlying non-clinical and potentially prodromal social anxiety symptoms as participants beyond arbitrary clinical thresholds.

The existing literature is largely cross-sectional, limiting inferences about direction of the relationship between attachment and social anxiety. Longitudinal studies provided mixed evidence with small effect sizes, despite theory hypothesising clear causal associations (Vertue, 2003). Links between attachment and social anxiety were rarely the focus of longitudinal research, which was itself limited. This suggests the need for much greater investigation of this relationship in future work. No association was observed between infant attachment and adult social anxiety, though research has suggested this relationship may be attenuated by environment and interactions influencing attachment throughout life (Fraley et al., 2013). Additionally, lower associations between parental attachment and social anxiety in young adults (Anhalt & Morris, 2008) compared with studies measuring peer or romantic attachment (Eng et al., 2001; McDermott et al., 2015) suggest that parental attachment may contribute less to adult social anxiety. Future research would benefit from prospective designs, especially those designed to test the role of mediators between attachment and social anxiety. Experience-sampling methods (Scollon, et al., 2009) which allow the exploration of moment-by-moment changes in social anxiety would also be beneficial here.

A further challenge to this area of literature is that overlap in the content of self-report attachment and social anxiety measures may exaggerate associations, since both measures

may ask about themes such as discomfort or distrust in relationships. However, this possibility is unlikely to fully account for findings, since social anxiety measures often focus on behaviour and psychophysiology aspects of anxiety (e.g., arousal, blushing) in specific social settings, whilst attachment measures concern general patterns of relating (and associated cognitions) across inter-personal relationships. The impact of this overlap on the included literature is unclear, but has the potential to weaken or invalidate conclusions of much of the research in this area.

A number of further limitations of the included literature require mention. The variety of assessment measures used to operationalise both attachment and social anxiety likely contributed to variability in the findings. Greater consistency between research groups on choice of attachment measures would therefore be beneficial. Research has shown that self-report and behavioural/observational measures of attachment are not highly correlated, suggesting they may be measuring separate constructs (Roisman et al., 2007; Ravitz et al., 2010). These two types of measures may explain unique variance in social anxiety and so could be used together in future research. Several studies used convenience samples of student populations, limiting the generalisability of findings. Though social anxiety can be conceptualised on a continuum with similar underlying processes at all levels (Ruscio, 2010), inclusion of greater clinical populations in future research in this area will allow for exploration of this conceptualisation and of attachment processes in people more significantly impaired. The overlap between social anxiety and depression was also not always well accounted for.

Limitations

The findings of this review must be understood in the context of several limitations. Reviews included were limited to studies published in English, and this could have excluded

several relevant studies from other languages and cultures. Studies exploring social anxiety and attachment in late adolescents were not included, and may have altered conclusions. However, adolescence is an important time in terms of the development of social anxiety, and so probably warrants a separate review. Meta-analysis was inappropriate as different theoretical approaches to assessing attachment meant findings were too heterogeneous, but this also limited our ability to infer population effect sizes from identified studies.

Clinical relevance

In accordance with findings clinicians should consider attachment relationships and experiences as potential precursors of social anxiety, when engaging in assessment and formulation with clients. In particular, attachment could be understood as a potential contributor to anxiogenic thinking styles and behaviours indicated by models of social anxiety (i.e. Clark & Wells, 1995; Gilbert, 2000). Self-protective attachment behaviours, such as avoidance, appear to result in withdrawal or social anxiety when maladaptively applied. Aiming to change such behaviours without attending to their origins in IWMs and attachment experiences may limit the efficacy of interventions. Additionally, identification of negative IWMs of self or other could trigger preventative interventions reducing social anxiety and the associated distress and economic burden. Greater consideration could also be given to reaching avoidant or fearfully attached groups, who naturally may limit social contact. There is preliminary evidence that psychotherapy can lead to improvements in attachment security (Taylor, et al., 2015), which may account in part for the beneficial effects of psychotherapy for those with social anxiety.

Conclusion

This is the first review of the literature exploring the relationship between adult attachment and social anxiety. It provides preliminary evidence that attachment insecurity,

and particularly anxious attachment style, is positively associated with social anxiety.

However, there is a need for more robust and homogeneous research assessing longitudinal relationships between attachment and social anxiety, as well as potential mediators of this relationship. This remains a promising, but underdeveloped, area of research.

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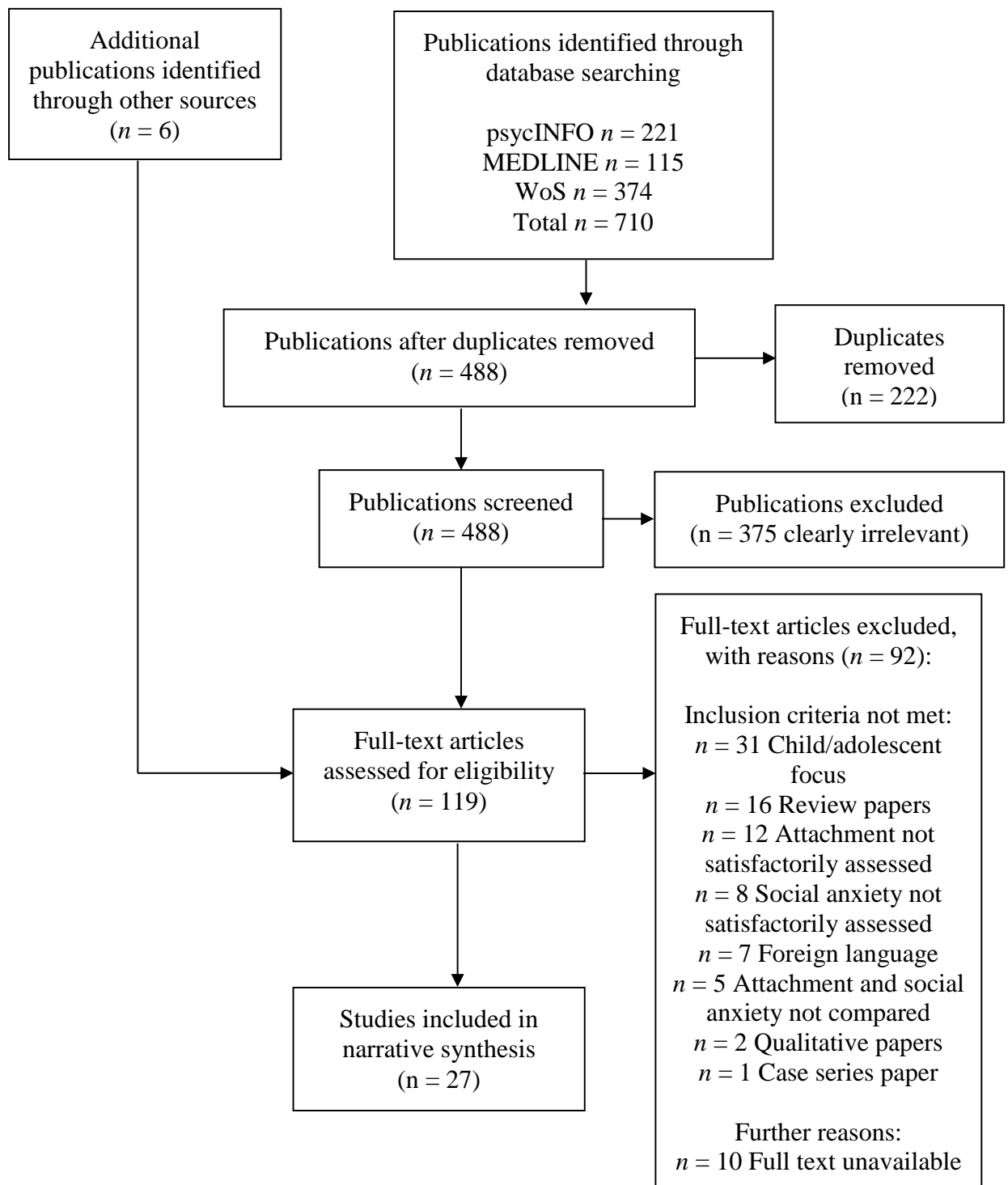


Figure 1. Literature Review search flow diagram

Table 1
Characteristics of Included Studies

Authors, year and country	Design	Sample source	Sample characteristics	control group characteristics	Attachment Measure	Social anxiety Measure
Aderka et al. (2009), Israel	Cross-sectional	Community snowball recruitment	n = 102 (72 female); Age M = 29.5 (SD = 9.0); ethnicity not stated	-	ECR	LSAS
Anhalt & Morris (2008), USA	Cross-sectional	Students	n = 434 (282 female); Age M = 19.10 (SD = 1.05); Ethnicity: 92% caucasian; 4% African-American; 2% Asian-American; 1% Hispanic; 2% other	-	PBI; IPPA	SPAI
Bifulco et al. (2006), UK	Longitudinal	Community	n = 154 (154 female); Age range 26-59; ethnicity not stated	-	ASI	SCID
Boelen, et al. (2014), The Netherlands	Cross-sectional	Students	n = 215 (198 female); Age M = 21.6 (SD = 2.0); ethnicity not stated	-	ECR-R	SPIN
Bohlin & Hagekull (2009), Sweden	Longitudinal	cohort born in during 11 week period, 1985	n = 85 (Gender not stated); Age M = 21 and 3 months (SD = 3 months); ethnicity not stated	-	Stange situation (Ainsworth et al., 1978) at 15 months	SIAS & SPS

Dağ, & Gülüm (2013), Turkey	Cross-sectional	Students	n = 992 (661 female); Age M = 21.07 (SD = 2.22); ethnicity not stated	-	ECR-R	LSAS
Dakanalis et al., (2014), Italy	Cross-sectional	Students at three universities in Italy	n = 359 (0 female); Age M = 20.4 (SD = 3.3); ethnicity not stated	-	Italian validated ASQ (Fossati et al., 2003)	Italian validated Interaction Anxiousness Scale (Conti, 1999)
Darcy, et al. (2005), USA	Cross-sectional	Students	n = 168 (88 female); Age M = 18.72 (SD = 1.05); Ethnicity: 73.5% Caucasian; 9% African American; 8% Asian Pacific Islander; 4% Latino/a; 6% other	-	RQ	SPAI
Eng et al., (2001), USA	Controlled cross-sectional	population seeking anxiety treatment	Primary sample n = 118 (47 female); Age M = 32.73 (SD = 10.13); Ethnicity: 78.4% Caucasian, 12.9% African American, 8.6% other; Replication sample n = 56 (23 female); Age M = 33.39 (SD = 9.04); Ethnicity: 39.3% Caucasian, 25.0% African American, 35.7% other	n = 36 (17 female); Age M = 32.66 (SD = 10.68); Ethnicity: 61.1% Caucasian, 27.8% African American, 11.1% other	RAAS	LSAS-total fear scale; SIAS & SPS; FQ-social; BFNE; IPSM

Erozkan (2009), Turkey	Cross-sectional	Students	n = 600 (300 female); Age M = 21.80 (SD = 2.20); ethnicity not stated	-	RSQ	SAS
Fan & Chang (2015) (study 2), China	Cross-sectional	Students	n = 296 (95 female); Age M = 20.78 (SD = 1.73); Ethnicity: 100% Chinese	-	ECR-R	SIAS & SPS plus 10 new items specific to Chinese population (Fan & Chang, 2015)
Forston (2005), USA	Cross-sectional	Students (Psychology undergraduates only)	n = 503 (358 female); Age M = 19.9 (SD = 2.8); Ethnicity: 89.2% Caucasian; 4.2% African American; 1.6% Asian/Pacific Islander; 1% Hispanic; 3.6% Other	-	ASQ	SPAI
Gajwani, et al. (2013), UK	Cross-sectional	recruited from EIS	n = 51 (18 female); Age M = 19 (SD = 3.09); Ethnicity: 57% White British; 31% Asian; 4% Black/Black British Caribbean; 2% Black/Black British African; 6% other	-	RAAS	SIAS & SPS
Greenwood (2008), USA	Cross-sectional	Students	n = 241 (191 female); Age and ethnicity not stated	-	ECR	subscale from the MPPS-C

Gülüm & Dağ (2013) study 1, Turkey	Cross- sectional	Students	n = 992 (661 female); Age M = 21.07 (SD = 2.22)	-	ECR-R	LSAS
Gülüm & Dağ (2013) study 2, Turkey	Cross- sectional	Students	n = 875 (581 female); Age M = 21.1 (SD = 1.90)	-	ECR-R	LSAS
Hoyer et al. (2016), Germany	Cross- sectional	Community Outpatients	n = 165 - 183 (91 - 101 female); Age M = 34.94 (SD = 12.11); Ethnicity not stated	-	ECR-R (German Version)	LSAS
Jordan (2010), USA/International (online recruitment)	Cross- sectional	users of online gamer forums	n = 141 (27 female); Age = 78%=18-24; 19.1%=25-35; 2.8%=36-45;0%=45+; Ethnicity: 75.9% Caucasian; 9.9% Latino/Hispanic; 7.1% Asian; 2.8% Biracial; 1.4% African American; 1.4% Native American; 1.4% other	-	RSQ	LSAS

Kashdan & Roberts, (2011), USA	Cross-sectional	Community Outpatients at a depression clinic	n = 76 (59 female); Age M = 37.8 (SD = 10.4); Ethnicity: 89.5% Caucasian; 10.5% Other	-	Adapted ECR to assess state attachment to therapists & group; good internal consistency	SCID & SIAS
Lionberg (2003) study 1, Canada	Controlled cross-sectional	community anxiety clinic; control group from local community	n = 71 (36 female); Age M = 37.70 (SD = 12.33); ethnicity not stated	Panic disorder group n = 25 (80% female); Age not reported; Ethnicity not reported; Healthy control n = 46 (59% female); Age M = 37.30 (SD = 12.28);	RAAS	SCID
McDermott et al., (2015), USA	Cross-sectional	Students	n = 2644 (1216 female); Age M = 22.5 (SD = 5.26); Ethnicity: 67% white; 18% Asian/Asian American; 3.4% multi-racial; 3% African American/Blank; 2.5% Latino/a; 0.03% Pacific Islander	-	ECR-S	Social anxiety subscale of the CCAPS-62

Michail & Birchwood (2014), UK	Controlled cross-sectional	Psychosis groups: service users of Birmingham EIS; SAD group: respondents from Social Anxiety UK; community sample from community	Group 1: n = 31 (20 female) social anxiety only; Age M = 27.6 (SD = 5.0); Ethnicity = 93.5% White British, 3.2% Asian, 3.2% Black British, 0% Afro-Caribbean, 0% Other; Group 2: n = 20 (13 female) first episode psychosis with social anxiety, Age M = 24.4 (SD = 5.1), Ethnicity = 35% White British, 40% Asian, 10% Black British, 10% Afro-Caribbean, 5% Other	Group 3: 60 (14 female) first episode of psychosis without social anxiety, Age M = 24 (SD = 4.5), ethnicity = 18.3% White British, 50% Asian, 16.6% Black British, 15% Afro-Caribbean, 0% Other; Group 4: n = 24 (13 female) healthy community, Age M = 24.2 (SD = 5.0), Ethnicity = 41.7% White British, 54.1% Asian, 0% Black British, 4.2% Afro-Caribbean, 0% Other	RAAS	SIAS & SPS
Mickelson, et al. (1997), USA	Cross-sectional	Data from the national comorbidity survey (household survey of population between 15-54 in US)	n = 8080 (4083 female); Age: 15-24 range (n = 2000; 24.8% of sample) 25-34 range (n = 2435; 30.1% of sample) 35-44 range (n = 2189; 27.1% of sample) 45-54 range (n = 1456; 18.0% of sample); Ethnicity = 75.3% Caucasian; 11.5%	-	Attachment style measure drawn from Hazan & Shaver (1987)	CIDI

			Black; 9.7% Hispanic; 3.5% other			
Nikitin & Freund (2010) study 1, Switzerland	Cross- sectional	Students and community of Zurich	n = 245 (181 female); Age M = 26.06 (SD = 5.95); ethnicity not stated	-	ASQ, german version (Hexel, 2004) abbreviated to 18 marker items	SIAS only
Parade, et al. (2010), USA	Longitudinal	Students	n = 172 (172 female); Age M = 18.09 (SD = 0.33); Ethnicity = 70% white; 18% Black; 5% Asian-American; 3% Hispanic-non-white; 4% other	-	IPPA	SIAS only
Roring (2008), USA	Cross- sectional	Students	n = 194 (139 female); Age M = 19.41 (SD = 1.39); Ethnicity: 78.8% Caucasian; 3.6% African American; 3.1% Asian American; 2.6% Hispanic; 4.6% Native American; 6.2% Biracial; 0.5% multiracial; 0.5% Other	-	Adapted RQ for non-romantic attachment	SIAS & SPS
van Buren & Cooley (2002), USA	Cross- sectional	Students	n = 123 (Gender unclear); Age unclear; Ethnicity not stated. ¹	-	RQ	IAS

Weisman et al. (2011) study 1, Israel	Controlled cross-sectional	SAD treatment seekers & community controls	n = 42 (23 female); Age M = 30.5 (SD = 6.2); Ethnicity not stated	n = 47 (29 female); Age M = 29.5 (SD = 8.9); Ethnicity not stated	ECR	LSAS
Weisman et al. (2011) study 2, Israel	Controlled cross-sectional	SAD treatment seekers (with MDD) group & other ANX treatment seekers with MDD group	n = 45 (18 female) people diagnosed with SAD and MDD; Age M = 28.6 (SD = 5.7); Ethnicity not stated	n = 31 (16 female) people diagnosed with anxiety disorders other than SAD, plus MDD; Age M = 33.7 (SD = 11.2); ethnicity not stated	ECR	LSAS
Weisman, et al., (2011) SEM, Israel	Controlled cross-sectional	SAD treatment seekers	n = 87 (41 female) people meeting SAD diagnostic criteria; Age M = 29.5 (SD = 6.0); Ethnicity not stated	-	ECR	LSAS

NOTE: ¹ demographic information unclear as a subset of participants was used for attachment and social anxiety comparison; Attachment assessments: ASI = Attachment Style Interview (Bifulco, et al., 1998); ASQ = Attachment Style Questionnaire (Feeney, et al., 1994); ECR = Experiences in Close Relationships Scale (Brennan, et al., 1998); ECR-R = Experiences in Close Relationships Scale-Revised (Fraley, et al., 2000); ECR-S = Experiences in Close Relationships Scale – Short form (Wei, et al., 2007); IPPA = Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987); RAAS = Revised Adult Attachment Scale (Collins & Read, 1990; Collins, 1996); RQ = Relationship Questionnaire (Bartholomew & Horowitz, 1991); RSQ = Relationship Scales Questionnaire (Griffin & Bartholomew, 1994). Social anxiety assessments: BFNE = Brief Fear of Negative Evaluation scale (Leary, 1983a); FQ-social = Fear Questionnaire-Social subscale (Marks & Matthews, 1979); IAS = Interaction Anxiety Scale (Leary, 1983b); IPSM = Interpersonal Sensitivity Measure (Boyce & Parker, 1989); LSAS = Liebowitz Social Anxiety Scale (Liebowitz, 1987); MPPS-C = Measure of Public and Private Self-Consciousness (Fenigstein, et al., 1975); PBI = Parental Bonding Instrument (Parker, et al., 1979); SAS = Social Anxiety Scale (Özbay & Palanci, 2001); SIAS = Social Interaction Anxiety Scale (Mattick & Clarke, 1998; NOTE: companion measure with SPS); SPAI = Social Phobia Anxiety Inventory (Turner, et al., 1989); SPIn =

Social Phobia Inventory (Connor, et al., 2000); SPS = Social Phobia Scale (Mattick & Clarke, 1998; NOTE: companion measure with SIAS).
Other assessments: CCAPS-62 = Counselling Centre Assessment of Psychological Symptoms-62 (Locke et al., 2011); CIDI = Composite
International Diagnostic Interview (World Health Organisation, 1990); SCID = Structured Clinical Interview for DSM-IV (First, et al., 1995).

Table 2
Risk of Bias Assessment

Authors	Unbiased selection of cohort	Selection minimises baseline differences *	Sample size calculation/ justification	Adequate description of the cohort	Valid method to assess attachment style	Valid method to assess social anxiety	Assessors blind to SA or attachment status	Adequate follow-up*	Missing data minimal	Control of confounders	Analysis appropriate*
Aderka et al. (2009)	Partial	N/A	No	Partial	Yes	Yes	Yes	N/A	Unclear	Yes	unclear
Anhalt & Morris (2008)	No	N/A	No	Yes	Yes	Yes	Yes	N/A	Unclear	Partial	unclear
Bifulco et al. (2006)	Partial	N/A	No	No	Yes	Yes	No	Yes	Partial	No	unclear
Boelen, et al. (2014)	No	N/A	No	Yes	Yes	Yes	unclear	N/A	Unclear	Yes	Yes
Bohlin & Hagekull (2009)	Yes	N/A	No	Partial	Partial	Yes	Yes	Yes	Partial	Yes	unclear
Dağ, & Gülüm (2013)	Unclear	Unclear	No	Partial	Yes	Yes	unclear	N/A	Unclear	Yes	Yes
Dakanalis et al., (2014)	Partial	N/A	Yes	Partial	Partial	Partial	Yes	N/A	Yes	no	unclear
Darcy, et al. (2005)	Partial	N/A	No	Yes	Yes	Yes	Yes	N/A	Unclear	Yes	unclear

Eng et al., (2001)	Yes	Yes	No	Yes	Yes	Yes	unclear	N/A	Unclear	Yes	unclear
Erozkan (2009)	Unclear	N/A	No	No	Yes	Unclear	unclear	N/A	Unclear	No	unclear
Fan & Chang (2015) study 2	Partial	N/A	No	Yes	Yes	Yes	Yes	N/A	Unclear	Partial	unclear
Forston (2005)	No	N/A	No	Yes	Yes	Yes	Yes	N/A	Yes	No	unclear
Gajwani, et al. (2013)	Yes	N/A	No	Yes	Yes	Yes	Yes	N/A	Unclear	Partial	Yes
Greenwood (2008)	Unclear	N/A	No	No	Yes	Partial	Yes	N/A	Yes	No	unclear
Gülüm & Dağ (2013) study 1	Unclear	Unclear	No	Partial	Yes	Yes	unclear	N/A	Unclear	Yes	Yes
Gülüm & Dağ (2013) study 2	Unclear	Unclear	No	Partial	Yes	Yes	unclear	N/A	Unclear	Yes	Yes
Hoyer et al., (2016)	Yes	N/A	Partial	Partial	Yes	Yes	unclear	N/A	Yes	No	unclear
Jordan (2010)	No	No	No	Yes	Yes	Yes	N/A	N/A	Yes	No	Partial
Kashdan & Roberts (2011)	Yes	Yes	No	Yes	Partial	Yes	Yes	N/A	Yes	Yes	Yes
Lionberg	Partial	No	No	Partial	Yes	Yes	unclear	N/A	Unclear	Partial	unclear

(2003) study 1											
McDermott et al., (2015)	Yes	N/A	Partial	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes
Michail & Birchwood (2014)	Yes	Yes	No	Yes	Yes	Yes	unclear	N/A	Unclear	No	unclear
Mickelson, et al. (1997)	Yes	N/A	Partial	Yes	Partial	Yes	No	N/A	Yes	No	unclear
Nikitin & Freund (2010) study 1	Partial	N/A	No	Partial	Partial	Partial	Yes	N/A	Unclear	Partial	unclear
Parade, et al. (2010)	No	Yes	No	Yes	Yes	Partial	Yes	Yes	Yes	No	Yes
Roring (2008)	No	N/A	Unclear	Yes	No	Yes	Yes	N/A	Yes	No	unclear
van Buren & Cooley (2002)	Partial	Unclear	No	Partial	Partial	Yes	Yes	N/A	Unclear	No	unclear
Weisman et al. (2011) study 1	Partial	Yes	No	Partial	Yes	Yes	unclear	N/A	Unclear	Yes	unclear
Weisman et al. (2011)	Yes	Partial	Partial	Partial	Yes	Yes	unclear	N/A	Unclear	Yes	unclear

study 2

Weisman, et al., (2011) SEM	Yes	N/A	No	Partial	Yes	Yes	Unclear	N/A	Unclear	Yes	Yes
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* Criteria only applicable to certain designs

Table 3
Associations between Social Anxiety and Attachment Across Studies

Study	Comparison	Attachment variable	Bivariate association	Multivariate association	Control variables
Aderka, et al., (2009)	Spectrum of global social anxiety	Attachment insecurity	$r = .39^{**}$	-	-
			-	Non-significant (values not reported)	Social comparison; Submissive behaviour
Anhalt & Morris (2008)	Spectrum of global social anxiety	Attachment security	$r = -.17^*$ - $r = -.21^{***}$	$\beta = -.11$ - $\beta = -.15$	Gender; perceived parenting style; perceived attitudes towards child rearing - parenting behaviour
Bifulco et al. (2006)	Social anxiety 'caseness'	Attachment insecurity	$r = .17^*$	-	-
		Enmeshed attachment	$r = .01$	-	-
		Fearful attachment	$r = .16^*$	-	-
		Angry-Dismissive attachment	$r = .10$	-	-
		Withdrawn attachment	$r = .10^a$	-	-
Boelen, et al. (2014)	Spectrum of global social anxiety	Attachment anxiety	-	$\beta = .11$	Neuroticism; Attachment avoidance; Prospective intolerance of uncertainty; Inhibitory intolerance of uncertainty
		Attachment avoidance	-	$\beta = .10$	Neuroticism; Attachment anxiety; Prospective intolerance of uncertainty; Inhibitory intolerance of uncertainty

Bohlin & Hagekull (2009)	Social Interaction Anxiety and Social Phobia combined into global social anxiety measure	Attachment security	Non-significant (values not reported)	-	-
Dağ & Gülüm (2013) ^b	Spectrum of global social anxiety	Attachment anxiety	$r = .23^{**}$ - $r = .26^{**}$	$\beta = .06$ - $\beta = .09$	Attachment avoidance; Cognitive flexibility
		Attachment avoidance	$r = .21^{**}$ - $r = .29^{**}$	$\beta = .16^*$ - $\beta = .25^{***}$	Attachment anxiety; Cognitive flexibility
Dakanalis et al., (2014)	Spectrum of social interaction anxiety	Attachment anxiety	$r = .52^{***}$	-	-
Darcy, et al. (2005)	Spectrum of global social anxiety	preoccupied attachment	$r = .12$ - $r = .38^{**}$	$\beta = .02$ - $\beta = .26^{**}$	Depressive symptoms; Fearful attachment
				$\beta = -.04$ - $\beta = .18^*$	Trait anxiety; Fearful attachment
				$\beta = -.02$ - $\beta = .25^{**}$	Anxiety sensitivity; Fearful attachment
		fearful attachment	$r = .09$ - $r = .35^{**}$	$\beta = .02$ - $\beta = .19^*$	Depressive symptoms; preoccupied attachment
				$\beta = .04$ - $\beta = .11$	Trait anxiety; preoccupied attachment
				$\beta = .02$ - $\beta = .16^*$	Anxiety sensitivity; preoccupied attachment
Eng et al., (2001)	Social anxiety 'caseness' Vs. healthy control	Attachment security	$d = -.49^*$ - $d = -1.16^{***}$	-	Groups matched on: Age; Gender; Race; Psychosis; Bipolar disorder; Organic mental disorders; Active substance dependence (within

		last 3 months)			
		Attachment anxiety	d = 1.30 - d = 1.45	-	Groups matched on: Age; Gender; Race; Psychosis; Bipolar disorder; Organic mental disorders; Active substance dependence (within last 3 months)
		Attachment depend on others	d = -.45 - d = -.54	-	Groups matched on: Age; Gender; Race; Psychosis; Bipolar disorder; Organic mental disorders; Active substance dependence (within last 3 months)
		Attachment comfort with closeness	d = -1.15 - d = -1.21	-	Groups matched on: Age; Gender; Race; Psychosis; Bipolar disorder; Organic mental disorders; Active substance dependence (within last 3 months)
Erozkan (2009)	Spectrum of global social anxiety	Secure attachment group	r = -.42 **	Significant *** (effect size not reported)	Fearful attachment; Preoccupied attachment; Dismissive attachment
		Fearful attachment group	r = .45 **	Significant *** (effect size not reported)	Secure attachment; Preoccupied attachment; Dismissive

		attachment			
		Preoccupied attachment group	$r = .30^{**}$	Significant *** (effect size not reported)	Secure attachment; Fearful attachment; Dismissive attachment
		Dismissive attachment group	$r = .21^*$	Significant ** (effect size not reported)	Secure attachment; Preoccupied attachment; Fearful attachment
Fan & Chang (2015) (study 2)	Social Interaction Anxiety and Social Phobia combined into global social anxiety measure	Attachment anxiety	-	$\beta = .414^{***}$	Gender; Attachment avoidance
		Attachment avoidance	-	$\beta = .088$	Gender; Attachment anxiety
Forston (2005)	Spectrum of global social anxiety	Preoccupation with relationships	$r = .37^{**}$	-	-
		Need for approval	$r = .49^{**}$	-	-
		Relationships as secondary	$r = .28^{**}$	-	-
		Discomfort with closeness	$r = .42^{**}$	-	-
		Confidence	$r = -.50^{**}$	-	-
Gajwani, et al. (2013)	Social Interaction Anxiety and Social Phobia combined into global social anxiety measure	Attachment security	$r = .39^{**} - r = .47^{***}$ $d = -1.00 - d = -1.08$	$\beta = .23$ -	Depression -
		Secure Vs Preoccupied comparison	$d = -1.16 - d = -1.30^*$	-	-
		Secure Vs Dismissive comparison	$d = -.29 - d = -.51$	-	-
		Secure Vs Fearful comparison	$d = -1.71^{***} - d = -1.76^{***}$	-	-

Greenwood (2008)	Public and private self-consciousness	Attachment anxiety	$r = .28^{**}$	-	-
		Attachment avoidance	$r = .02$	-	-
Gülüm & Dağ (2013) study 1 ^b	Spectrum of global social anxiety	Attachment anxiety	$r = .23^{**} - r = .26^{**}$	$\beta = .16^{**} - \beta = .19^{**}$	Locus of control; Attachment avoidance
		Attachment avoidance	$r = .21^{**} - r = .29^{**}$	$\beta = .17^{**} - \beta = .28^{**}$	Locus of control; Attachment anxiety
Gülüm & Dağ (2013) study 2	Spectrum of global social anxiety	Attachment anxiety	$r = .24^{**} - r = .25^{**}$	$\beta = .14^{**} - \beta = .16^{**}$	Repetitive thinking; Attachment avoidance
		Attachment avoidance	$r = .22^{**} - r = .33^{**}$	$\beta = .21^{**} - \beta = .33^{**}$	Repetitive thinking; Attachment anxiety
Hoyer et al., (2016)	Spectrum of global social anxiety	Attachment anxiety	$r = .20^{**}$	-	-
		Attachment avoidance	$r = .22^{**}$	-	-
Jordan (2010)	Spectrum of global social anxiety	Attachment insecurity	$r = .616^{**}$	-	-
Kashdan & Roberts (2011)	Spectrum of global social anxiety	Attachment anxiety	No significant difference in attachment anxiety to therapy group between SA & no SA groups (values not reported)	-	SA and no SA groups matched on: clinically relevant depression; treatment completion; Age; Gender; Ethnicity
		Attachment avoidance	No significant difference in attachment avoidance to therapy group between SA & no SA groups (values not reported)	-	SA and no SA groups matched on: clinically relevant depression; treatment completion; Age; Gender; Ethnicity

Lionberg (2003) study 1	Social anxiety 'caseness' Vs. healthy control (total participants)	Attachment comfort with closeness	d = -1.44 **	-	Social anxiety and healthy control groups matched on: Age; Gender; Ethnicity; Parental marital status; Participant relationship status; Participant relationship duration; Schizophrenia diagnosis; MDD; OCD; substance dependence diagnosis; organic psychiatric disorders; high suicide risk; Social anxiety and panic disorder groups matched on: Age; Ethnicity; Parental marital status; Participant relationship status; Participant relationship duration; Treatment seeking for anxiety; Schizophrenia diagnosis; MDD; OCD; substance dependence diagnosis; organic psychiatric disorders; high suicide risk;
	Social anxiety 'caseness' Vs. Vs. healthy control (female participants only)		d = -1.03 *	-	
	Social anxiety 'caseness' Vs. Panic disorder 'caseness' (female participants only)		d = -.71 *	-	
	Social anxiety 'caseness' Vs. healthy control (total participants)	Attachment depend on others	d = -1.02 **	-	
	Social anxiety 'caseness' Vs. Vs. healthy control (female participants only)		d = -.83 *	-	
	Social anxiety 'caseness' Vs. Panic disorder 'caseness' (female participants only)		d = -.33	-	
	Social anxiety 'caseness' Vs. healthy control (total participants)	Attachment anxiety	d = 1.32 *	-	
	Social anxiety 'caseness' Vs. Vs. healthy control (female participants only)		d = 1.33 *	-	

Social anxiety 'caseness' Vs. Panic disorder 'caseness' (female participants only)		d = 0.06	-	
McDermott et al., (2015)	Attachment anxiety	r = .40 *** ^c	$\beta = .21$ ***	Attachment avoidance; Hope
	Attachment avoidance	r = .27 *** ^c	$\beta = .06$ **	Attachment anxiety; Hope
Michail & Birchwood (2014)	Social Interaction Anxiety and Social Phobia combined into global social anxiety measure	Insecure attachment overall	OR = 18.5 ^e	-
		Preoccupied attachment	OR = 1.5 ^e	-
		Dismissive attachment	OR = 0.4 ^e	-
		Fearful attachment	OR = 23.2 ^e	-
Mickelson et al. (1997)	Social anxiety 'caseness'	Secure attachment group	Significant *** (standardised effect size not reported)	-
		anxious attachment group	Significant *** (standardised effect size not reported)	-
		avoidant attachment group	Significant *** (standardised effect size not reported)	-
		anxious/avoidant attachment comparison	Non-significant (standardised effect size not reported)	-

Nikitin & Freund (2010) (study 1)	Spectrum of social interaction anxiety	secure attachment	-	$\beta = -.48^{***}$	Preoccupied attachment; Dismissive attachment; Fearful attachment; Social approach motivation; Social avoidance motivation; Social approach X avoidance motivation interaction
		Preoccupied attachment	-	Non-significant (values not reported)	Secure attachment; Dismissive attachment; Fearful attachment; Social approach motivation; Social avoidance motivation; Social approach X avoidance motivation interaction
		Dismissive attachment	-	Non-significant (values not reported)	Secure attachment; Preoccupied attachment; Fearful attachment; Social approach motivation; Social avoidance motivation; Social approach X avoidance motivation interaction
		Fearful attachment	-	Non-significant (values not reported)	Secure attachment; Preoccupied attachment; Dismissive attachment; Social approach motivation; Social avoidance motivation; Social approach X avoidance motivation interaction

Parade, et al. (2010)	Spectrum of social interaction anxiety	Attachment security	$r = -.25^{**}$	$\beta = -.14$	Ethnicity
Roring (2008)	Social Interaction Anxiety and Social Phobia combined into global social anxiety measure	Overall attachment	-	Significant predictor of SIAS & SPS (standardised values not reported) **	Perceived social support
		Secure attachment	$r = -.25^{**} - r = -.44^{**}$	Significant predictor of SIAS (standardised values not reported) **	Fearful attachment; Preoccupied attachment; Dismissing attachment
		Fearful attachment	$r = .28^{**} - r = .33^{**}$	Significant predictor of SPS (standardised values not reported) **	Secure attachment; Preoccupied attachment; Dismissing attachment
		Preoccupied attachment	$r = .19^{**} - r = .26^{**}$	Significant predictor of SIAS (standardised values not reported) **	Secure attachment; Fearful attachment; Dismissing attachment
		Dismissing attachment	$r = .05 - r = .06$	Non-significant (values not reported)	Fearful attachment; Preoccupied attachment; Dismissing attachment
van Buren & Cooley (2002)	Spectrum of global social anxiety	Secure attachment group Vs. Preoccupied attachment group	$d = -.86^z$	-	-
		Secure attachment group Vs. Dismissive attachment group	$d = -.36^z$	-	-

	Secure attachment group Vs. Fearful attachment group	$d = -.88^z$	-	-
Weisman, et al., (2011) (Study 1)	Attachment anxiety	$d = 1.15$	-	Groups matched on: Age; Gender; Marital status; Occupational status; Schizophrenia diagnosis; MDD (excluded); substance dependence diagnosis;
	Attachment avoidance	$d = 1.15^{**}$	-	Groups matched on: Age; Gender; Marital status; Occupational status; Schizophrenia diagnosis; MDD (excluded); substance dependence diagnosis;
Weisman, et al., (2011) (Study 2)	Attachment anxiety	$d = 0$	-	Groups matched on: Gender; years of education; Depression (included); Schizophrenia diagnosis; substance dependence diagnosis; treatment seeking for anxiety
	Attachment avoidance	$d = 1.38$	-	Groups matched on: Gender; years of education; Depression (included); Schizophrenia diagnosis; substance dependence diagnosis; treatment seeking for anxiety
Weisman, et al.,	Attachment anxiety	$r = .39^{***}$	$\beta = .21^*$	Attachment avoidance; Submissive behaviour; Social

(2011)			comparison
(SEM)			
	Attachment avoidance	$r = .49^{***}$	$\beta = .27^*$
			Attachment anxiety; Submissive behaviour; Social comparison

NOTE: MDD = Major Depressive Disorder; OCD = Obsessive Compulsive Disorder;

* = $p < .05$; ** = $p < .01$; *** = $p < .001$; z = significance not reported

a = value corrected from published article through contact with author

b = studies used the same population

c = latent variables correlated

d = Cohen's d (Cohen, 1992); all Cohen's d effect sizes calculated from study data, but not reported in original paper

e = Values calculated with very low cell numbers; interpret with caution

r = correlation coefficient

β = standardised regression coefficient

Appendix A: Email sent to included authors and important authors in the field seeking further publications to consider for inclusion

Dear Insert author's name here,

We are currently undertaking a systematic review of the research literature concerning the relationship between attachment and social anxiety disorder. During our literature search we identified your paper, entitled "*Insert relevant paper title here*" which appears relevant to our review. I am emailing to check if you have undertaken any further work, either published or unpublished, which meets the following criteria:

- *Uses quantitative measures of attachment and social anxiety/social phobia*
- *The association between Attachment and social anxiety data is analysed*
- *Adult population (e.g. sample aged 18 years or over)*

If so, we would greatly appreciate it if you could send us any articles/reports relating to this work to consider for inclusion in this review. Many thanks for your time.

Ray Manning

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Appendix B: Systematic Review Quality Assessment Tool

Quality of observational studies

General instructions: Grade each criterion as “Yes,” “No,” “Partially,” or “Unsure.” Factors to consider when making an assessment are listed under each criterion. Note that some criteria will only apply to specify types of study. For example, power calculations are relevant for studies aiming to compare attachment or social anxiety between two groups, or studies that look at correlates of social anxiety in an insecurely attached sample. However, power calculations are not relevant in an uncontrolled study of a single socially anxious sample where attachment related data is only described (rather than featuring in any inferential statistics). Where a criterion only applies to a specific design, it is in italics.

1. *Unbiased selection of the cohort?*

Factors that help reduce selection bias:

- *Inclusion/exclusion criteria*
 - *Clearly described*
 - *Criteria for separating groups based on social anxiety or attachment style are stated or referred to in reference to past research*
- *Recruitment strategy*
 - *Clearly described*
 - *Sample is representative of the population of interest: How representative of the general population is the study sample (i.e. people with social anxiety sampled represents all people with social anxiety)*

2. *Selection minimizes baseline differences in demographic factors (For controlled studies only)?*

Factors to consider:

- *Was selection of the comparison group appropriate? Consider whether these two sources are likely to differ on factors related to the outcome (other than degree of social anxiety or attachment style). Note that in instances of attachment insecurity or social anxiety versus secure or non-clinical controls, differences in clinical characteristics may be expected, but matching on key demographics (age, gender, ethnicity, education, etc.) would still be required to minimize bias.*
- *Did the study investigators do other things to ensure that exposed/unexposed groups were comparable, e.g., by using stratification or propensity scores?*

3. *Sample size calculated (for controlled studies and where studies test for predictors/correlates of social anxiety/attachment style)?*

Factors to consider:

- *Did the authors report conducting a power analysis or describe some other basis for determining the adequacy of study group sizes for the primary outcome(s) of interest to us?*
- *Did the eventual sample size deviate by $\leq 10\%$ of the sample size suggested by the power calculation?*

4. *Adequate description of the cohort?*

Consider whether the cohort is well-characterized in terms of baseline demographics?

- *Consider key demographic information such as age, gender and ethnicity.*
- *Information regarding education or socio-economic characteristics is also important.*

5. *Validated assessment of attachment style?*

Factors to consider:

- *Was the method used to ascertain attachment style clearly described? (Details should be sufficient to permit replication in new studies)*
- *Was a valid and reliable measure used to assess attachment? (self-report measures tend to have lower reliability and validity than clinical interview). Gold standard tools include the Adult Attachment Interview (AAI).*

6. *Validated method for assessing social anxiety?*

Factors to consider:

- *Was social anxiety assessed using valid and reliable measures? Note that measures that consist of subscales taken from larger measures, or scales intended for use in conjunction with other scales may lack content validity and reliability, failing to capture social anxiety and social phobia symptoms comprehensively. Gold standard tools include the Anxiety Disorders Interview Schedule (ADIS) and the Structured Clinical Interview for DSM-IV (SCID).*
- *Were these measures implemented consistently across all study participants?*

7. *Outcome assessment blind to exposure ?*

- *Were the study investigators who assessed outcomes blind to the UHR status of participants? (Note that even in single-arm studies so degree of blinding is possible, for example using external interviewers with no knowledge of participants clinical status).*

8. *Adequate follow-up period (longitudinal studies only)?*

Factors to consider:

- *Follow-up for effects of intervention is required to assess endurance of clinical change.*

9. *Missing data*

Factors to consider:

- *Did missing data from any group exceed 20%?*
- *In longitudinal studies consider attrition over time as a form of missing data. Note that the criteria of < 20% missing data may be unrealistic over longer follow-up periods.*
- *If missing data is present and substantial, were steps taken to minimize bias (e.g., sensitivity analysis or imputation).*

10. *Analysis controls for confounding (controlled studies and where studies test for predictors/correlates of attachment style or social anxiety)?*

Factors to consider for controlled studies:

- *Does the study identify and control for important confounding variables and effect modifiers? Confounding variables are risk factors that are correlated with attachment style and social anxiety and may therefore bias the estimation of the effect of attachment on social anxiety if unmeasured. These may include demographic and clinical variables (e.g., co-morbidity).*

11. *Factors to consider for studies looking at predictors of social anxiety within insecurely attached groups:*

- *Did the study control for likely demographic and clinical confounders? For example, using multiple regression to adjust for demographic or clinical factors likely to be correlated with predictor and outcome?*

12. *Analytic methods appropriate (Controlled studies and where studies test for predictors/correlates of attachment style and social anxiety)?*

Factors to consider:

- *Was the kind of analysis done appropriate for the kind of outcome data (categorical, continuous, etc.)?*
- *Was the number of variables used in the analysis appropriate for the sample size? (The statistical techniques used must be appropriate to the data and take into account issues such as controlling for small sample size, clustering, rare outcomes, multiple comparison, and number of covariates for a given sample size)*