Research review: the relationship between social anxiety and social cognition in children and adolescents: a systematic review and meta-analysis

The Journal of Child Psychology and Psychiatry

Journal of Child Psychology and Psychiatry **:* (2020), pp **–** doi:10.1111/jcpp.13319

Research Review: The relationship between social anxiety and social cognition in children and adolescents: a systematic review and meta-analysis

Samantha Pearcey,[1,2,3] Kate Gordon,[1,4] Bhismadev Chakrabarti,[1,5] Helen Dodd,[1] Brynjar Halldorsson,[2,3,6] and Cathy Creswell[2,3]

[1]School of Psychology and Clinical Language Sciences, University of Reading, Reading, UK; [2]Department of Experimental Psychology, University of Oxford, Oxford, UK; [3]Department of Psychiatry, University of Oxford, Oxford, UK; [4]Berkshire Healthcare NHS Foundation Trust, Berkshire, UK; [5]Department of Psychology, Ashoka University, Sonipat, India; [6]Department of Psychology, Reykjavik University, Reykjavik, Iceland

Background: Childhood Social Anxiety Disorder (SAD) is common and impairing. The recommended treatment is a disorder specific form of cognitive behavioural therapy (CBT) that includes social skills training and, whilst they appear to be more effective than more general treatments, it is not clear whether social skills training is the critical component involved in improved outcomes, particularly given that evidence for the relationship between social anxiety and social skills deficits in children is inconsistent. This may be partly due to an overlap in their observable features, and because the nature of the association may vary in different contexts (e.g. according to child age). An alternative approach is to examine the association between social anxiety and the social cognitive capacities that underpin social skills. This paper aims to examine the association between social anxiety and social cognition in children and adolescents, and examine conceptual and methodological moderators of this relationship. **Methods:** Papers published between 1980 and 2019 were screened systematically. Fifty studies were identified from which an effect size could be calculated for the relationship between social anxiety and social cognition, including 15,411 children and adolescents. **Results:** An overall significant, but moderate effect ($r = -.15$) was identified, where increased social anxiety was associated with lower social cognitive ability. Moderation analyses revealed specific associations within studies examining social anxiety among participants with and without ASD who were older than 7 years old, and studies assessing the relationship between social anxiety and specific aspects of Theory of Mind (ToM). No significant association was identified between social anxiety and emotion recognition. **Conclusions:** Significant associations between social anxiety and social cognitive abilities appear to be accounted for by elevated social anxiety among children with ASD, and those with difficulties in specific aspects of ToM but not broader social skills, such as emotion recognition. This reinforces the importance of accurately identifying and treating social anxiety within ASD populations. In addition, treatments for social anxiety among neurotypical populations may benefit from targeting particular aspects of ToM rather than emotion recognition and other broad social skills.
Keywords: Social anxiety disorder; social cognition; social skills; autism spectrum disorder; theory of mind.

Introduction

Social anxiety disorder (SAD) is one of the most common mental health difficulties across the life span (8.6% prevalence; Kessler et al., 2005). The age of onset of SAD is commonly during early adolescence (median age of onset 13 years; Kessler et al., 2012) although adults with SAD often report having always felt socially anxious (Kim-Cohen et al., 2003). Child and adolescent SAD has a negative impact on school attendance and performance (Kessler, Foster, Saunders, & Stang, 1995), and on the development and maintenance of effective relationships across the life span (e.g. Forthofer, Kessler, Story, & Gotlib, 1996; Greco & Morris, 2005). Furthermore, SAD increases risk for other clinical disorders such as depression (Beesdo et al., 2007) and substance misuse (Buckner et al., 2008). Together this highlights the need for effective early interventions based on a good understanding of what maintains social anxiety in children and adolescents (e.g. Halldorsson & Creswell, 2017).

Currently, the first-line recommended treatment for SAD in children and adolescents is cognitive behavioural therapy (CBT) that includes social skills training (National Institute for Health & Care Excellence, 2013). Evaluations of this type of treatment have shown variable outcomes, with between 50% and 87% remission post-treatment (e.g. Beidel, Turner, & Morris, 2000; Spence, Donovan, & Brechman-Toussaint, 2000). However, it is not clear whether CBT with social skills training is more effective than CBT without social skills training (Spence, Donovan, March, Kenardy & Hearn, 2017), and, particularly, whether social skills training is a critical component of improved treatment outcomes for children and adolescents with SAD. For example, treatments also tend to involve intensive exposure and include parent involvement, which may also contribute to positive treatment outcomes (e.g. Beidel et al., 2000; Spence et al., 2000).

Conflict of interest statement: No conflicts declared.

The evidence for social skills deficits in childhood SAD is inconsistent. Some studies report that children with SAD have poorer social skills than children with other anxiety disorders or nonanxious children (Greco & Morris, 2005; Morgan & Banerjee, 2006; Scharfstein, Beidel, & Sims, 2011; Spence, Donovan, & Brechman-Toussaint, 1999; Tuschen-caffier, Kühl, & Bender, 2011), but others suggest that this is a reflection of inhibited behaviour in social situations and children's overly negative perceptions of their own social skills (Cartwright-Hatton, Hodges, & Porter, 2003; Cartwright-Hatton, Tschernitz, & Gomersall, 2005; Halldorsson, Castelijn, & Creswell, 2019). Recent work suggests that social skills deficits may be present only in a subgroup of children with SAD (Halls, Cooper, & Creswell, 2014; Pearcey et al., 2018). However, these inconsistent findings may also result from methodological limitations, particularly regarding the potential overlap between social skills difficulties and the observable symptoms of social anxiety. For example, many observational and questionnaire measures of social skills (e.g. the Performance Questionnaire; Cartwright-Hatton et al., 2003; and the social skills rating system, Gresham & Elliott, 1990) assess behaviours that may reflect, or be heavily influenced by, inhibition resulting from social anxiety (e.g. reduced eye contact, "looking nervous", not looking friendly and stumbling over words). This overlap makes it difficult to tease apart social skill deficits from social anxiety. However, significant associations have been identified between social anxiety and measures assessing social communication where items are less likely to reflect inhibition (e.g. the Social Communication Questionnaire; Halls et al., 2014). These findings are based on parent report only but tentatively suggest that there may be a significant association between social anxiety and social functioning where there is no obvious behavioural overlap.

One approach to overcoming the limitation of behavioural overlap is to focus on the social cognitive abilities that underlie effective social skills, rather than observing children and adolescent's responses in socially challenging situations. Social cognition includes various cognitive processes that are involved in interacting with others (Frith & Blakemore, 2003) such as those required for recognising emotions, reading body language and gesture, and understanding other's intentions. Studies have begun to explore social cognition among children and adolescents with SAD and with elevated social anxiety, but results are mixed. For example, some have found significant associations between social anxiety symptoms (typically measured using parent or self-report questionnaires) and dimensions of social cognition (typically measured using experimental tasks) in nonclinical children and adolescents, suggesting that they may be more impaired at identifying the intentions, or taking the perspective of other's than nonanxious children and adolescents (using experimental tasks; e.g. Banerjee & Henderson, 2001; Pile, Haller, Hiu, & Lau, 2017). However, others suggest that neither SAD (measured using semi-structured clinical assessments) nor social anxiety symptoms are significantly associated with dimensions of social cognition such as perspective taking and broad measures of understanding other's thoughts and beliefs (measured with questionnaires and interviews; e.g. Batanova & Loukas, 2011; Broeren, Muris, Diamantopoulou, & Baker, 2013; Colonnesi, Nikolić, de Vente, & Bögels, 2017). Studies have also investigated the relationship between SAD and disorders for which social cognition deficits are a central feature (e.g. Autism Spectrum Disorder; ASD) and typically identify a higher prevalence of SAD among those with ASD (30%–40%; Simonoff et al., 2008; White, Oswald, Ollendick, & Scahill, 2009) compared to neurotypical children and adolescents (8.6%–12%; Kessler et al., 2012; Stein et al., 2017). Notably, these studies also find a higher prevalence of several anxiety disorders (e.g. generalised anxiety disorder, panic disorder and phobias) and other psychopathologies (e.g. depression, oppositional defiant disorder and attention deficit hyperactivity disorder).

A lack of consistent associations between social anxiety and social cognition may not be surprising given that some social cognition tasks require the ability to understand cognitive information (i.e. thoughts), whilst others require the ability to understand affective information (i.e. emotions; e.g. Gallese, Keysers, & Rizzolatti, 2004; Kalbe et al., 2010). As such, it is plausible that the relationship differs between social anxiety and different domains/phenotypes of social cognition ability (henceforward referred to as social cognition; e.g. recognising emotions or understanding other's thoughts/beliefs) in children and adolescents. Similarly, associations with social cognition may vary according to how social anxiety is defined. For example, shyness and social anxiety have overlapping features that are often viewed as being on a spectrum (Rapee & Heimberg, 1997) but can also be distinguished by reference to symptoms and behaviours versus temperamental disposition (Cheek & Buss, 1981). Thus, distinct associations of social anxiety and shyness might exist with social cognitive abilities. Consistent with this view, LaBounty, Bosse, Savicki, King, and Eisenstat (2017) found that better performance on a cognitive Theory of Mind (ToM) ToM task (i.e. better ability to identify other's beliefs and desires) was associated with higher levels of shyness in young children, whereas many other studies have found that social anxiety symptoms are associated with poorer performance on a variety of affective and cognitive social cognition measures (Banerjee & Watling, 2010; McClure & Nowicki, 2001; Van Steensel, Bögels, & Wood, 2013). Finally, there may also be differences in the nature of the relationship

between social anxiety and social cognition among neurotypical populations compared to ASD populations. For example, it may be the case that additional features associated with ASD (e.g. social motivation, and restricted and repetitive behaviours) influence the association between social anxiety and social cognition among children with ASD. In addition, the association may be influenced by different ways of assessing social cognition in studies of children with ASD versus neurotypical populations with a tendency to measure social cognition indirectly through clinical assessments in ASD populations (e.g. Burrows et al., 2018), and directly through experimental tasks in neurotypical populations (e.g. Banerjee & Henderson, 2001), as well as within neurotypical populations (where experimental tasks may differ in their sensitivity and assessment of different nuances of social cognition).

Given the lack of clarity about the nature of the association between social anxiety and social cognition in children and adolescents, the aim of this paper is to (a) systematically review the evidence examining the relationship between social anxiety and social cognition, (b) establish, through meta-analysis, the strength of the association, and (c) examine potential moderators of the association, focusing on conceptual (i.e. social cognition and social anxiety dimension measured) and methodological features (i.e. clinical vs. community populations, neurotypical vs ASD populations, assessment tool (questionnaire/interview/task), reporter (child/parent/other) and sample demographics (i.e. age and sex)) that vary across studies.

Methods

Eligibility criteria

1. The full paper should be available in English.
2. The paper should present original data and not be a review.
3. The paper should have recruited a sample of human children or adolescents with a mean age <18 years and a maximum age </= 21 years.
4. The sample should not be specifically recruited from a population characterised by a different condition which may influence the nature of the association between social anxiety and social cognition (e.g. children with OCD, ADHD, Williams syndrome).
5. The paper should include an age appropriate, trait/temperament or symptom/diagnostic measure of social anxiety completed by parent, child, teacher or independent observer and in the form of a questionnaire, clinical assessment, experimental task or observation. For the purposes of this review, social anxiety was defined as a fear of negative evaluation by others and the consequent avoidance of social situations or endurance with significant distress (American Psychiatric Association, 2000). This includes the continuum of difficulties from shyness to social anxiety. It does not include the extreme end of this continuum (i.e. avoidant personality disorder; AVPD) given that AVPD typically involves a sensitivity to negative evaluation which is conceptualised more by low self-esteem as opposed to fear (Lampe, 2015).
6. The paper should include an age appropriate measure of social cognition. For the purposes of this meta-analysis, social cognition was defined as an ability to identify and/or understand the thoughts, feelings and/or perceptions of another (adapted from Sharp, Fonagy, & Goodyer, 2008). This definition allowed for the inclusion of social cognition dimensions that would not be affected by inhibition or broader aspects of functioning (i.e. did not include memory and learning). A diagnosis of ASD based on a standardised assessment (e.g. *ADI-r and/or ADOS*) was accepted within the scope of this definition given that deficits in social cognition, as defined here, are routinely assessed within diagnostic assessments and are a requirement for an ASD diagnosis (Abell et al., 1999). Other measures may assess social cognition by a questionnaire or experimental task, where at least 60% of the items assess social cognition.
7. The measure of social anxiety and social cognition must be standardised such that the measure can be applied consistently across the sample.
8. The design of the study must allow for an effect size to be calculated for the relationship between social anxiety and social cognition at baseline. This may be assessed using a correlational or between-group design.

    a. Where continuous associations are examined, the full variance of either social anxiety or social cognition must be represented (i.e. samples of only those with a relevant diagnosed disorder (e.g. SAD), or only those scoring above cut-offs on relevant measures will not be included).
    b. Where a between-group design is used, a high scoring group must be established on the basis of either (i) a clinical diagnosis of SAD or ASD (determined by a standardised diagnostic interview); or (ii) score more than 1SD above a normative mean on an eligible measure of social anxiety or social cognition, or above a cut-off recommended by its author.

Information sources

Searches were conducted on several relevant databases (PsycINFO, Web of Science, Medline, EMBASE and ERIC) for papers published from 1980 (when social anxiety was first included in the DSM (DSM-III; American Psychiatric Association, 1980)) to May 2019.

Searches

Search terms (see Appendix S1 for full search terms) included items identifying social anxiety (including fear of negative evaluation and shyness) and social cognition (including social cognition, theory of mind, emotion recognition and ASD). These were combined such that the identified papers included a social anxiety and social cognition term. Where possible, searches were refined by database category, document type and language. Results were exported into Endnote (version X8.0.1), where duplicates were removed. Further duplicates were removed through study selection.

Study selection

Study selection was carried out in line with PRISMA guidelines (Moher et al., 2015). Studies were selected by first screening abstracts against the study eligibility criteria (see Appendix S2 for full criteria) and then screening the full texts of studies in which abstracts did not contravene any eligibility criteria. Studies were excluded at the first "no" response to an eligibility criterion, and this was recorded as the reason for exclusion at both abstract and full-text screening. The first author screened

the abstracts of all identified studies and two postgraduate students checked 25% of these, selected randomly, against the inclusion criteria. A high rate of interrater reliability was found for accept/reject decision in this subset of abstracts ($K = 0.91$, $p < .001$). Where there was an absence of a "no" response at abstract screening (i.e. if responses to all criteria were "yes", "unclear" or a combination of both), the full text of the papers was screened.

All full texts were screened against eligibility criteria by the first author and a 21% subset by KG. There was a high rate of accept/reject decision agreement between full text raters ($K = 0.89$, $p < .001$). Full texts were only included if all inclusion criteria were met. Where there was disagreement, the study was discussed between raters and a consensus decision was reached. The references and citations of accepted texts were screened by the first author for relevant papers that had not been identified in the original searches.

Data collection processes and resulting data items

Once the final set of included papers had been established, the first author extracted the relevant data from each study. This included (a) outcome information required to investigate the effect size of the relationship between social anxiety and social cognition, such as relevant effect sizes where available, means and standard deviations from relevant measures, and sample size; and (b) information required to investigate the effect of possible moderators on this relationship. These included (a) sample characteristics, including mean age, age range (Figure S1), percentage of males, number of clinical and nonclinical participants, and (b) information about the measures, including the construct being measured (e.g. ToM (or individual aspects of ToM[1]), or shyness) as well as the type of measure (e.g. questionnaire, experimental task or clinical assessment) and the informant (see Appendix S3 for full description of moderators and definitions). It is possible that the relationships between the constructs being investigated are age-dependent. To qualitatively explore this possibility within the set of existing studies that meet the eligibility criteria, six age groups were calculated using the sample age range instead of using mean age which would not usefully reflect the range of ages in the sample. Groups were calculated where "Young children" included samples aged 0–6, "Pre-adolescents" aged 7–12, "Adolescents" aged 13–18, "Younger and older children" aged 0–12, "Pre-adolescents and adolescents" aged 7–18 and "Full age range" aged 0–18.

Where the data required to compute an effect size between social anxiety and social cognition were not available, but papers met all other inclusion criteria, authors were contacted for the required information.

Risk of bias within and across individual studies

Risk of influence of bias within individual studies was controlled as far as possible through the development of eligibility criteria that ensured papers would be of sufficient quality with respect to their design and the quality of the measures used to assess social anxiety and social cognition. Furthermore, all accepted papers were assessed for quality against a checklist derived from Study Quality Assessment Tools (2018). This checklist included assessment of transparency of aims, clear specification of population, participant selection procedures and sample size justification, clear definitions of the reliability and validity of relevant measures, and adjustments made for confounding variables. Additional criteria for between-group studies were included, such as selection of controls and differentiation of cases from controls (see Appendix S4 for full details on quality coding criteria). The quality of all papers was assessed by a psychology undergraduate following detailed training, and a sample of 45% of these was also assessed by the first author. Good interrater reliability was reached (ICC = 0.81, $p < .001$) for total quality scores between raters.

Publication bias was assessed using a funnel plot of aggregated effect sizes (where each study was represented by only one effect size). Statistical tests (regression and rank correlation tests for funnel plot asymmetry) were also carried out to assess asymmetry of the funnel plot. The trim and fill method (Duval & Tweedie, 2000a, 2000b) was conducted as sensitivity analysis to control for the risk of bias between studies.

Summary measures

Pearson's r (r_p) was used as the common effect size across studies as this was the most common effect size reported across studies and is an appropriate effect size for answering the research question (i.e. investigating the relationship between two constructs Richardson, 1996). Pearson's r was extracted from all papers reporting a bivariate correlation between social anxiety and social cognition. For studies comparing one of these concepts between two groups, Cohens d was extracted where reported and converted to an approximation of r_p (Field & Gillett, 2010). For papers that reported a between groups analysis, but did not report Cohens d, this was calculated from the means and standard deviations (pooled) of each group (Field & Gillett, 2010) and then converted to an approximation of r_p. Where studies reported a nonparametric correlation coefficient (e.g. Spearman's Rho; r_s) or a partial effect size, these were used as an approximation of r_p (Winter, Gosling, & Potter, 2016). Sensitivity analyses were run without the studies originally reporting nonparametric or partial correlations and the pattern of results remained consistent. Effect sizes were transformed, where required, so that negative effects indicated that higher levels of social anxiety were related to lower ability in social cognition and vice versa.

Planned method of analysis

Most studies yielded several effect sizes as multiple informants completed measures, or multiple dimensions or levels of a concept were assessed. Therefore, a multilevel approach was used to account for within study dependency. Effect sizes were treated as fixed effects across moderators within studies (level 1 of the multilevel analysis) and as random effects across studies (level 2 of the multilevel analysis). The model fitted can be described by:

$$r_j = \Upsilon_0 + \Upsilon_1 Z_{1j} + \Upsilon_2 Z_{2j} + \cdots \Upsilon_p Z_{pj} + \mu_j + e_j$$

which states that the effect size, r, in study j is predicted from (a) the mean effect size across studies, Υ_0, (b) the study characteristics $Z_1 \ldots Z_p$, and their associated parameter estimates, $\Upsilon_1 \ldots \Upsilon_p$, (c) the deviation of the effect in study j from the overall mean, μ_j, and (d) the sampling error for study j, e_j,. The sampling error and deviation from the overall mean are both assumed to be normally distributed with variance σ_j and σ_μ, respectively. With no moderators included, the model is reduced to:

$$r_j = \Upsilon_0 + \mu_j + e_j$$

which states that the effect size, r, in study j, is predicted by the mean effect across studies, the deviation of r_j from that mean, and the sampling error, e_j.

The models were fitted with R 3.5.0 (R Core Team, 2018) using the rma.mv() function in the Metafor package (Viechtbauer, 2010). Data processing was carried out using the reshape (Wickham, 2007) package. At least four effect sizes per level of moderator were required to be included in the analysis. Publication bias was assessed visually using a funnel plot of aggregated effect sizes as well as statistically using Beggs rank correlation and Eggers regression tests. Similarly, outliers and studies of high influence were assessed visually using a Baujat plot of aggregated effect sizes and statistically using Cook's distance (following cut-off's proposed by Viechtbauer & Cheung, 2010).

Results

Study selection

Figure 1 shows the number of studies that were screened and accepted at each stage of the selection process and the number of studies rejected at each eligibility criteria during full-text screening. Thirty-nine authors were contacted where the data to calculate an effect size were not available and seven authors responded with the required data. On completion of the screening process, 50 studies were included in the final meta-analysis, providing 150 effect sizes.

Study characteristics and results from individual studies

Visual inspection of a Baujat plot, along with Cooks d statistic and *df* Beta's, indicated that there were no significant outliers, resulting in a total sample across studies of 15,411 young people with an average age of 113.60 months ($SD = 41.76$, min = 12 months, max = 252 months). Community samples were recruited in 26 studies, with three studies recruiting only clinical samples and the remaining studies recruiting a combination of community and clinical samples. Thirty-one studies investigated social cognition in relation to general social anxiety symptoms, 15 in relation to shyness, two in relation to individual fear of negative evaluation or avoidance and distress, and the remaining two studies used a combination of social anxiety dimensions (i.e. reporting data for social anxiety symptoms as well as fear of negative evaluation and avoidance and distress individually). Three broad dimensions of social cognition were identified as measured in relation to social anxiety; 18 studies investigated social anxiety in relation to ASD (where a diagnosis was based on the Autism Diagnostic Observation Schedule [ADOS; Lord et al., 2000], Autism Diagnostic Interview revised [ADI-r; Lord, Rutter, & Le Couteur, 1994], or both), 18 in relation to Theory of Mind (ToM), 10 in relation to emotion recognition and 4 measured multiple dimensions of social cognition. Table 1 gives an overview of all included studies and their characteristics. Figure 2 presents the aggregated effect sizes and confidence intervals for each study based on a model that uses only one effect size per study representing an aggregate of all effect sizes within that study. However, the following sections will present the outcomes of multilevel models in which individual effect sizes are assessed as fixed effects within studies and random effects across studies.

Synthesis of results

There was a significant negative association between social anxiety and social cognition in children and adolescents with a population estimate of $r = -.15$ ($p < .001$; Table 2). However, there was a significant amount of heterogeneity between the effect sizes ($Q = 231.04$, $p < .001$) so further moderation analyses were conducted to identify the source of heterogeneity with follow-up meta-analyses within each level of significant moderators (see Table 2).

Moderation analyses

Conceptual features. The dimension of social anxiety that was measured did not account for a significant amount of the variance in effect sizes (QM = 0.64, $p = .73$). However, the dimension/phenotype of social cognition that was measured did (QM = 9.68, $p = .01$); as shown in Table 2, there was a significant negative association between social anxiety and social cognition for studies measuring ASD symptomatology ($r = -.28$, $p < .001$), but not for studies measuring the specific constructs of ToM ($r = -.05$, $p = .16$) or emotion recognition ($r = -.07$, $p = .12$). ToM subtype significantly moderated the relationship between social anxiety and social cognition (QM = 6.50, $p = .04$), such that a significant association between the two was found when presentational displays were measured ($r = -.12$, $p = .05$), but not when false belief ($r = -.01$, $p = .85$) or affective ToM was measured ($r = -.08$, $p = .33$). In contrast, neither emotion recognition subtype (i.e. accuracy or sensitivity) nor the type of face used (i.e. adult, child, or cartoon faces) significantly moderated the relationship between social anxiety and social cognition (QM = 1.09, $p = .78$; QM = 1.99, $p = .37$). Although face valence (e.g. happy, sad and angry) was a significant moderator (QM = 16.60, $p = .01$) of the association between social anxiety and social cognition, no significant association was identified for any particular facial expression valance (Table 2).

Methodological features. Variance in effect sizes was significantly accounted for by study design (QM = 5.75, $p = .02$) and sample type (QM = 19.48, $p < .001$). Specifically, significant negative associations between social anxiety and social cognition were found among studies using between groups ($r = -.26$, $p < .001$), rather than correlational ($r = -.07$, $p = .06$), designs and when clinical and nonclinical groups were compared ($r = -.31$,

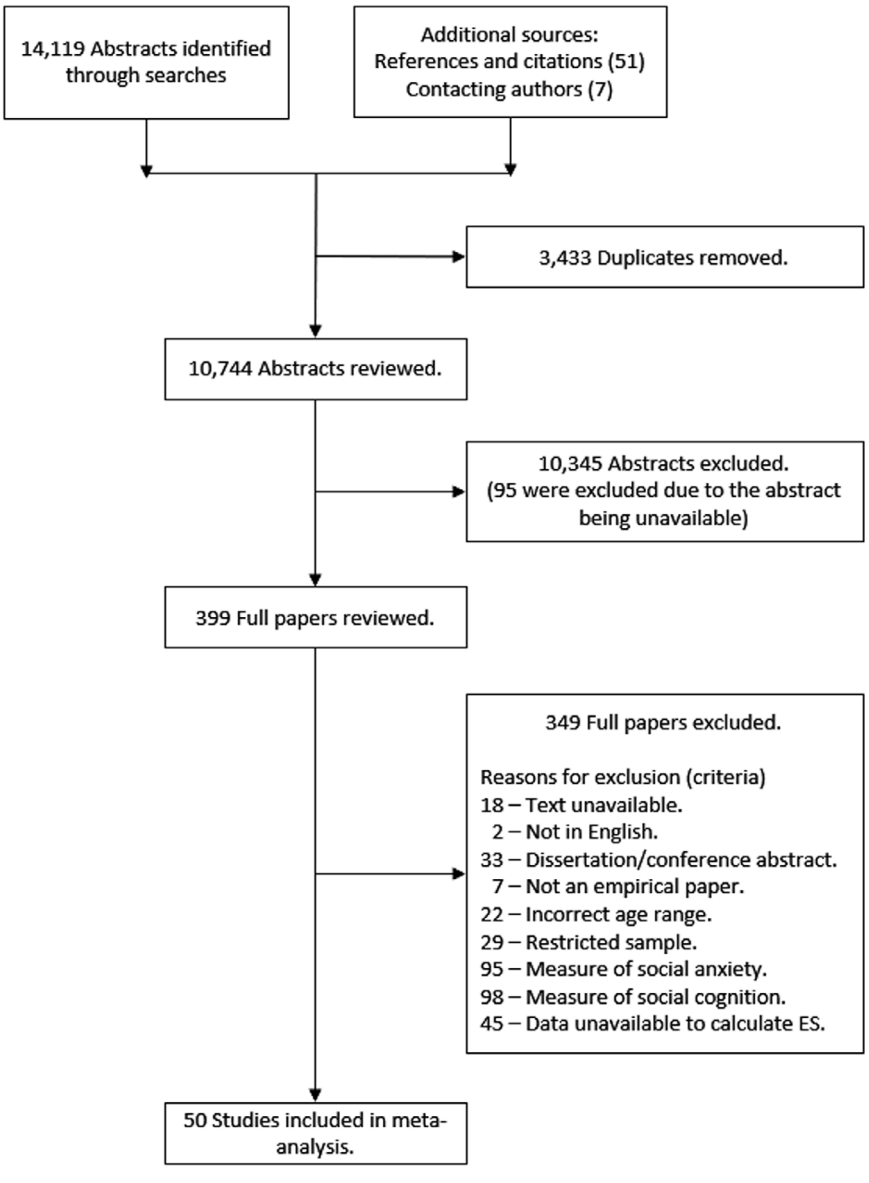

Figure 1 Flow chart of the number of papers accepted and rejected throughout the eligibility screening process

$p < .001$; of which 40% of effect sizes were from studies in which ASD was the clinical group, and 60% from those with SoAD as the clinical group), but not when samples included clinical only ($r = -.02$, $p = .86$) or community only samples ($r = -.05$, $p = .13$).

The type of measure used to measure social anxiety did not account for a significant amount of variance among effect sizes (QM = 2.46, $p = .48$). However, the type of measure used to assess social cognition (QM = 9.72, $p = .02$), as well as the informant of both the social cognition (QM = 16.65, $p < .01$) and social anxiety measures, did (QM = 10.23, $p = .02$). Specifically, a significant negative association between social anxiety and social cognition was found within studies that used a clinical assessment as a measure of social cognition ($r = -.28$, $p < .001$; clinician reported, $r = -.34$, $p < .001$) and within those that used self- or parent-reported social anxiety measures ($r = -.18$, $p < .01$; $r = -.16$, $p = .01$). Overall significant effects were not found among studies that used experimental tasks ($r = -.06$, $p = .09$) or those using self-report, $r = -.05$, $p = .08$; or parent-report, $r = -.20$, $p = .11$ to assess social cognition. Neither were significant effects found for those using clinician or teacher report to assess social anxiety ($r = -.09$, $p = .29$; $r = -.13$, $p = .12$). The type of face used in emotion recognition tasks did not significantly moderate the relationship between social anxiety and social cognition (QM = 1.99, $p = .37$), but the valence of the face did (QM = 16.60, $p = .01$). However, within each valence, no significant association was found between social anxiety and social cognition for any of the facial expression valences (see Table 2).

Demographic features. Variation in effect sizes was significantly accounted for by the age group of the sample (QM = 13.55, $p = .02$), but not by sex

Table 1 Study characteristics and quality assessment

Study characteristics									Quality assessment		
Study label	*N*	Mean age (*SD*)	*n* (Clinical)	Case group	Social anxiety dimension	Social cognition dimension/phenotype	*r*	No. ES	Overall rating	Items not reported	Items cannot determine
Ale et al. (2010)	30	53.00 (–)	–	–	Social anxiety/ shyness	Emotion recognition	.22	2	9	1	0
Banerjee and Henderson (2001)	56	103.57 (–)	–	–	Social anxiety	ToM	−.19	3	7	3	0
Banerjee and Watling (2010)	196	108.36 (–)	–	–	Social anxiety	ToM	−.19	1	8	0	0
Batanova and Loukas (2011)	262	140.16 (9.00)	–	–	Social anxiety	ToM	.04	2	10	0	0
Bender et al. (2015)	16	124.56 (1.54)	16	–	Social anxiety	Emotion recognition	−.16	1	8	0	0
Broeren et al. (2013)	224	73.08 (18.60)	–	–	Social anxiety	ToM	−.04	1	9	0	0
Burrows et al. (2016)	198	16.32 (23.52)	104	ASD	Shyness	ASD	−.82[a]	1	11	0	2
Burrows et al. (2018)	223	156.72 (27.12)	110	ASD	Social anxiety	ASD	−.44[a]	2	11	1	1
Caputi and Schoenborn (2018)	318	135.00 (21.00)	–	–	Social anxiety	ToM	−.04	1	10	0	0
Colonnesi et al. (2010)	62	69.24 (6.00)	–	–	Shyness	ToM	.08	1	8	0	0
Colonnesi et al. (2017)	101	53.46 (1.70)	–	–	Social anxiety	ToM	−.06	1	9	0	0
Corbett et al. (2009)	27	109.20 (18.00)	12	ASD	Social anxiety	ASD	−.02[a]	1	8	1	0
de Rosnay et al. (2014)	129	78.80 (–)	–	–	Shyness	Emotion recognition/ ToM	−.27	3	6	2	1
Hallett et al. (2013)	231	159.38 (9.20)	107	ASD	Social anxiety	ASD	−.12[a]	4	10	2	0
Henning et al. (2011)	172	59.00 (11.00)	–	–	Shyness	ToM	.09	2	6	3	0
Kaboski et al. (2015)	16	– (–)	8	ASD	Social anxiety/ FNE/ A&D	ASD	−.47[a]	4	7	4	0
Kokkinos et al. (2016)	177	129.93 (–)	–	–	Shyness	ToM	−.08	2	9	0	1
Kuusikko et al. (2008)	359	144.60 (25.50)	54	ASD	Social anxiety	ASD	−.19[a]	2	11	1	0
LaBounty et al. (2017)	34	43.20 (7.80)	–	–	Shyness	ToM	.34	2	6	0	1
Lee et al. (2013)	122	99.60 (16.63)	10	SAD	Social anxiety	Emotion recognition	.08[a]	1	10	1	0
McClure and Nowicki (2001)	62	107.64 (7.20)	–	–	FNW/ A&D	Emotion recognition	−.14	12	8	0	1
Melfsen and Florin (2002)	75	122.97 (13.21)	17	SAD	Social anxiety	Emotion recognition	−.12[a]	16	9	1	0
Mewhort-buist and Nilsen (2013)	88	118.00 (–)	–	–	Shyness	ToM	−.19	5	9	0	0
Mikita et al. (2015)	74	157.68 (23.64)	47	ASD	Social anxiety	ASD	−.55[a]	2	12	1	0
Mink et al. (2014)	88	27.48 (0.55)		–	Shyness	ToM	.25	2	6	2	0
Montazeri et al. (2019)	2143	133.08 (6.72)	126	ASD	Social anxiety	ASD	−.01[a]	1	8	1	1
Neil et al. (2019)	47	119.28 (25.20)	22	ASD	Social anxiety	ASD	−.20[a]	2	8	1	1
Ogawa et al. (2017)	12	132.00 (6.00)	–	–	Social anxiety	ToM	−.35	1	10	2	0
Orinstein et al. (2015)	98	162.84 (34.92)	64	–	Social anxiety	ASD	−.36	1	9	3	0
Palser et al. (2018)	58	146.16 (35.46)	29	ASD	Social anxiety	ASD	−.08[a]	1	9	1	1
Pecora et al. (2018)	98	41.12 (–)	–	–	Shyness	ToM	−.16	1	10	0	0

(continued)

Table 1 (continued)

Study characteristics									Quality assessment		
Study label	*N*	Mean age (*SD*)	*n* (Clinical)	Case group	Social anxiety dimension	Social cognition dimension/phenotype	*r*	No. ES	Overall rating	Items not reported	Items cannot determine
Pile et al. (2017)	59	183.12 (24.96)	–	High social anxiety	Social anxiety	ToM	−.23[a]	1	8	1	0
Scharfstien et al. (2011)	60	127.02 (21.60)	30	ASD	Social anxiety	ASD	−.20[a]	1	10	1	1
Schermerhorn (2019)	101	125.88 (10.44)	–	–	Shyness	Emotion recognition	.01	6	7	1	0
Schiltz et al.(2017)	97	138.47 (26.36)	57	ASD	Social anxiety	ASD	−.09[a]	2	7	5	0
Sette et al. (2016)	163	53.29 (14.48)	–	–	Shyness	Emotion recognition	−.08	2	7	1	0
Simonian et al. (2001)	29	139.24 (–)	15	SAD	Social anxiety	Emotion recognition	−.40[a]	6	10	2	0
South et al. (2011)	60	153.36 (34.22)	36	ASD	Social anxiety	ASD	−.21[a]	1	9	2	0
Strand et al. (2008)	338	53.00 (6.52)	–	-	Shyness	Emotion recognition/ ToM	−.12	6	8	1	0
Usher et al. (2015)	73/37	159.17 (32.06)	37/–	ASD	Social anxiety	ASD/ ToM	−.08[a]	3	11	0	0
van Rijn et al. (2014)	164	143.56 (31.95)	58	ASD	Social anxiety	ASD	−.11[a]	1	11	1	0
van Steensel et al. (2012)	237	148.08 (32.16)	237	ASD	Social anxiety	ASD	.11[a]	1	6	4	0
van Steensel et al. (2013)	84	143.28 (22.44)	42	–	Social anxiety	ASD	−.40	2	9	2	0
van Steensel and Bogels (2015)	174	148.26 (33.01)	174	ASD	Social anxiety	ASD	.08[a]	1	10	0	0
Vanhalst et al. (2017)	170	163.80 (6.84)	–	–	FNE	Emotion recognition	.10	6	8	1	0
Verron and Teglasi (2018)	119	57.38 (–)	–	–	Shyness	Emotion recognition/ ToM	−.01	6	8	1	0
Walker (2005)	63	50.46 (4.04)	–	–	Shyness	ToM	−.27	2	7	1	1
Wellman et al. (2011)	146	54.00 (–)	–	–	Shyness	ToM	.14	1	5	1	0
Willcutt et al. (2011)	7,634	131.04 (34.92)	2,457	–	Social anxiety	Social cognition	−.56	1	6	1	1
Wong et al. (2012)	38	119.04 (18.96)	17	SAD	Social anxiety	Emotion recognition	−.07[a]	20	11	1	0

For quality analysis, overall ratings are out of a possible 11 for correlational and 14 for between groups studies.
[a]Denotes between groups studies in which the *r* statistic has been estimated from *d*.

(QM = 0.21, $p = .65$). Specifically, a significant negative association was found between social anxiety and social cognition among studies that included pre-adolescent ($r = -.21$, $p < .001$) and combined pre-adolescent and adolescent samples ($r = -.25$, $p < .001$). However, a significant *positive* association was found based on effect sizes from the one study that included an adolescent only sample ($r = .10$, $p < .01$). Overall significant effects were not found for studies including only young children ($r = .03$, $p = .63$), those including younger and older children ($r = -.09$, $p = .23$), or those including participants from across the full child and adolescent age range (i.e. 0–18 years old; $r = -.33$, $p = .06$).

Risk of bias

Visual inspection of the funnel plot in Figure 3 suggests possible asymmetry, but rank correlation tests suggested that the funnel plot was not significantly asymmetrical ($z = -0.11$, $p = .91$). Furthermore, trim and fill sensitivity analyses suggested that no studies were required to satisfy symmetry resulted in no change to the overall effect size estimate. This suggests that publication bias was not likely to have significantly influenced the overall meta-analysis results.

Sensitivity analysis

When the ASD literature was excluded from the analyses, there continued to be a significant negative association between social anxiety and social cognition ($r = -.07$, $p = .05$), consistent with the main analysis. Moderation analyses on this subset of data suggested that none of the conceptual or methodological aspects of the studies were significant moderators of the overall effect size (see Table S1). This was not consistent with the main analysis, where several methodological features were significant moderators. However, the informant of social anxiety and the sample type approached significance (QM = 7.83, $p = .05$; QM = 5.39, $p = .07$). Where studies scoring below 60% on the quality rating scale were excluded from the analysis, there also continued to be a significant negative association between social anxiety and social cognition ($r = -.16$, $p = <.001$). Moderation analysis on this subset of data suggested that patterns remained mostly consistent with the main analysis (see Table S2). However, a significant association was also identified for correlational studies ($r = -.27$, $p < .001$), and the moderating role of self-report measures ($r = -.08$, $p = .00$) and experimental tasks assessing social cognition also became significant ($r = -.09$, $p = .00$). However, the type of social cognition measure (QM = 0.41, $p = .82$) and age no longer reached significance (QM = 7.94, $p = .09$), but the pattern of results within the age moderator remained consistent (see Table S2).

Discussion

This meta-analysis identified a small, but significant, association between social anxiety and social cognition among children and adolescents, where higher levels of social anxiety were associated with lower levels of social cognition. Follow-up analyses indicated that the considerable inconsistencies apparent across studies could be explained, at least in part, by both conceptual and methodological features of these studies. Specifically, significant findings appeared to be driven by studies which examined social anxiety among children with and without ASD as measured using a clinical tool and which included pre-adolescent and/or adolescents (i.e. more than 7 years old), but not younger (i.e. less than 7 years old) children. Smaller, but significant, effect sizes were also found among studies assessing the relationship between social anxiety and specific aspects of ToM that may be more cognitively demanding than aspects that were not significantly associated with social anxiety. Effects identified among those that used a self- or parent-report measure of social anxiety were similar, although notably about half of these studies compared children with and without ASD.

Our findings are consistent with previous research establishing that children with ASD have higher scores on measures of social anxiety than neurotypical children (e.g. Burrows et al., 2018; Orinstein et al., 2015; Usher, Burrows, Schwartz, & Henderson, 2015). In addition, findings are consistent with previous studies finding that social anxiety is associated with some, but not all, aspects of ToM (e.g. self-presentational displays, but not false belief; Banerjee & Henderson, 2001). However, in contrast to some previous studies, we did not find evidence that social anxiety was associated with impairments in emotion recognition. These findings raise interesting questions about whether social anxiety is associated with ASD broadly or is driven by associations with very specific dimensions of social cognition. It is also plausible that other features of ASD (i.e. those unrelated to social cognition) underlie the relationship with anxiety (e.g. intolerance of uncertainty; see Boulter, Freeston, South, & Rodgers, 2014), and potentially social anxiety specifically (e.g. experience of negative social interactions, Humphrey & Symes, 2010). Future studies are needed to elucidate exactly which features of ASD appear to create a risk for social anxiety in children and young people.

Several methodological features significantly moderated the relationship between social anxiety and social cognition. However, there was considerable overlap in the studies that accounted for moderation effects of conceptual and methodological features (see Figure S2 for illustrations of these overlaps) and, as such, it is difficult to disentangle the extent to which findings were influenced by each of these

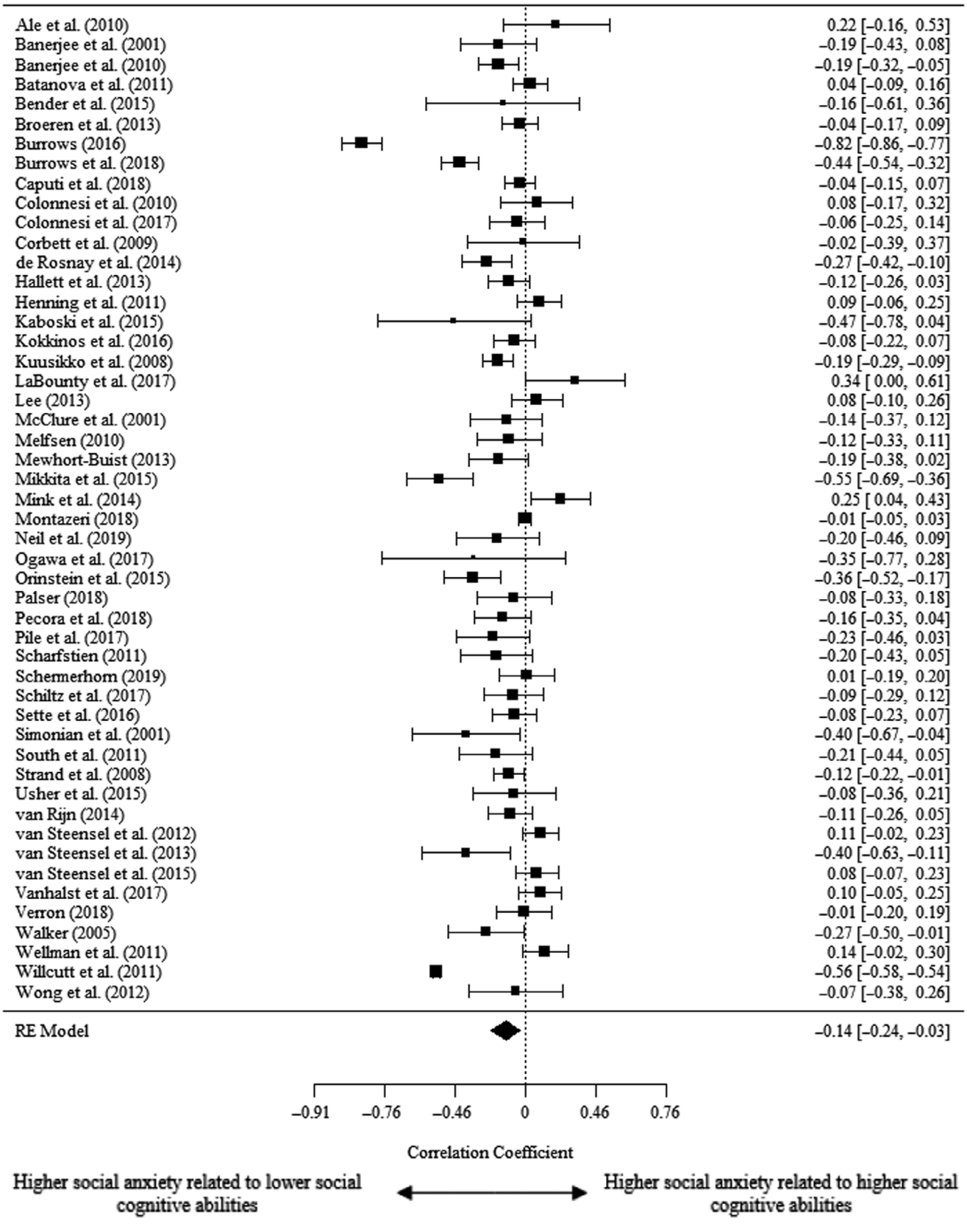

Figure 2 Forest plot displaying an aggregated effect size from each study and an overall effect size from the meta-analysis of aggregated study effect sizes

individually. For example, studies including children with ASD typically involved methodological features where significant associations between social cognition and social anxiety were found (e.g. 93% of these studies were between groups, 90% included a mixed sample (e.g. ASD vs. not ASD), 90% included

Table 2 Meta-analytic results

	N studies	*k*	*r*	95% CI	QM	*p*
Overall	50	150	−.15	−0.22, −0.07		
Moderators						
Conceptual factors						
Social anxiety dimension	50	150			0.64	.73
Social cognition dimension/phenotype	49	149			9.68	.01**
ASD	19	31	−.28***	−0.42, −0.14		
Emotion recognition (ER)	12	81	−.05	−0.14, 0.04		
ToM	21	37	−.05	−0.13, 0.02		
ER subtype	12	76			1.09	.78
ER face type	9	73			1.99	.37
ER face valence	11	58			16.60	.01**
Happy	5	10	−.13	−0.37, 0.11		
Afraid	3	4	−.05	−0.25, 0.15		
Anger	4	8	−.13	−0.27, 0.02		
Disgusted	2	5	−.20	−0.83, 0.44		
Sad	4	8	−.11	−0.29, 0.08		
Combined	7	23	−.03	−0.14, 0.08		
ToM subtype	18	29			6.50	.04*
False belief	11	13	−.01	−0.12, 0.10		
Presentational display	6	9	−.12*	−0.23, −0.00		
Affective ToM	6	7	−0.08	−0.25, 0.08		
Methodological factors						
Study design	50	150			4.34	.04*
Correlation	29	78	−.08†	−0.15, 0.00		
Between groups	22	72	−.24***	−0.37, −0.11		
Sample type	50	150			19.48	<.001***
Community	27	74	−.05	−0.11, 0.01		
Clinical	5	5	−.02	−0.18, 0.15		
Mixed	20	71	−.31***	−0.43, −0.18		
Type of social anxiety measure	50	150			2.46	.48
Type of social cognition measure	50	150			9.72	.02*
Clinical assessment	19	31	−.28***	−0.42, −0.14		
Experimental task	26	100	−.06	−0.13, 0.01		
Interview	4	16	−.05	−0.16, 0.07		
Informant of social anxiety measure	50	150			10.23	.02*
Self-report	25	62	−.18***	−0.28, −0.07		
Parent report	21	37	−.16*	−0.29, −0.03		
Teacher report	4	14	−.13	−0.30, 0.04		
Clinician report	6	37	−.09	−0.26, 0.08		
Informant of social cognition measure	50	150			16.65	<.01**
Self-report	31	117	−.05	−0.11, 0.01		
Parent report	6	7	−.20	−0.44, 0.04		
Clinician report	14	25	−.34***	−0.52, −0.17		
Demographic factors						
Age group	50	150			13.55	.02*
Young children (</= 6)	11	27	.03	−0.08, 0.13		
Pre-adolescents (7-12)	18	62	−.21***	−0.31, −0.11		
Adolescents (>/= 13)	1	6	.10**	0.04, 0.17		
Younger and older children (</= 12).	9	5	−.09	−0.23, 0.06		
Pre-adolescents and adolescents (>/= 7)	22	60	−.25***	−0.38, −0.13		
Full age range (0–18)	3	4	−.33†	−0.67, 0.01		
Sex	48	145			0.21	.65

The first level under each moderator is the reference category.
*$p < .05$; **$p < .01$; ***$p < .001$; †$p = .05$.

a pre-adolescent and/or adolescent sample, and 100% used clinical assessment as the measure). Of note, sensitivity analyses, for those that did not already take account of ASD cases, indicated that the overall pattern of results was consistent when the ASD studies were excluded from the analysis. However, none of the significant moderator findings were maintained, suggesting that these may be specific to ASD populations and/or the methodological approach taken in studies with ASD populations.

This conclusion is supported by the overlap in moderator variables that did not have significant effects on the association between social anxiety and social cognition. For example, studies assessing levels of social cognition that were not significant (ToM and emotion recognition) typically employed self-reported experimental measures to assess these

(which were also not significant). Self-report and experimental measures of social cognition are less reliant on observation of behavioural manifestations than parent and clinician report measures. As such, their significant overlap with measures assessing emotion recognition and ToM strengthens conclusions that these areas of social cognition may not be strongly associated with social anxiety.

Notably, although some areas of ToM were significantly associated with social anxiety, there were not clear differences in the methodology of studies finding a significant effect from those that found no significant effect. Similarly, the dimension of social anxiety that was measured did not seem to account for differences in results across child ages, settings and study designs. It will be important for future research to assess the association between social anxiety and individual dimensions of social cognition within different samples (e.g. clinically anxious samples) given the potential influence of these methodological features on findings.

In drawing conclusions about the pattern of findings, some limitations of the identified literature need to be highlighted. Notably, the emotion recognition tasks used in studies in this review typically required little cognitive load. This is not representative of the nature of real-world emotion recognition (Aviezer, Ensenberg, & Hassin, 2017) and would arguably be unlikely to identify effects within neurotypical populations. In addition, the required number of effect sizes to be included in moderation analyses was not obtained for some subtypes of ToM. However, qualitative assessment suggests that significant effects were found for children's ability to understand faux pas, where children with higher social anxiety symptoms were less able to accurately identify that the emotional consequences of a faux pas was unintended (Banerjee & Henderson, 2001; Banerjee & Watling, 2010). In contrast, significant effects were not consistently found for the relationship between social anxiety and children's ability to take another's perspective; a significant association was found with self-reported social anxiety symptoms (Pile et al., 2017), but not with parent- or teacher-reported shyness (LaBounty et al., 2017; Strand et al., 2008). Similarly, inconsistent effects were found for more general measures of ToM, where abilities at 3 years old were significantly associated with shyness at 12-month olds, but not associated with shyness at 3–6-years (Henning et al., 2011; Mink et al., 2014). These results support the idea that social anxiety may be associated with more complex aspects of ToM that are required to understand the subtler nuances of social interaction. However, given the limited investigation of some specific aspects of ToM, further examination is required.

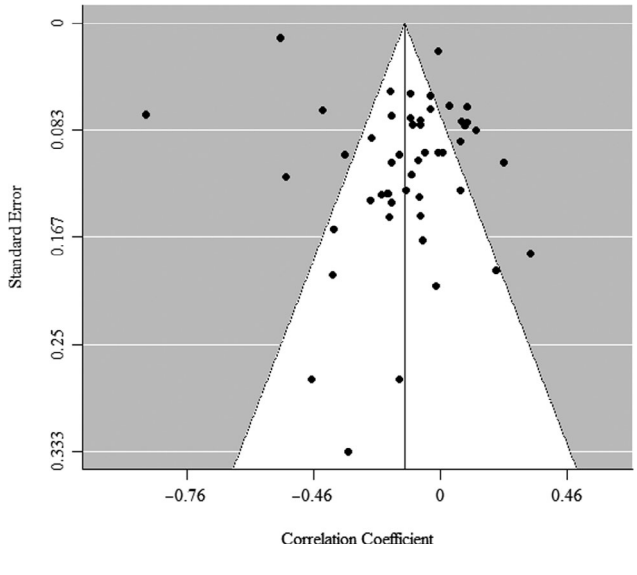

Figure 3 Funnel plot showing the risk of bias in the selection of studies

We did not find that the type of social anxiety measured (i.e. social anxiety and shyness) moderated the association with social cognition, and this may be explained by the levels of this moderator sharing common individual components (including avoidance of feared stimuli). However, these individual components may have different relationships with social cognition which may be masked by the tendency to use fairly general measures of social anxiety and shyness. Indeed, where specific components of social anxiety were investigated, their relationship with social cognition varied; for example, avoidance of general situations and fear of negative evaluation had a significant *negative* association with ASD and verbal emotion recognition respectively (Kaboski et al., 2015; Vanhalst et al., 2017), but fear of negative evaluation had a significant *positive* relationship with facial emotion recognition (McClure & Nowicki, 2001). Given that these specific components are common to both social anxiety and shyness, and that few studies examined them in isolation, it was not possible to include these as levels in their own right. Future research would benefit from examining more discrete components of both social anxiety and social cognition in order to more accurately assess their relationship. Of note, the study that found a positive relationship between fear of negative evaluation and verbal emotion recognition was also the one study in the meta-analysis that only included adolescents only. As such, it is unclear whether the relationship between social anxiety and social cognition would be consistent for pre-adolescents (and whether it is specific to the particular social anxiety and social cognition dimensions that were measured). Future studies would benefit from evaluating associations within more discrete age ranges in order to improve our understanding of whether and how the relationship between social anxiety and social cognition changes through development. In addition to inconsistencies in the age group studied, there also tended to be an

imbalance in the sex of participants, particularly within studies recruiting ASD samples, which may have affected the lack of significant result of sex as a moderator.

This systematic review and meta-analysis has several strengths, including its broad consideration of the association between social anxiety and social cognition, quantification of the size of the effect and exploration of how that was influenced by several conceptual and methodological moderators. However, several limitations should also be borne in mind. This review focused on dimensions of social cognition that were unlikely to be affected by external confounds (e.g. inhibition) or to have a broader effect on other areas of functioning. Consequently, children's ability to effectively produce social signals and supporting dimensions of social cognition (e.g. affinity to understand or produce effective social signals, working memory, learning, and joint attention) were not included. As such, conclusions cannot be drawn from this review about the relationship between social anxiety and these broader dimensions of social cognition. Although our inclusion criteria were developed to maximise the chance that all papers included were of good quality, our quality assessments identified several areas in which studies did not meet quality standards. For example, many of the between groups studies included assessments of social anxiety disorder or ASD for the case group, but not for the control group. Instead questionnaires were typically used to rule out caseness, although in some cases there appeared to be no systematic procedure to confirm the absence of caseness (Kuusikko et al., 2008; Scharfstein et al., 2011). Quality assessments also indicated that many studies failed to report a justification for their sample size, whether controls were recruited concurrently with cases, and to provide demographic information relating to ethnicity and socioeconomic status. In particular, study designs often do not allow for the possibility that a subgroup of socially anxious children might account for relationships between social anxiety and social cognition. Where lower quality studies were excluded, the pattern of results remained generally consistent with the main analyses, although several levels of moderators became significant (see Table S2). However, there were no clear differences between included and excluded papers.

A potential limitation of the current paper is the operational definition of social anxiety used which required measures to assess a fear of negative evaluation, given recent suggestions that fear of negative evaluation may not be a core feature of social anxiety among people with ASD (e.g. Kerns & Kendall, 2012). However, no studies were excluded on this basis. This does raise the question of whether the standard measures of social anxiety that are being administered are suitable for ASD populations. Future examination of the nature of social anxiety and how it may differ among children with ASD and neurotypical children is warranted, for example using measurement invariance approaches (e.g. Glod et al., 2017). A further potential limitation is the exclusion of grey literature. However, we can be reassured by the rank and correlation tests and trim and fill analyses which suggested that there was unlikely to be a publication bias in the papers identified.

Our findings showed that pre-adolescents and adolescents with ASD typically have elevated social anxiety symptoms. However, the evidence for a relationship between social anxiety and social cognition outside of ASD populations was mixed. For example, the results suggest that that there was not a significant association between social anxiety and aspects of social cognition such as emotion recognition and some aspects of ToM (e.g. false belief understanding). However, increased social anxiety symptoms appeared to be related to difficulties in specific aspects of complex ToM abilities (e.g. understanding of presentational displays). This highlights important questions for future research and treatment of social anxiety in neurotypical children, as well as children with ASD. In particular, the use of social skills based treatments that target emotion recognition abilities and other basic social skills may not be required to effectively treat SAD in neurotypical children. However, a focus on complex aspects of social interaction may be more appropriate. Going forwards, it will be important to consider the extent to which these specific social cognition difficulties influence children's abilities to make best use of other central aspects of CBT such as exposure. Finally, in line with the robust support for the association between ASD and elevated social anxiety, studies of adapted CBT have already shown some promise for targeting anxiety (including social anxiety) symptoms in children with ASD (e.g. White et al., 2013; Wood et al., 2019). However, further development of these treatments and of programmes to improve identification of and treatment effects specifically for social anxiety among ASD populations are clearly warranted.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Appendix S1. Search criteria.
Appendix S2. Eligibility criteria.
Appendix S3. Moderators and definitions.
Appendix S4. Quality assessment.
Figure S1. The distribution of age ranges that studies were grouped into.
Figure S2. Charts Illustrating the overlaps between moderators from the main findings.

Table S1. Sensitivity analyses omitting ASD studies.
Table S2. Sensitivity analyses omitting lower quality studies.

Acknowledgements
The authors would like to thank the undergraduate and postgraduate students who assisted in second coding the abstracts for this review. The authors have declared that they have no competing or potential conflicts of interest.

Correspondence
Samantha Pearcey, Department of Experimental Psychology, Anna Watts Building, University of Oxford, Woodstock Road, Oxford OX2 6GG. UK; Email: samantha.pearcey@psych.ox.ac.uk

Key points

- Treatments including social skills training for SAD are typically more effective than those that do not, but evidence for an association between social anxiety and social skills difficulties is hindered by an overlap in their presentation.
- Measuring the cognitions underlying social skills may provide clearer conclusions.
- A medium negative association was present between social anxiety and social cognitive abilities.
- Particular associations were identified for social anxiety with Autism Spectrum Disorder and specific aspects of theory of mind, but not emotion recognition.
- Treatments that focus on specific abilities in social interactions may be more relevant to neurotypical populations than those focussing on broader social skills abilities. More effective identification and treatment of SAD in autistic populations is warranted.

Note

1.. For example False belief (i.e. the ability to identify and understand that others have different knowledge or beliefs as oneself); Presentational display (i.e. identifying and understanding deceptive behaviours); Affective ToM (i.e. understanding other's emotional responses).

References

Abell, F., Krams, M., Ashburner, J., Passingham, R., Friston, K., Frackowiak, R., … & Happe, F. (1999). The neuroanatomy of autism: A voxel-based whole brain analysis of structural scans. *NeuroReport*, *10*, 1647–1651.

Ale, C.M., Chorney, D.B., Brice, C.S., & Morris, T.L. (2010). Facial affect recognition and social anxiety in preschool children. *Early Child Development and Care*, *180*, 1349–1359.

American Psychiatric Association (1980). *Diagnostic and statistical manual of mental disorders* (3rd edn). Washington, DC: Author.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th edn, text revised). Washington, DC: Author.

Aviezer, H., Ensenberg, N., & Hassin, R.R. (2017). The inherently contextualized nature of facial emotion perception. *Current Opinion in Psychology*, *17*, 47–54.

Banerjee, R., & Henderson, L. (2001). Social-cognitive factors in childhood social anxiety: A preliminary investigation. *Social Development*, *10*, 558–572.

Banerjee, R., & Watling, D. (2010). Self-presentational features in childhood social anxiety. *Journal of Anxiety Disorders*, *24*, 34–41.

Batanova, M.D., & Loukas, A. (2011). Social anxiety and aggression in early adolescents: Examining the moderating roles of empathic concern and perspective taking. *Journal of Youth and Adolescence*, *40*, 1534–1543.

Beesdo, K., Bittner, A., Pine, D.S., Stein, M.B., Hofler, M., Lieb, R., & Wittchen, H. (2007). Incidence of social anxiety disorder and the consistent risk for secondary depression in the first three decades of life. *Archives of General Psychiatry*, *64*, 903–912.

Beidel, D.C., Turner, S.M., & Morris, T.L. (2000). Behavioral treatment of childhood social phobia. *Journal of Consulting and Clinical Psychology*, *68*, 1072–1080.

Bender, P.K., Pons, F., Harris, P.L., Esbjørn, B.H., & Pons, F. (2015). Emotion understanding in clinically anxious children: A preliminary investigation. *Frontiers in Psychology*, *6*, 1–10.

Boulter, C., Freeston, M., South, M., & Rodgers, J. (2014). Intolerance of uncertainty as a framework for understanding anxiety in children and adolescents with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *44*, 1391–1402.

Broeren, S., Muris, P., Diamantopoulou, S., & Baker, J.R. (2013). The course of childhood anxiety symptoms: Developmental trajectories and child-related factors in normal children. *Journal of Abnormal Child Psychology*, *41*, 81–95.

Buckner, J.D., Schmidt, N.B., Lang, A.R., Small, J.W., Schlauch, R.C., & Lewinsohn, P.M. (2008). Specificity of social anxiety disorder as a risk factor for alcohol and Cannabis dependence. *Journal of Psychiatric Research*, *42*, 230–239.

Burrows, C.A., Usher, L.V., Becker-Haimes, E.M., McMahon, C.M., Mundy, P.C., Jensen-Doss, A., & Henderson, H.A. (2018). Profiles and correlates of parent-child agreement on social anxiety symptoms in youth with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *48*, 2023–2037.

Burrows, C.A., Usher, L.V., Schwartz, C.B., Mundy, P.C., & Henderson, H.A. (2016). Supporting the spectrum hypothesis: Self-reported temperament in children and adolescents with high functioning autism. *Journal of Autism and Developmental Disorders*, *46*, 1184–1195.

Caputi, M., & Schoenborn, H. (2018). Theory of mind and internalizing symptoms during middle childhood and early adolescence: the mediating role of coping strategies. *Cogent Psychology*, *5*, 1–15.

Cartwright-Hatton, S., Hodges, L., & Porter, J. (2003). Social anxiety in childhood: The relationship with self and observer rated social skills. *Journal of Child Psychology and Psychiatry*, *44*, 737–742.

Cartwright-Hatton, S., Tschernitz, N., & Gomersall, H. (2005). Social anxiety in children: Social skills deficit, or cognitive distortion? *Behaviour Research and Therapy*, *43*, 131–141.

Cheek, J.M., & Buss, A.H. (1981). Shyness and sociability. *Journal of Personality and Social Psychology*, *41*, 330–339.

Colonnesi, C., Engelhard, I.M., & Bögels, S.M. (2010). Development in children's attribution of embarrassment and the relationship with theory of mind and shyness. *Cognition and Emotion*, *24*, 514–521.

Colonnesi, C., Nikolić, M., de Vente, W., & Bögels, S.M. (2017). Social anxiety symptoms in young children: Investigating the interplay of theory of mind and expressions of shyness. *Journal of Abnormal Child Psychology*, *45*, 997–1011.

Corbett, B.A., Carmean, V., Ravizza, S., Wendelken, C., Henry, M.L., Carter, C., & Rivera, S.M. (2009). A functional and structural study of emotion and face processing in children with autism. *Psychiatry Research - Neuroimaging*, *173*, 196–205.

De Rosnay, M., Fink, E., Berger, S., Slaughter, V., & Peterson, C. (2014). Talking theory of mind talk: young school-aged children's everyday conversation and understanding of mind and emotion. *Journal of Child Language*, *41*, 1179–1193.

De Winter, J.C.F., Gosling, S.D., & Potter, J. (2016). Comparing the Pearson and Spearman Correlation coefficients across distributions and sample sizes: A Tutorial using simulations and empirical data. *Psychological Methods*, *21*, 273–290.

Duval, S., & Tweedie, R. (2000a). A nonparametric, "Trim and Fill" method of accounting for publication bias in meta-analysis. *Journal of the American Statistical Association*, *95*, 89–98.

Duval, S., & Tweedie, R. (2000b). Trim and fill: A simple funnel-plot-based method. *Biometrics*, *56*, 455–463.

Field, A.P., & Gillett, R. (2010). How to do a meta-analysis. *British Journal of Mathematical and Statistical Psychology*, *63*, 665–694.

Forthofer, M., Kessler, R.C., Story, A.L., & Gotlib, I. (1996). The effects of psychiatric disorders on the probability and timing of first marriage. *Journal of Health and Social Behavior*, *37*, 121–132.

Frith, U., & Blakemore, S. (2003). Social Cognition. Retrieved from https://d1wqtxts1xzle7.cloudfront.net/30703793/10.1.1.121.9914.pdf?1361986789=&response-content-disposition=inline%3B+filename%3DForesight_Cognitive_Systems_Project_Rese.pdf&Expires=1596364697&Signature=SuM%7ERm-ZHMISd%7ENiun3kxyM%7EDGAN7mjqWlUjSpXBdH0pKBukyBuJ%7EkpSZZRm61ZeF%7EZLHBsUMFJVKHYukmqM5HnFgflmKnc-E2QkuiJQSPWZ7uD8jVy-rtgO26zTN%7EENdMTmlpLqeALHg2MHiG%7E1UFdA6Z0vYKptS3QyX7cs1-p9kgncHEXw2On3fTDQ74%7Ev9GXAJAgtJYTkNF-QZoblPmfC0eWgienA01kOc-4GxrGikzZPBhNQj4x0p13sp6EBWiBCV3iiBwyhaebyyiuCom-CoR2YhDUHrw7tMKM2Kg1bvxyrmoJJqGAuioY%7EFFsNhagN2K-RZ1G9yDK-KaHrBA__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

Gallese, V., Keysers, C., & Rizzolatti, G. (2004). A unifying view of the basis of social cognition. *Trends in Cognitive Sciences*, *8*, 396–403.

Glod, M., Creswell, C., Waite, P., Jamieson, R., McConachie, H., South, M.D., & Rodgers, J. (2017). Comparisons of the factor structure and measurement invariance of the spence children's anxiety scale—parent version in children with autism spectrum disorder and typically developing anxious children. *Journal of Autism and Developmental Disorders*, *47*, 3834–3846.

Greco, L.A., & Morris, T.L. (2005). Factors influencing the link between social anxiety and peer acceptance: Contributions of social skills and close friendships during middle childhood. *Behavior Therapy*, *36*, 197–205.

Gresham, F.M., & Elliott, S.N. (1990). *Social skills rating system (SSRS)*. New York: American Guidance Service.

Halldorsson, B., Castelijn, S., & Creswell, C. (2019). Are children with social anxiety disorder more likely than children with other anxiety disorders to anticipate poor social performance and reflect negatively on their performance? *Journal of Affective Disorders*, *245*, 561–568.

Halldorsson, B., & Creswell, C. (2017). Social anxiety in pre-adolescent children: What do we know about maintenance? *Behaviour Research and Therapy*, *99*, 19–36.

Hallett, V., Ronald, A., Colvert, E., Ames, C., Woodhouse, E., Lietz, S., … & Happé, F. (2013). Exploring anxiety symptoms in a large-scale twin study of children with autism spectrum disorders, their co-twins and controls. *Journal of Child Psychology and Psychiatry*, *54*, 1176–1185.

Halls, G., Cooper, P.J., & Creswell, C. (2014). Social communication deficits: Specific associations with Social Anxiety Disorder. *Journal of Affective Disorders*, *172*, 38–42.

Henning, A., Spinath, F.M., & Aschersleben, G. (2011). The link between preschoolers' executive function and theory of mind and the role of epistemic states. *Journal of Experimental Child Psychology*, *108*, 513–531.

Humphrey, N., & Symes, W. (2010). Perceptions of social support and experience of bullying among pupils with autistic spectrum disorders in mainstream secondary schools secondary schools. *European Journal of Special Needs Education*, *25*, 77–91.

Kaboski, J.R., Diehl, J.J., Beriont, J., Crowell, C.R., Villano, M., Wier, K., & Tang, K. (2015). Brief report: A pilot summer robotics camp to reduce social anxiety and improve social/vocational skills in adolescents with ASD. *Journal of Autism and Developmental Disorders*, *45*, 3862–3869.

Kalbe, E., Schlegel, M., Sack, A.T., Nowak, D.A., Dafotakis, M., Bangard, C., … & Kessler, J. (2010). Dissociating cognitive from affective theory of mind: A TMS study. *Cortex*, *46*, 769–780.

Kerns, C.M., & Kendall, P.C. (2012). The presentation and classification of anxiety in autism spectrum disorder. *Clinical Psychology: Science and Practice*, *19*, 323–347.

Kessler, C., Foster, L., Saunders, B., & Stang, P.E. (1995). Social consequences of psychiatric disorders, I: Educational attainment influence. *American Journal of Psychiatry*, *152*, 1026–1032.

Kessler, R.C., Avenevoli, S., Costello, E.J., Georgiades, K., Green, J.G., Gruber, M.J., … & Merikangas, K.R. (2012). Prevalence, persistence, and sociodemographic correlates of DSM-IV Disorders in the National Comorbidity Survey Replication Adolescent Supplement. *Archives of General Psychiatry*, *69*, 372–380.

Kessler, R.C., Berglund, P., Demler, O., Jin, R., Merikangas, K.R., & Walters, E.E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV Disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*, 593–602.

Kim-cohen, J., Caspi, A., Moffitt, T.E., Harrington, H., Milne, B., & Poulton, R. (2003). Prior juvenile diagnoses in adults with mental disorder. *Archives of General Psychiatry*, *60*, 709–717.

Kokkinos, C.M., Kakarani, S., & Kolovou, D. (2016). Relationships among shyness, social competence, peer relations, and theory of mind among pre-adolescents. *Social Psychology of Education*, *19*, 117–133.

Kuusikko, S., Pollock-Wurman, R., Jussila, K., Carter, A.S., Mattila, M.L., Ebeling, H., … & Moilanen, I. (2008). Social anxiety in high-functioning children and adolescents with

autism and Asperger syndrome. *Journal of Autism and Developmental Disorders*, *38*, 1697–1709.

LaBounty, J., Bosse, L., Savicki, S., King, J., & Eisenstat, S. (2017). Relationship between social cognition and temperament in preschool-aged children. *Infant and Child Development*, *26*, 1–10.

Lampe, L. (2015). Psychiatry Australasian Social anxiety disorders in clinical practice: Differentiating social phobia from avoidant personality disorder. *Australian Psychiatry*, *23*, 343–346.

Lee, T.C., Dupuis, A., Jones, E., Guberman, C., Candidate, M.A., Herbert, M., & Manassis, K. (2013). Effects of age and subtype on emotional recognition in children with anxiety disorders: Implications for cognitive-behavioural therapy. *Canadian Journal of Psychiatry*, *58*, 283–290.

Lord, C., Risi, S., Lambrecht, L., Cook, E.H., Leventhal, B.L., Dilavore, P.C., … & Rutter, M. (2000). The autism diagnostic observation schedule – generic : A standard measure of social and communication deficits associated with the spectrum of autism. *Journal of Autism and Developmental Disorders*, *30*, 205–223.

Lord, C., Rutter, M., & Le Couteur, A. (1994). Autism diagnostic interview-revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders 1. *Journal of Autism and Developmental Disorders*, *24*, 659–685.

McClure, E.B., & Nowicki, S. (2001). Associations between social anxiety and nonverbal processing skill in preadolescent boys and girls. *Journal of Nonverbal Behavior*, *25*, 3–19.

Melfsen, S., & Florin, I. (2002). Do socially anxious children show deficits in classifying facial expressions of emotions? *Journal of Nonverbal Behaviour*, *26*, 109–126.

Mewhort-buist, T.A., & Nilsen, E.S. (2013). What are you really saying? Associations between shyness and verbal irony comprehension. *Infant and Child Development*, *197*, 180–197.

Mikita, N., Hollocks, M.J., Papadopoulos, A.S., Aslani, A., Harrison, S., Leibenluft, E., … & Stringaris, A. (2015). Irritability in boys with autism spectrum disorders: an investigation of physiological reactivity. *Journal of Child Psychology and Psychiatry*, *56*, 1118–1126.

Mink, D., Henning, A., & Aschersleben, G. (2014). Infant shy temperament predicts preschoolers Theory of Mind. *Infant Behavior and Development*, *37*, 66–75.

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., … & Stewart, L.A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, *4*, 1–9.

Montazeri, F., Bildt, A.De, Dekker, V., & Anderson, G.M. (2019). Network analysis of anxiety in the autism realm. *Journal of Autism and Developmental Disorders*, *49*, 2219–2230.

Morgan, J., & Banerjee, R. (2006). Social anxiety and self-evaluation of social performance in a nonclinical sample of children. *Journal of Clinical Child and Adolescent Psychology*, *35*, 292–301.

National Institute for Health and Care Excellence (2013). *Social anxiety disorder: Recognition, assessment and treatment (NICE Quality Standard, CG159)*.

Neil, L., White, H., Warren, K., Pellicano, E., & Neil, L. (2019). Anxiety and interpretation of ambiguity in autistic children, typical children and their mothers. *Journal of Autism and Developmental Disorders*, *49*, 1035–1047.

Ogawa, S., Lee, Y.A., Yamaguchi, Y., Shibata, Y., & Goto, Y. (2017). Associations of acute and chronic stress hormones with cognitive functions in autism spectrum disorder. *Neuroscience*, *343*, 229–239.

Orinstein, A., Tyson, K.E., Suh, J., Troyb, E., Helt, M., Rosenthal, M., … & Fein, D.A. (2015). Psychiatric symptoms in youth with a history of autism and optimal outcome. *Journal of Autism and Developmental Disorders*, *45*, 3703–3714.

Palser, E.R., Fotopoulou, A., Pellicano, E., & Kilner, J.M. (2018). The link between interoceptive processing and anxiety in children diagnosed with autism spectrum disorder: Extending adult findings into a developmental sample. *Biological Psychology*, *136*, 13–21.

Pearcey, S., Alkozei, A., Chakrabarti, B., Dodd, H., Murayama, K., Stuijfzand, S., & Creswell, C. (2018). Do clinically anxious children cluster according to their expression of factors that maintain child anxiety? *Journal of Affective Disorders*, *229*, 469–476.

Pecora, G., Addessi, E., Paoletti, M., & Bellagamba, F. (2018). Relations between temperament and false belief understanding in the preschool age. *Journal of Child and Family Studies*, *27*, 1682–1691.

Pile, V., Haller, S.P.W., Hiu, C.F., & Lau, J.Y.F. (2017). Young people with higher social anxiety are less likely to adopt the perspective of another: Data from the Director task. *Journal of Behavior Therapy and Experimental Psychiatry*, *55*, 41–48.

R Core Team (2018). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. Available online at https://www.R-project.org/

Rapee, R.M., & Heimberg, R.G. (1997). A cognitive-behavioural model of anxiety in social phobia. *Behaviour Research and Therapy*, *35*, 741–756.

Richardson, J.T.E. (1996). Measures of effect size. *Behaviour Research Methods*, *28*, 12–22.

Scharfstein, L.A., Beidel, D.C., Sims, V.K., & Rendon Finnell, L. (2011). Social skills deficits and vocal characteristics of children with social phobia or asperger's disorder: A comparative study. *Journal of Abnormal Child Psychology*, *39*, 865–875.

Schermerhorn, A.C. (2019). Associations of child emotion recognition with interparental conflict and shy child temperament traits. *Journal of Social and Personal Relationships*, *36*, 1343–1366.

Schiltz, H., Mcintyre, N., Swain, L., Matthew, L., & Mundy, P. (2017). The stability of self-reported anxiety in youth with autism versus ADHD or typical development. *Journal of Autism and Developmental Disorders*, *47*, 3756–3764.

Sette, S., Baumgartner, E., Laghi, F., & Coplan, R.J. (2016). The role of emotion knowledge in the links between shyness and children's socio-emotional functioning at preschool. *The British Journal of Developmental Psychology*, *34*, 471–488.

Sharp, C., Fonagy, P., & Goodyer, I. (2008). *Social cognition and developmental psychopathology*. Oxford: Oxford University Press.

Simonian, S.J., Beidel, D.C., Turner, S.M., Berkes, J.L., & Long, J.H. (2001). Recognition of facial affect by children and adolescents diagnosed with social phobia. *Child Psychiatry & Human Development*, *32*, 137–145.

Simonoff, E., Sych, F.R.C.P., Pickles, A., Charman, T., Chandler, S., Loucas, T.O.M., … & Turner, M. (2008). Psychiatric disorders in children with autism spectrum disorders: Prevalence, comorbidity, and associated factors in a population-derived sample. *Journal of the American Academy of Child & Adolescent Psychiatry*, *47*, 921–929.

South, M., Larson, M.J., White, S.E., Dana, J., & Crowley, M.J. (2011). Better fear conditioning is associated with reduced symptom severity in autism spectrum disorders. *Autism Research*, *4*, 412–421.

Spence, S.H., Donovan, C., & Brechman-Toussaint, M. (1999). Social skills, social outcomes, and cognitive features of childhood social phobia. *Journal of Abnormal Psychology*, *108*, 211–221.

Spence, S.H., Donovan, C., & Brechman-toussaint, M. (2000). The treatment of childhood social phobia: The effectiveness of a social skills training-based, cognitive-behavioural

intervention, with and without parental involvement. *Journal of Child Psychology and Psychiatry*, *41*, 713–726.
Spence, S.H., Donovan, C.L., March, S., Kenardy, J.A., & Hearn, C.S. (2017). Generic versus disorder specific cognitive behavior therapy for social anxiety disorder in youth: A randomized controlled trial using internet delivery. *Behaviour Research and Therapy*, *90*, 41–57.
Stein, D.J., Lim, C.C.W., Roest, A.M., De Jonge, P., Aguilar-gaxiola, S., Al-hamzawi, A., … & De Girolamo, G. (2017). The cross-national epidemiology of social anxiety disorder: Data from the World Mental Health Survey Initiative. *BMC Medicine*, *15*, 1–21.
Strand, P., Cerna, S., & Downs, A. (2008). Shyness and Emotion-processing skills in preschoolers: A 6-month Longitudinal Study. *Clinical Cancer Research*, *4*, 1383–1391.
Study Quality Assessment Tools (2018). Available from www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools.
Tuschen-caffier, B., Kühl, S., & Bender, C. (2011). Cognitive-evaluative features of childhood social anxiety in a performance task. *Journal of Behavior Therapy and Experimental Psychiatry*, *42*, 233–239.
Usher, L.V., Burrows, C.A., Schwartz, C.B., & Henderson, H.A. (2015). Social competence with an unfamiliar peer in children and adolescents with high functioning autism: Measurement and individual differences. *Research in Autism Spectrum Disorders*, *17*, 25–39.
Van Rijn, S., Stockmann, L., Borghgraef, M., Bruining, H., Van Ravenswaaij-Arts, C., Govaerts, L., … & Swaab, H. (2014). The social behavioral phenotype in boys and girls with an extra X chromosome (Klinefelter syndrome and Trisomy X): A comparison with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *44*, 310–320.
van Steensel, F.J.A., & Bogels, S.M. (2015). CBT for anxiety disorders in children with and without autism spectrum conditions. *Autism Research*, *83*, 512–523.
van Steensel, F.J.A., Bögels, S.M., & Dirksen, C.D. (2012). Anxiety and quality of life: Clinically anxious children with and without autism spectrum disorders compared. *Journal of Clinical Child and Adolescent Psychology*, *41*, 731–738.
Van Steensel, F.J.A., Bögels, S.M., & Wood, J.J. (2013). Autism spectrum traits in children with anxiety disorders. *Journal of Autism and Developmental Disorders*, *43*, 361–370.
Vanhalst, J., Gibb, B.E., & Prinstein, M.J. (2017). Lonely adolescents exhibit heightened sensitivity for facial cues of emotion. *Cognition and Emotion*, *31*, 377–383.
Verron, H., & Teglasi, H. (2018). Indirect effects of temperament on social competence via emotion understanding indirect effects of temperament on social competence via emotion understanding. *Early Education and Development*, *29*, 655–674.
Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor Package. *Journal of Statistical Software*, *36*, 1–48.
Viechtbauer, W., & Cheung, M.W. (2010). Outlier and influence diagnostics for meta-analysis. *Research Synthesis Methods*, *1*, 112–125.
Walker, S. (2005). Gender differences in the relationship between young children's peer-related social competence and individual differences in theory of mind. *Journal of Genetic Psychology*, *166*, 297–312.
Wellman, H.M., Lane, J.D., LaBounty, J., & Olson, S.L. (2011). Observant, nonaggressive temperament predicts theory of mind development. *Contact and Intraocular Lens Medical Journal*, *7*, 111–114.
White, S.W., Ollendick, T., Albano, A.M., Oswald, D., Johnson, C., Southam-Gerow, M.A., & Scahill, L. (2013). Randomized controlled trial: Multimodal anxiety and social skill intervention for adolescents with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *43*, 382–394.
White, S.W., Oswald, D., Ollendick, T.H., & Scahill, L. (2009). Anxiety in children and adolescents with Autism Spectrum Disorders. *Clinical Psychology Review*, *29*, 216–229.
Wickham, H. (2007). Reshaping data with the reshape package. *Journal of Statistical Software*, *21*, 1–20.
Willcutt, E.G., Boada, R., Riddle, M.W., & Pennington, B.F. (2011). Colorado learning difficulties questionnaire: Validation of a parent-report screening measure. *Psychological Assessment*, *23*, 778–791.
Wong, N., Beidel, D.C., Sarver, D.E., & Sims, V. (2012). Facial emotion recognition in children with high functioning autism and children with social phobia. *Child Psychiatry and Human Development*, *43*, 775–794.
Wood, J.J., Kendall, P.C., Wood, K.S., Kerns, C.M., Seltzer, M., Small, B.J., … & Storch, E.A. (2019). Cognitive behavioral treatments for anxiety in children with autism spectrum disorder: A Randomized Clinical Trial. *JAMA Psychiatry*, *77*, 474–483.

Accepted for publication: 29 June 2020