Understanding the social difficulties and the distribution of other putative maintenance mechanisms of childhood anxiety disorders.

Submitted thesis for: Doctor of Philosophy.

School of Psychology and Clinical Language Sciences

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Declaration.

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Samantha Pearcey.

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Contribution to Papers.

Samantha Pearcey (SP) was the lead researcher for all the research that is reported in the papers within this thesis. For studies two and three, all of the research planning was carried out by SP, with support from her supervisors. SP conducted and oversaw recruitment of participants, the data collection, data entry and coding of data. For study one, this was carried out by researchers duly acknowledged in the section below. All the data analysis for all research reported in this thesis was carried out by SP, with supervision as detailed below. SP wrote the first draft of each paper and submitted paper one for publication. Her specific contribution to each paper, along with the contribution from other authors are described below.

Paper 1: Identifying subgroups.

Cathy Creswell (CC), Bhismadev Chakrabarti (BC), and Helen Dodd (HD) conceived the general idea upon which this study was based. Anna Alkozei (AA) collected the data and, along with Suzannah Stuijfzand (SS), cleaned and prepared all of the heart rate data ready for analysis. SP developed the specific hypotheses and analysis plan and performed the analysis with the assistance of Kou Murayama (KM). SP wrote the first draft of the manuscript and revised subsequent drafts after receiving feedback from CC and with input from all authors.

Paper 2: Meta-analysis.

SP led planning of the review and meta-analysis including developing the research question, designing the search strategy, inclusion and exclusion criteria, and determining moderators.

Co-authors (CC, BC, HD and Brynjar Halldorsson; BH) contributed to the planning of the review by participating in discussions in which search terms and inclusion criteria were refined. SP ran the literature searches, screened all abstracts and full texts for inclusion in the review, and conducted all hand searching. SP supervised the second coding of abstract and full text screening, as well as the initial quality coding of included papers, and carried out second coding of quality. SP discussed any papers where inclusion was unclear with CC, BC and KG. SP extracted all data from the paper, conducted the analysis and constructed the figures and tables. SP wrote the first draft of the manuscript and revised subsequent drafts after receiving feedback from CC and with input from all authors.

Paper 3: Theory of Mind Study.

SP designed the study, prepared the ethics application with BH and prepared the study documents. SP planned the analysis with support from co-authors (CC, BC). SP and BH led participant recruitment and SP led the data collection; including overseeing and conducting the recruitment of clinical participants, contacting schools and families for community recruitment and conducting data collection sessions (with assistance from post-graduate research assistants). SP also supervised a team of undergraduate and post-graduate students in data entry and task coding and carried out part of this herself. SP developed the analysis plan, wrote all data preparation and analysis scripts and carried out the analysis with support from CC and BC. SP wrote the first draft of the manuscript and revised subsequent drafts after receiving feedback from CC and with input from all authors.

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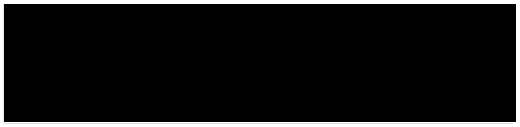

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Abstract.

Anxiety disorders are common in childhood and have a significant negative effect on functioning. Although cognitive behavioural therapy (CBT) is an effective treatment for many children with anxiety disorders, a significant number of children retain a diagnosis after treatment. Furthermore, children with social anxiety disorder (SAD) have worse outcomes from generic forms of CBT than children with other anxiety disorders. This is likely to be at least partly because the putative maintenance mechanisms that are targeted in CBT are not yet well understood in the context of childhood anxiety disorders in general and SAD in particular. Notably, better outcomes are found for child SAD when treatment includes social skills training, despite mixed evidence for the presence of social skills deficits in socially anxious children. However, this literature is difficult to interpret given measurement issues caused by an overlap in the observable behaviours of social skills deficits and social anxiety.

This thesis aims to first establish whether there are subgroups of children with anxiety disorders characterised by particular profiles of the mechanisms targeted in generic CBT programmes (including social skills deficits) within a sample of children who have been diagnosed with a clinical anxiety disorder. The second aim is to explore the relationship between social anxiety and social skills difficulties in more depth. This will be achieved by investigating the relationship between social anxiety and the social cognitions that underlie social skills in order to overcome limitations of previous research which confounded measurements of social anxiety and social skills themselves.

The findings suggest that clinically anxious children cluster into three groups according to the putative maintenance mechanisms of childhood anxiety disorders, but that these do not neatly align with existing diagnostic categories. In addition, the findings suggest that social skills difficulties may be present in only a small proportion of children with SAD, but that underlying difficulties in specific aspects of complex Theory of Mind (ToM; i.e. identifying the intentions of others in complex interactions) may be related to SAD more broadly. These findings have implications for the use of specific treatments for children with SAD, targeting their understanding of complex social interactions, rather than general social skills. In addition, these findings identify key variables that warrant further examination to improve understanding of the maintenance of anxiety disorders in children.

Chapter 1:

General Introduction.

1.1 Anxiety disorders in children.

Anxiety disorders occur when normal fears and worries become persistent and interfere significantly with daily life. They are the most prevalent mental health disorders in childhood, affecting approximately 6.5% of children worldwide (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015). There are several types of anxiety disorder that are commonly experienced by children. These include separation anxiety disorder (SEP; anxiety upon separating from a loved one and fear that they will not return), generalised anxiety disorder (GAD; intense and persistent worry about several topics), social anxiety disorder (SAD; fear of negative evaluation from others and, consequently, the avoidance of social situations, or endurance with distress), specific phobias (severe anxiety and avoidance of a specific thing, such as fear of the dark), agoraphobia (the avoidance of specific places due to the fear that an uncomfortable physiological feeling might be experienced and there would be no way of getting help or escaping), and panic disorder (panic attacks experienced out of the blue and anxiety about them happening in the future).

Studies of the clinical characteristics of anxiety disorders amongst children and adolescents have shown that the most commonly diagnosed anxiety disorders are GAD, SEP, SAD and specific phobias (26%, 19%, 17% and 12% of a treatment seeking sample respectively; Waite & Creswell, 2014). In contrast, SEP tends to be diagnosed in significantly fewer adolescents (4%) and SAD in significantly more adolescents compared

to pre-adolescents (29%; Waite & Creswell, 2014). Adolescents also tend to experience fewer diagnoses of GAD (19%) and more diagnoses of specific phobias (18%) compared to pre-adolescent children (Waite & Creswell, 2014).Although panic disorder is rarely diagnosed in younger children, it is more typically seen within adolescence (0% compared with up to 7%, respectively; Waite & Creswell, 2014) and diagnoses of OCD and agoraphobia are much less common than other anxiety disorders across children and adolescents (3% and up to 2%, respectively; Waite & Creswell, 2014).

Anxiety disorders typically co-occur in childhood, such that children who meet criteria for an anxiety disorder, typically meet criteria for 2 anxiety disorders on average (Waite & Creswell, 2014). Additionally, anxiety disorders can lead to an increased risk of developing other mental health difficulties, such as depression and substance misuse (Kessler et al., 2005) and can cause difficulties in attending school (Waite & Creswell, 2014). The risk for developing these wider difficulties tends to increase over time. For example, adolescents with anxiety disorders are significantly more likely to present with a co-morbid mood disorder than children (up to 19% in adolescents compared to up to 6% in children), and to more regularly refuse to attend school (Waite & Creswell, 2014). In addition, whereas substance use is typically not seen in children, anxiety disorders in adolescence significantly predicts the development of alcohol use disorders in adolescence (Wolitzky-Taylor, Bobova, Zinbarg, Mineka & Craske, 2012).

When left untreated, anxiety disorders often persist into adulthood (Bittner et al., 2007) and continues to have an increasing impact on wider difficulties. For example, the prevalence of co-morbid mood disorders in adults with anxiety disorders is much higher than amongst children and adolescents (around 63% of adults with a current

anxiety disorder; Lamers et al., 2011). In addition, substance abuse disorders are more common (19.1%) and typically take the form of marijuana use disorders (Conway, Compton, Stinson & Grant, 2006). Anxiety disorders in adults go on to further affect an individuals' ability to hold down a job and function effectively within society (Mendlowicz & Stein, 2000). As such, effective early interventions are important to minimise the distress caused by anxiety disorders and to prevent their wider impact on the individual, their families and on society as a whole.

The putative maintenance mechanisms that are targeted within current treatments for childhood anxiety disorders are not yet well understood. As such, the broad aim of this thesis is to better understand the distribution of these maintenance mechanisms across individual anxiety disorders to go some way to explaining (i) the inconsistent evidence regarding how well different diagnostic subcategories within childhood anxiety disorders align with distinct maintenance mechanisms; and (ii) the relatively poor treatment outcomes experienced by a particular subgroup of children with anxiety disorders (i.e. those with social anxiety disorder; SAD). This introduction will outline the theory and evidence for the primary putative maintenance mechanisms of anxiety disorders in children, with a particular focus on subgroups that do not do well from these treatments (i.e. children with SAD).

1.1.1 Effectiveness of treatments for children with anxiety disorders

Cognitive Behaviour Therapy (CBT) is a promising intervention for children with many types of anxiety disorder. This approach typically involves a combination of psychoeducation, to inform children and their families about anxiety; exposure, to target avoidance of feared stimuli; relaxation techniques, to target the physical

symptoms of anxiety; cognitive restructuring, to target cognitive biases and negative thoughts; and sometimes skills training, to target social skills (e.g. Coping Cat, as in Kendall et al., 1997). CBT treatments are associated with overall recovery rates estimated at 58.9% compared to 16% for wait list controls (James, James, Cowdrey, Soler, & Choke, 2015). However, this leaves a significant number of anxious children who retain a diagnosis of anxiety even after receiving treatment. Several factors have been associated with impaired outcomes, including symptom severity, caregiver strain, the presence of comorbid diagnoses (e.g. mood disorders) and the presence of particular anxiety diagnoses, especially Social Anxiety Disorder (Compton et al., 2015; Hudson, Rapee, et al., 2015).

Children with Social Anxiety Disorder (SAD) tend to have poorer outcomes from CBT programs (40.6%) than children with other anxiety disorders (72%; Ginsburg et al., 2012) and there may be several explanations for this. For example, several studies have suggested that central components of generic treatments, like exposure, may not be targeted effectively for children with SAD (e.g. Compton et al., 2015; Hudson, Rapee, et al., 2015). These studies note that exposure for children with SAD is often not conducted with same-age peers, limiting the ecological validity (Compton et al., 2015), and tends to be graded, resulting in more severe fears common in social phobia not being targeted until the end of treatment (Hudson, Keers, et al., 2015). In addition, there may be mechanisms specific to the maintenance of SAD that are not targeted in generic forms of CBT (e.g. social safety seeking behaviours, internal focus of attention, and social skills difficulties; Halldorsson & Creswell, 2017) and this may lead to poorer outcomes.

1.1.2 The importance of understanding maintenance mechanisms for treatment.

Behavioural approaches to the treatment of anxiety disorders were grounded in learning theory and have focused on eliminating fear responses through procedures such as desensitization, flooding and exposure (Clark, 2004). More recently, cognitive approaches have set out to identify targets that may maintain anxious cognitions and prevent the natural recovery of the anxiety disorder (Clark, 2004). This approach has led to the development of several important maintenance models of anxiety disorders in adults, upon which successful treatments that directly target these mechanisms have been based (Clark, 2004). These models include several factors which are thought to maintain anxiety including cognitive factors (such as negatively biased cognitions), behavioural factors (such as avoidance of feared stimuli), and physiological factors and emotions. These typically interact in a cyclical fashion such that maladaptive cognitions result in anxious behaviours which, in turn, can increase the physiological experience of anxiety, providing evidence of a threat and increasing anxious cognitions (James et al., 2015). However, such models have not been established for childhood anxiety disorders (e.g. Halldorsson & Creswell, 2017). Instead models have tended to focus on the *development* of anxiety disorders in children and young people which may be limited in terms of what they can tell us about treatment (as opposed to prevention) of childhood anxiety disorders. Given the clear room for improvement in outcomes from treatments for childhood anxiety disorders, it will be important to return to a more bottom up approach (as described by D. M. Clark, 2004); where effective treatments can be based on a clear understanding of the mechanisms that maintain anxiety disorders in childhood.

1.1.3 The mechanisms that maintain childhood anxiety.

A good starting point for understanding the maintenance mechanisms of childhood anxiety disorders is to fully investigate those that have been established for adults and which are commonly targeted in treatments currently used for children (i.e. those based on adult treatments). These include (i) negative cognitions, such as biased interpretation of ambiguous information, and impairments in self-efficacy; (ii) avoidance of feared stimuli; (iii) abnormal physiological arousal; and (iv) in some cases, skills difficulties, such as social skills and emotion regulation skills. In addition, maintenance factors that may be specific to childhood should be considered. For example, given the differences in children's lifestyles in comparison to adults, additional environmental factors (e.g. parenting styles, parental mental health and peer relationships) may play a role (e.g. Lawrence, Waite & Creswell, 2019). Investigation of these mechanisms in children with anxiety disorders has begun, but with conflicting results.

1.1.3.1 Negative cognitions.

The CBT model describes the interaction between maladaptive thoughts, anxious feelings (emotional and physiological) and anxious behaviours which maintains anxiety disorders (as described in James et al., 2015). Negative cognitions are a central component of this model and, as such a central target for CBT, often targeted by cognitive restructuring (Seligman & Ollendick, 2011). Cognitive restructuring is a process by which children identify maladaptive and biased thoughts, identify and discuss evidence to dispute them, and then develop alternative and more adaptive cognitions. Following the CBT model, the aim is that this leads to engagement in fewer anxious behaviours and less anxious feelings (e.g. Rapee & Heimberg, 1997). However, the role of negative cognitions in maintaining anxiety in children is not yet fully understood.

A recent meta-analysis identified a significant positive association between child anxiety and negative interpretations of ambiguous information, with a medium effect size (Stuijfzand, Creswell, Field, Pearcey, & Dodd, 2018). Specifically, studies have identified significant differences in interpretation bias scores between children with and without anxiety disorders, as well as an association with anxiety symptoms across samples of clinically anxious and non-anxious children (e.g. Gifford, Reynolds, Bell, & Wilson, 2008) and within community only samples (Muris, Huijding, Mayer, Remmerswaal, & Vreden, 2009). This suggests that an interpretation bias may be associated with both anxiety disorders and symptoms. However, there was significant heterogeneity across studies, which was to some extent accounted for by an interaction with child age, in which the association between interpretations and anxiety was weaker among younger compared to older children. For example, Waite, Codd, & Creswell (2015) found that, although pre-adolescent children gave more threat interpretations than adolescents overall, there was only a significant difference between anxious and non-anxious individuals amongst adolescents and not pre-adolescents. Additionally, although a meta-analysis of effects from studies in which interpretation biases are manipulated (i.e. by cognitive bias modification; CBM) showed significant reductions in negatively biased interpretations following positive manipulations, this only translated in to a small, although significant, effect on reducing anxiety (Krebs et al., 2018), and the effect was only significant when positive manipulations were compared to negative manipulations and not to neutral or no manipulation. As such, there is not currently clear evidence that correcting interpretation biases is a central component of treatments to reduce anxiety in children.

Of note, although there is little evidence for diagnostic specificity in the association between interpretation biases and childhood anxiety, associations appear to be stronger when the content of the information that is being interpreted is congruent with the type of anxiety disorder diagnosed (i.e. social information for social anxiety disorder; Stuijfzand et al., 2018). This may account for the inconsistencies in the evidence for an association between anxiety and interpretation bias, given the tendency of studies to recruit anxious samples with a variety of anxiety disorders.

Negative cognitions relating to children's self-efficacy and, specifically, their perceived control in feared situations is also often targeted through cognitive restructuring. A meta-analysis of the studies investigating the relationship between anxiety (symptoms and disorder) and perceived control has established an overall medium to large effect size within child samples (ESr = -0.401; Gallagher, Bentley, & Barlow, 2014). For example, increased anxiety symptoms have been associated with less perceived control over threatening events in non-clinically anxious children (Mcginn, Jerome, & Nooner, 2010; Muris, Huijding, et al., 2009). However, *improvements* in children's perceived control following CBT have not been significantly associated with reductions in anxiety symptoms (Muris, Mayer, Adel, & Roos, 2009). Furthermore, the evidence for an association between perceived control and anxiety disorders is less consistent than for anxiety symptoms. For example, in some studies, children with anxiety disorders have reported seeing themselves as having significantly less control or influence over threatening events compared to non-anxious children (e.g. Waters, Craske, Bergman, & Treanor, 2008). However, other studies have found no difference between children with, compared to those without, an anxiety disorder in the amount of control they expect to have (Waite et al., 2015). These inconsistent findings do not

appear to be accounted for by potential differences in child diagnoses among the study populations, as no evidence has been found for diagnostic specificity of perceived control (Gallagher et al., 2014). However, as for interpretation bias, age effects may account for some differences in findings. For example, studies have found that older children (aged 10-12) with anxiety disorder, compared to those without, expect less control over the outcome of a stressful situation, but no significant differences were found for younger children (aged 7-9; Creswell, Murray, & Cooper, 2014). This is an important finding particularly when considering that studies identifying a significant association between anxiety symptoms or disorders and perceived control have tended to include samples up to 12, 14, or 16 years of age (Muris, Huijding, et al., 2009; Waters et al., 2008; Waite et al., 2015; respectively).

Children's perceptions of their ability to cope in threatening situations have also been identified for some but not all anxious children. For example, older children (and adolescents) with, compared to those without, anxiety disorders expect more negative emotions and less ability to cope effectively in a threatening situation (Creswell et al., 2014; Waite et al., 2015; Waters et al., 2008). In addition, treatment studies have shown that children receiving CBT experience an increase in their perception of their ability to cope in anxious situations, and this mediated the effect that CBT had on reductions in anxiety symptoms (Kendall et al., 2016). However, studies have not identified significant differences in perceived coping abilities between younger children (i.e. 7-10 year olds) with anxiety disorders and those without (Creswell et al., 2014; Waite et al., 2015). Furthermore, treatment studies identifying coping as a treatment mediator have typically recruited a wide age range (7-17; Kendall et al., 2016) where findings may have been driven by adolescents. This highlights the importance of investigating putative

maintenance mechanisms of anxiety within narrow age ranges. This is especially important in the investigation of these mechanisms in children, given the many developmental changes that occur during this period.

1.1.3.2 Avoidance

Another key component of the CBT model is anxious behaviour, particularly avoidance. Indeed, the avoidance of feared stimuli is typically included in the diagnostic criteria for anxiety disorders (American Psychiatric Association, 2013). As a result, exposure to feared stimuli is a key component of CBT and aims to reduce avoidance of these stimuli. In support of the place of exposure in CBT, several studies have found that avoidance of particular stimuli (e.g. spiders) is associated with self-reported general anxiety symptom amongst clinically anxious children (e.g. Lebowitz, 2017) or specific fear symptoms (e.g. spider phobia) amongst non-clinical girls (Klein, Becker, & Rinck, 2011). In addition, children with an anxiety disorder have shown more avoidance of more general feared situations (e.g. a speech task, or black box task) than those without an anxiety disorder (Waite et al., 2015), suggesting an association with anxiety disorders as well as symptoms. Furthermore, exposure alone has been found to effectively reduce anxiety in children (Chorpita et al., 2002), suggesting avoidance of feared stimuli may be a key mechanism in the maintenance of childhood anxiety. As with other mechanisms, although avoidance itself may be associated with various anxiety disorders and self-reported anxiety symptoms, the stimulus avoided is likely to be specific to individual types of anxiety. For example, although Lebowitz (2017) identified associations between spider avoidance and general anxiety symptoms this was at least partially explained by spider fear.

Of note, many studies of avoidance have been assessed in lab conditions in which children are given the option to avoid a stimulus. However, avoidance of feared stimuli is not always an option for children in reality, where their daily environment is typically highly structured by others (e.g. parents and teachers) and they are often required to endure feared situations, often with distress (American Psychiatric Association, 2013). Indeed, for some disorders, avoidance is not a strict requirement for a diagnosis; as in SAD, where endurance of a feared situation with distress is accepted as an alternative. In addition, several scales of anxiety symptoms include reports of both avoidance and distress, particularly those assessing social anxiety (e.g. The Liebowitz Social Anxiety Scale, LSAS; Masia-warner, Storch, & Pincus, 2003). As such, although it may be the case that avoidance is likely to be associated with both general anxiety symptoms and across anxiety disorders in experimental studies, children's daily experience of some anxiety difficulties may include endurance of some feared situations (e.g. at school for children with social anxiety disorder) which may often be distressing.

1.1.3.3 Elevated physiological arousal.

A further component of the CBT model is anxious physiological sensations (e.g. increased heart rate, sweating etc, as in panic disorder; American Psychiatric Association, 2000) and, as a result, teaching relaxation techniques to anxious children is a common aspect of CBT. This tends to precede or accompany exposure (Seligman & Ollendick, 2011), with the aim that reducing the physical symptoms of anxiety may enhance learning during exposure. However, it is not clear whether anxious children do experience increased physiological arousal in comparison to non-anxious children and, as such, whether this is an essential component to target in treatment.

Several studies have investigated the presence and nature of associations between physiological arousal and both anxiety symptoms and disorders. Most commonly, the metric used to assess physiological arousal in relation to anxiety in children has been heart rate (HR) by means of beats per minute (BPM), but the evidence for an association has been inconsistent. For example, children with anxiety disorders have been shown to have significantly higher heart rates at baseline than non-anxious children (e.g. Monk et al., 2001; Schmitz, Tuschen-caffier, Kramer, Heinrichs, & Blechert, 2011). In contrast, others have found no differences in baseline HR between children with compared to those without anxiety disorders (Alkozei, Creswell, Cooper, & Allen, 2015). It is notable that the studies which have found a significant difference at baseline have included samples with wider age ranges (9-18; Monk et al., 2001) or have only assessed specific associations between children with SAD and arousal before a social stressor (Schmitz et al., 2011). As such, it is possible that differences in physiological arousal may be driven by associations with anxiety among adolescents or may be specific to particular anxiety disorders in childhood. However, it is also possible that some studies do not assess a true baseline. For example, studies differ on the length of acclimatisation to the unfamiliar surroundings of a research session that is given before a baseline is assessed (e.g. Alkozei et al., 2015; Schmitz et al., 2011). Given that entering the research session itself is likely to be a stressful situation for children with anxiety disorder compared to those without, they may be more aroused at the "baseline" measurement than non-anxious children. Providing further support for this suggestion, a different pattern of results have been identified for anxiety symptoms in non-clinical samples. Specifically, those scoring high and low on anxiety symptom measures do not differ on their baseline HR (Weems, Zakem, Costa, Cannon, & Watts, 2005).

In contrast to findings for baseline physiological arousal, anxiety symptoms appear to be associated with differences in physiological arousal during anxiety provoking events. For example, Weems et al. (2005) found that children who scored high on anxiety symptom measures were more aroused (as measured by heart rate and galvanic skin response) than children with low anxiety during and after an anxiety provoking video. However, studies investigating differences in physiological arousal during a stressor in clinical populations have found no significant differences between anxious and non-anxious children (e.g. Alkozei et al., 2015). Notably, Alkozei controlled for state anxiety during the stressor. This suggests that significant differences identified between high and low anxiety symptoms in previous studies (e.g. Weems et al., 2005) may be accounted for by differences in how anxiety provoking children found the stressor, rather than differences in how they respond to the stressor physiologically.

Although it appears that anxious children are not necessarily in a general state of high arousal compared to non-anxious children, several studies support the idea that anxious children differ in their physiological *response* to a stressor (i.e. change in HR between baseline and during the stressor or between during and after the stressor; reactivity and recovery respectively). However, there is a lack of agreement as to how they differ. For example, some studies show an increase in physiological reactivity in response to a stressor between those with and without an anxiety disorder and in relation to anxiety symptoms (e.g. Kossowsky, Wilhelm, Roth, & Schneider, 2012; Weems et al., 2005). However, others suggest that anxious children show slower physiological reactivity than anxious children and less recovery (e,g, Schmitz et al., 2011; Schmitz, Tuschen-caffier, Wilhelm, & Blechert, 2013). In addition, some have found that anxious children show only a marginally reduced physiological recovery from a stressor

in comparison to non-anxious children (Beidel, 1991), or have found no significant differences in physiological reactivity (e.g. Alkozei et al., 2015; Monk et al., 2001). However, as discussed above, Alkozei controlled for children's state anxiety during the stressor.

The great deal of inconsistencies in this evidence may reflect the difficulties in measuring heart rate without the confounds of several other factors. For example, individual differences in heart rate can be affected by exercise patterns and general health (Dixon, Kamath, Mccartney, & Fallen, 1992). Additionally, methodological factors may affect heart rate recording; such as whether the child is sitting or standing, when heart rate is taken (i.e. whether it is a *true* baseline) and how it is calculated.

1.1.3.4 Skills deficits.

Although not present in all CBT programmes, some include components that focus on skills training (e.g. training social skills). In many cases, the psychoeducation component of CBT encompasses much of this training, with some modelling and reinforcement from the therapist (Seligman & Ollendick, 2011). In contrast, some more specific treatments for social anxiety disorder (SAD) include a much more intensive social skills training programme (e.g. Beidel, Turner, & Morris, 2000; Spence, Donovan, & Brechman-toussaint, 2000).

Despite the inclusion of skills training in some CBT approaches, there is considerable inconsistency amongst studies investigating the presence of social skills deficits amongst anxious children. For example, there is some evidence of a significant association between social anxiety and social skills deficits on the basis of both child (Spence, Donovan, & Brechman-Toussaint, 1999) and parent or teacher report

questionnaire (Ginsburg, La Greca, & Silverman, 1998; Greco & Morris, 2005; Halls, Cooper, & Creswell, 2014; Spence et al., 1999), as well as observer rated social skills in vivo (Morgan & Banerjee, 2006; Tuschen-caffier, Kühl, & Bender, 2011) and during speech and interaction tasks (Scharfstein, Beidel, Sims, & Finnell, 2011). However, others have found no such association with similar measures (Cartwright-Hatton, Hodges, & Porter, 2003; Cartwright-Hatton, Tschernitz, & Gomersall, 2005; Erath, Flanagan, & Bierman, 2007; Hannesdóttir & Ollendick, 2007). There are several explanations for the inconsistencies in this evidence, which are discussed in section 1.3 below. First, the diagnostic specificity of the mechanisms already discussed will be considered, and social anxiety disorder (SAD) will be discussed in more depth, along with SAD specific treatments.

1.1.3.5 Additional childhood factors

In addition to those factors that are present in adult maintenance models of anxiety, there may be other factors that are specifically present in the maintenance of anxiety in childhood. In particular, given that parents and families heavily influence and control children's environments, they may play a part in maintaining childhood anxiety. Parenting styles and behaviours have been investigated in relation to childhood anxiety, but there have been mixed findings to date (e.g. McLeod, 2007; Lawrence et al., 2019). Whilst parenting style in general appears to account for only a small amount of the variance in childhood anxiety (4%; McLeod, 2007), certain specific parenting styles are more strongly associated with childhood anxiety than others. For example, whereas neither parental withdrawal nor overinvolvement appear to be significantly associated with childhood anxiety, lower levels of warmth and autonomy granting, as well as higher

levels of aversiveness have been significantly associated with higher levels of childhood anxiety with effect sizes of up to r = .42 (McLeod, 2007). Most of the studies investigating this are cross-sectional and, as such, do not provide evidence for the role of these parental factors in the maintenance of childhood anxiety. However, some evidence for this can be found in experimental studies manipulating whether mothers were more or less controlling in their interactions with their non-anxious children (e.g. de Wilde & Rapee, 2008; Thirlwall & Creswell, 2010). These studies found that children showed significantly more anxiety when their mothers behaved in a more controlling manner than when they behaved in a less controlling manner.

Parents own mental health may also play a role in the maintenance of their child's anxiety through modelling anxious behaviours and displaying anxious responses to their children. For example, studies have shown that children of parents who express anxious behaviours when interacting with a stranger display more avoidance of the stranger than children of parents who do not express anxious behaviours (e.g. Aktar et al., 2013). In addition, others have found that mothers with an anxiety disorder respond to their children with less warmth and more intrusiveness than do mothers without anxiety disorders (Creswell, Apetroaia, Murray & Cooper, 2012). This was particularly the case when their child is expressing anxiety. As such, parental anxiety may affect the way children learn to attend to and process information about threat.

In addition, wider relationships in children's lives, such as those with siblings and peers, may also play a role in maintaining anxiety in childhood. For example, significant associations have been identified between specific types of sibling relationship and internalizing disorders (Buist, Dekovic & Prinzie, 2013). Specifically, high sibling conflict,

and low sibling warmth were significantly associated with increased internalizing difficulties. However, it is unclear to what extent sibling relationships influence anxiety disorders in children specifically, and similar associations were also found with child externalising difficulties. Wider negative peer relationships outside of the family may also have a maintaining role for anxiety. For example, victimisation by peers is commonly associated with internalising difficulties; where increased experience of peer victimisation is specifically associated with increased anxiety (e.g. Crawfood & Manassis, 2011). These early peer relationships are important in the development of emotion regulation and social skills. As such, negative peer and sibling relationships may have an impact on childhood anxiety.

Although significant associations have been identified between many of these wider environmental factors and childhood anxiety disorders, the nature of these associations is unclear given the cross-sectional designs used in much of this literature. However, there have been a small number of longitudinal studies investigating the relationship between childhood anxiety and maternal overcontrol that may be more able to establish a causal direction. For example, some studies have found that maternal overcontrol in interactions with both behaviourally inhibited and uninhibited five-year olds significantly predicted the development of anxiety disorders by age nine (Hudson & Dodd, 2012). Others have found that maternal intrusive control and derision significantly moderated the association between peer inhibition at two years old and socially reticent behaviour at four years old (Rubin, Burgess & Hastings, 2002). These suggest that there may be a bi-directional relationship between maternal overcontrol and child anxiety; indicating a possible role in both the development and maintenance of childhood anxiety disorders. However, further research is needed to establish whether other wider

factors associated with childhood anxiety may be important in both or either of the development and maintenance of childhood anxiety disorders.**1.1.4 Diagnostic specificity of proposed maintenance mechanisms.**

As noted in many of the sections above, the inconsistent findings may be partly accounted for by potential diagnostic specificity as samples have differed in the composition of anxiety disorders included, although this has received limited research attention. The potential for diagnostic specificity of putative maintenance mechanisms is particularly poignant for SAD, where treatment outcomes for children are impaired and where children's anxious thoughts and behaviours often fail to self-correct despite social exposure in daily life (e.g. clarks model of social anxiety; David M Clark & Wells, 1995). Although several social specific maintenance mechanisms for social anxiety have been identified as treatment targets in adults (e.g. engagement in safety seeking behaviours, negative self-imagery, self-focussed attention; David M Clark & Wells, 1995; Hodson, Mcmanus, & Clark, 2008; Rapee & Heimberg, 1997), little is known about potential specific maintenance mechanisms of social anxiety in children (e.g. see Halldorsson & Creswell (2017) for a review).

1.2 Social anxiety disorder in children.

1.2.1 Overview of childhood social anxiety disorder.

Social anxiety disorder (SAD) is the most prevalent anxiety disorder across the lifetime with approximately 13% of individuals experiencing SAD at some point in their life (Beesdo et al., 2007). The median age of onset of SAD is typically estimated at 13 years of age (Kessler et al., 2005), but approximately half of cases are diagnosed by the age of 11 years old (Stein & Stein, 2008). As such, it is likely that age of onset estimates

represents the average age at which these difficulties begin to have a significant impact on their functioning, rather than the age at which difficulties are first experienced. Consequently, SAD can have significant negative implications on a child's wider functioning from early on in life; particularly affecting their ability to form and maintain effective relationships and fully engage in education (Greca & Lopez, 1998; C. Kessler, Foster, Saunders, & Stang, 1995; Wittchen, Stein, & Kessler, 1999). As such, children with SAD have an increased risk of developing other mental health difficulties later on in life such as depression and substance misuse (Beesdo et al., 2007).

The treatment that is most commonly used to treat anxiety disorders, including SAD, in children is a generic form of CBT, which is applied across a range of anxiety disorders and targets the putative maintenance mechanisms of anxiety disorders, as described above. However, given the poorer outcomes for children with SAD from these treatments, more specific treatments that involve a particular focus on social skills have been developed and recommended for treatment of children with SAD (National Institute for Health and Care Excellence., 2013).

1.2.2 Specific treatments for childhood SAD.

Specific treatments for SAD in children have typically involved several components from generic approaches to CBT (i.e. psychoeducation, relaxation techniques, problem solving, positive self-instruction and graded exposure), as well as social skills training. This is based on developmental models of social anxiety that hypothesise that social skills difficulties cause early negative social experiences, which lead children to expect negative social experiences in the future (R. M. Rapee & Heimberg, 1997; Ronald M Rapee & Spence, 2004).

Some SAD-specific treatments take a primarily behavioural approach, where social skills training is the main component and is conducted alongside educational sessions, peer generalisation sessions and in vivo exposure (SET-C; Beidel et al., 2000). Beidel et al. (2000) reported that 67% of children no longer met criteria for a SAD diagnosis following SET-C, compared to 5% of those who received a control (study skills) intervention. The first session of SET-C involved an education session for parents and children. Following this, social skills training was delivered to children in groups and targeted abilities such as greetings, conversation skills, listening and remembering, assertion and joining groups. Alongside the social skills training sessions, children took part in peer generalisation sessions in which they joined in an activity with a group of non-anxious peers to practice the new skills they had learned. Children also took part in individual exposure sessions. Treatment sessions lasted between 60-90 minutes and each of the latter three sessions were conducted concurrently every week over a 12-week period, resulting in a total of 3.5 hours of treatment per week.

Other specific treatments have built on this to include SAD specific CBT with social skills training and has achieved good outcomes. For example, Spence et al. (2000) integrated social skills training into a CBT program (CBT+SST) and found that between 58-88% of children who received this treatment were free of a SAD diagnosis post-treatment, compared to 7% in a waitlist control group. Within this treatment, many of the generic CBT components were adapted to be specific to social situations. For example, rather than general problem solving, techniques for dealing with challenging social situations (such as conflict and friendships) were taught. These included socially relevant techniques such as assertiveness and initiating friendships. In addition, CBT+SST included several components designed to improve social competence (including eye

contact, facial expressions, evidence of listening and interest in conversation, joining in, offering help and giving compliments). Treatment components were delivered through modelling, role-plays, prompts and reinforcement within 12 sessions lasting one and a half hours, with two additional booster sessions. Children were randomised to a waitlist control group, or to one of two treatment groups in which CBT+SST was delivered with and without parent involvement. Parents were taught to reinforce the social skills aspects of treatment, through modelling appropriate social skills and pro-active social behaviour, whilst ignoring and refraining from modelling socially anxious behaviour. The parent training sessions were 30-minutes in length and delivered in groups alongside child sessions. Involving parents in this treatment was associated with a 30% increase in the number of children without a diagnosis post-treatment compared to not involving parents.

Although outcomes for treatments that include social skills training tend to be better for socially anxious children than those that do not include social skills training, few studies have directly compared them which is important to bear in mind given that the social skills-based treatments have typically been longer and more intensive. However, generic and specific approaches have been directly compared in one study of online CBT (Spence, Donovan, March, Kenardy, & Hearn, 2017) with findings suggesting no additional benefit from the specific approach; although both treatment groups significantly improved in comparison to the waitlist control, outcomes did not differ between those receiving generic CBT (including components such as psychoeducation, relaxation, coping self-talk, cognitive restructuring, graded exposure and problem solving) and those receiving SAD specific CBT (including the same components, but adapted to be SAD specific and with the inclusion of social skills training).

Furthermore, it is unclear whether treatment outcomes are accounted for by improvements in social skills themselves, as opposed to by other factors such as increased therapy time and intensity, how parents are included in treatment, or the specificity of treatment components to fear-relevant situations. For example, although Beidel et al. (2000) found significant improvements in social skills (as measured by independent observers during role plays) following SET-C compared to study skills intervention, Spence et al. (2000) found no significant differences in change in (parent rated) social skills for the treatment and no treatment groups. This disparity is perhaps not surprising given the inconsistent evidence that children with SAD have social skills deficits.

1.3 Social anxiety and social skills deficits in children.

Social skills are typically defined as behaviours that aid effective social interactions with peers, leading to social acceptance and popularity (Cillessen & Bellmore, 2002). Social interactions and the information needed to be communicated within these can vary to a great extent across different situations. As such, there are a broad range of behaviours that might be considered social skills, and these have been measured using a number of approaches. Perhaps unsurprisingly therefore, several studies have investigated the relationship between social anxiety and social skills difficulties in children and have yielded conflicting results.

1.3.1 Child self-reported social skills.

A recent review (Halldorsson & Creswell, 2017) identified that, where studies have used self-report measures to assess children's social skills, results have been inconsistent; with no significant association identified with social anxiety symptoms

within non-clinical samples, but more consistent associations with SAD. For example, Spence et al. (1999) compared 7-14 year old's with and without a diagnosis of social phobia on several measures of social skills using self-report questionnaires. These included questions assessing general social skills (e.g. controlling emotions, listening to other's points of view, joining activities and use of eye contact), social competence (e.g. making and maintaining friendships), and more specific behaviours such as assertiveness. Significant differences were identified between children with and without a diagnosis of social phobia on these self-ratings of social skills and competence and on responses to vignettes describing socially challenging situations, where children with social phobia were more likely to choose a less assertive response to vignettes (Spence et al., 1999). In contrast, studies recruiting non-clinical children have not found significant associations between self-reported social anxiety symptoms and similar self-report questionnaire measures of social skills (Social skills rating system; SSRS; Gresham & Elliott, 1990; Hannesdóttir & Ollendick, 2007), particularly when controlling for depression and loneliness (Stednitz & Epkins, 2006). This evidence suggests that the way children view their own social functioning in daily life may relate differently to social anxiety symptoms compared to SAD.

In addition to questionnaire measures, several studies have invited children to give ratings of their own performance both before and after a social situation. Generally, these studies have found that children with higher social anxiety symptoms, or the presence of SAD, rate their performance more poorly than those with lower social anxiety; both in predictions of performance and in post-performance ratings. For example, Morgan & Banerjee (2006) asked children to complete performance ratings (i.e. ratings of their performance quality as well as what others think of it) before and

after taking part in role plays that required either positive or negative assertive responses (e.g. giving or receiving a compliment and denying an unreasonable request, respectively). Poorer pre-performance predictions and post-performance ratings were found among children scoring above recommended cut offs on a social anxiety symptom scale compared to those scoring below cut offs. Similar results have been identified in clinical samples, where children with SAD reported lower expectations and evaluations of their performance in interactions with a peer compared to non-clinical children (Alfano, Beidel, & Turner, 2006). However, where rating schemes have focused on more mechanical components of social skills (e.g. how loud and clear their voice was, looking at the camera, smiling, stumbling over words), others have found no significant associations between social anxiety symptoms and children's ratings of their performance in speech and interaction tasks (e.g. Cartwright-Hatton et al., 2003, 2005).

In summary, a relatively consistent and significant association has been identified between SAD and children's perception of their social skills, but associations between social anxiety symptoms and ratings of social skills in non-clinical samples have been less consistent. These results support the suggestion that self-reported social skills may be differently related to SAD and social anxiety symptoms; in particular, they suggest that social anxiety symptoms are associated with children's ratings of their performance in general, but not with ratings of more specific behaviours

1.3.2 Parent and teacher reported social skills

Where parents and teachers have reported on children's social skills, findings are less consistent than those from child reported social skills. For example, some studies have found that child and parent reports of child social skills correlated highly, and that

parents, like children, rated their child as less socially skilled and competent when their child had SAD compared to when their child did not have SAD (Spence et al., 1999). This has been extended by other studies that suggest diagnostic specificity of this relationship; finding that children with SAD are also rated by their parents as having more social communication difficulties than children with other anxiety disorders (e.g. Halls et al., 2014).

In contrast to the evidence for a significant association between social anxiety disorder and parent rated social skills, an association has not consistently been found for social anxiety symptoms amongst both clinically anxious and non-clinical samples. For example, Ginsburg et al. (1998) found a significant association between increased social anxiety symptoms and lower parent perceived frequency of assertiveness and responsible social skills (e.g. communicating with adults) within a clinically anxious sample. However, they found no significant association between self-reported social anxiety symptoms and overall parent ratings of social skills. Similarly, others have found no significant associations between self-reported social anxiety symptoms and general parent rated measures of social skills within non-clinical samples (Hannesdóttir & Ollendick, 2007; Stednitz & Epkins, 2006). The evidence from teacher rated social skills is similarly inconsistent, with some finding an association with self-reported social anxiety symptoms (Greco & Morris, 2005) and others finding no significant association (Banerjee & Henderson, 2001).

In summary, the evidence based on parent report is consistent with that from child self-report, providing further evidence for a more consistent association between SAD and social skills (both self and parent rated), but a less consistent association

between social anxiety symptoms and social skills across parent, teacher and self-ratings. As such, and particularly from children's and their parent's point of view, social skills may be an important factor in distinguishing SAD from non-disordered social anxiety symptoms.

1.3.3 Observer rated social skills.

An important limitation of the literature assessing both child, parent and teacher reported social skills is that these informants are not blind to children's social anxiety status. Several studies have sought to overcome this by using blinded observers to rate children's social skills in social situations. However, results are particularly inconsistent within this literature and this is largely due to variability in the paradigms used to observe social skills (e.g. role play, or speech) and the broad range of different social skills that are observed.

Ratings of observers have been used to assess social skills during role play tasks where the scenarios were delivered to children by the experimenter prompting a response. Studies have found that shorter responses, but not latency to response, were significantly associated both with social anxiety symptoms amongst community children (Morgan & Banerjee, 2006) and with SAD (Spence et al., 1999). However, more specific social skills (e.g. the amount of eye contact used) were not significantly associated with SAD (Spence et al., 1999), but were significantly associated with social anxiety symptoms; where higher social anxiety was associated with the use of more eye contact, particularly for negative rather than positive role plays (Morgan & Banerjee, 2006). Although the direction of the effect in the latter finding is not consistent with

expectations, the researchers suggest that an increase in eye-contact may reflect an increase in reassurance seeking from the experimenter.

Given that a diagnosis of SAD requires children to experience anxiety with peers, not just adults, it is important that studies have also assessed children's social skills in interactions with same aged peers. These studies have observed social skills such as giving and receiving a compliment, responding to bad behaviour, and starting a conversation with an unknown peer, and have found mixed results (Scharfstein et al., 2011). In particular, SAD has been significantly associated with lower blinded observer ratings of overall social skills (ranging from "not effective" to "effective"), effective conversational skill and vocal characteristics, but has not been found to be significantly associated with use of gestures and facial expressions or positioning. In contrast, no significant associations were identified between self-report measures of social anxiety symptoms and observations of children's social skills during speech tasks; where ratings included behaviours such as how much children looked at the camera, amount of smiling, stumbling over words, looking friendly (e.g. Cartwright-Hatton et al., 2003, 2005).

In contrast to the evidence for self- and parent-reported social skills, the inconsistencies in this evidence limits the conclusions that can be drawn about whether social skills difficulties are specific to SAD or more generally associated with social anxiety symptoms. However, it appears that significant associations may be more apparent in paradigms that include the physical presence of a confederate and for more general or conversational skills, rather than the use of specific body language. Importantly, a further limitation that lab based observational paradigms do not assess

children's social skills in relation to their broader daily social functioning – which parents, teachers and children themselves can. This distinction may have important implications for the association between social anxiety and social skills difficulties.

1.3.4 Making sense of different perspectives of social skills deficits in socially anxious children

Several studies assessing the relationship between social anxiety and social skills in children have used multiple informants to report on children's social skills. Where both self-and parent-reports have been used, results tend to be consistent across reports (e.g. Hannesdóttir & Ollendick, 2007; Spence et al., 1999; Stednitz et al., 2006). However, where self-reported performance in a social task is assessed in conjunction with blinded observer ratings, results are less consistent. For example, Cartwright-Hatton et al. (2003, 2005) found significant differences for self-reported performance during a speech by children with higher compared to those with lower social anxiety, but no significant difference based on observer reports of performance. On this basis it has been suggested that the dissociation in the relationship of social anxiety with self- and observer-reported social skills may represent a self-perception bias (Cartwright-Hatton et al., 2005), in which children with high social anxiety are not less socially skilled than those with lower social anxiety objectively, but that they have a negative perception of their abilities. However, this does not explain the significant association between child and parent reported social skills deficits, and the similarity in patterns of association for social anxiety for child and parent report. The different patterns of findings for self- and parent-reported social skills compared to self- and observer-reported social skills may reflect several key factors, for example, differences in the blinding of the observer (i.e.

parents and teachers are more likely to be aware that the child experiences difficulties with social anxiety), biases resulting from interactions with parents' own social skills abilities and anxiety (e.g. Burke, Woszidlo, Segrin, & Burke, 2013), and/or differences in ecological validity. For example, it may be the case that, when asked to perform in an experimental environment, socially anxious children are able to as well as non-anxious children, but find it difficult to employ these skills consistently in daily life (e.g. an issue of propensity as opposed to ability).

1.4 The problem with measuring social anxiety and social skills.

The inconsistencies found in the literature on social anxiety and social skills in children is hard to fully make sense of given the diverse range of methods that are employed, including differences in the types of measure (e.g. questionnaires and performance ratings), reporters (e.g. self, parent, teacher and observer) and experimental paradigms (e.g. role plays compared to speech tasks; same age peer confederate compared to adult confederate). In addition, what is defined as a "social skill" varies greatly across studies, with some including the use of social skills in everyday situations (e.g. Halls et al., 2014), some rating very mechanical skills (e.g. volume and inflesction of voice; Scharfstein et al., 2011) and others rating broader behaviours (e.g. looking friendly; Cartwright-Hatton et al., 2003). In particular, defining social skills is especially difficult in the, often, multi-cultural societies within which these studies are conducted (e.g. the UK).

A further particular problem with the study of the relationship between social anxiety and social skills is the overlap in the observable behaviours resulting from both social anxiety and social skills deficits. Specifically, many of the behaviours that are

measured as social skills are also behaviours that are an indication of, or heavily influenced by inhibition resulting from anxiety (e.g. difficulties with eye contact, stumbling over words, social withdrawal, not looking friendly). Additionally, the methods used to assess these behaviours tend to be observations or questionnaires, which measure overt behaviours and, as such, are unable to disentangle behaviours resulting from social skill deficit and those resulting from social anxiety.

1.4.1 Observational methods.

Behaviours assessed in observation schedules of social skills have typically included responding appropriately in both affect, timing and content of response, volume and inflection of speech, posture and movement and how friendly the child came across (Cartwright-Hatton et al., 2003, 2005; Scharfstein et al., 2011). However, many of these behaviours are also measured in observation schedules of inhibition (commonly associated with social anxiety; M. B. Stein & Stein, 2008). For example, observation measures of inhibition can include the assessment of the number of smiles and vocalisations, as well as voice quality (e.g. whispering; Biederman et al., 2001). Furthermore, social skills observations often include items overtly assessing anxiety (i.e. "looking nervous" in the PQ-O; Cartwright-Hatton et al., 2003, 2005). As such, it is unclear whether ether sets of observations are assessing behaviours resulting from social anxiety or social skills deficits or both.

1.4.2 Questionnaire methods.

As with observational methods, questionnaire measures of social skills also include items that overlap with social anxiety or inhibition. For example, the social communication questionnaire (SCQ; Rutter, Bailey, & Lord, 2003) contains items

assessing social interaction and communication skills such as “S/he finds social situations easy”, “Did s/he play cooperatively in games that required joining in with a group of other children?”, and “Did s/he respond positively when another child approached him/her?”. However, items assessing similar situations are commonly found in measures of social anxiety symptoms (e.g. Leibowitz Social Anxiety Scale, LSAS; Masia-warner et al., 2003), including how nervous the child feels or how much they avoid participating in groups, going to events or parties, starting a conversation with someone and meeting new people. In addition to the nature of the items themselves assessing overlapping behaviours, many of the social skills questionnaires are parent reported and, as such, are reliant on observation of social functioning, the difficulties of which are described above.

1.4.3 Overcoming these limitations.

In order to accurately assess whether social skills difficulties contribute to the maintenance of social anxiety in children, it is important to accurately assess social anxiety and social skills as independent constructs. Given the overlaps in behaviours measured by items in social anxiety and social skills measures and the subjective nature of observations, one approach to overcoming these limitations is to assess the cognitive processes that *underlie* effective social behaviour and are commonly assessed using objective measures (i.e. social cognitions).

1.5 Social cognition.

Various definitions of social cognition have been proposed, from the most general definition of “any cognitive process that involves other people” (Frith & Blakemore, 2003, p.139), to the more specific definition of “cognition about, or actions in regard to, agents or groups of agents, their intentions, emotions, actions and so on,

particularly in terms of their relation to other agents and the self" (Jaegher, Paolo, & Gallagher, 2010, p. 441). Others have suggested a more detailed definition that retains a sense of breadth; describing social cognitions as "those aspects of higher cognitive function which underlie smooth social interaction by understanding and processing interpersonal cues and planning appropriate responses" (Scourfield, Martin, Lewis, & McGuffin, 1999, p. 559). However, all of these definitions encapsulate a broad range of abilities including the ability to read faces and emotions (both simple and complex), follow eye gaze, participate in joint attention, detect agency in others, interpret biological motion, imitate others, empathise (specifically, taking the perspective of others), understand deception and hold a theory of mind (ToM; Frith & Blakemore, 2003). The ability to process social information in these ways is an essential part of social interactions (Frith & Blakemore, 2003) and, as such, are intrinsically linked to social skills (Dodge, Pettit, Mcclaskey, Brown, & Gottman, 1986). This is particularly evident in the presence of social cognition difficulties in individuals with disorders that are particularly defined by social skills deficits (Baron-cohen, Leslie, & Frith, 1985; Penn, Corrigan, Bentall, Racenstein, & Newman, 1997).

1.5.1 Psychopathology and social cognition.

Indeed, social cognition deficits have been linked to several psychological disorders in which difficulties in social functioning are significant features. For example, individuals with schizophrenia, for whom social skills difficulties are cited as a defining feature (e.g. Bellack, Morrison, Wixted, & Mueser, 1990), often have difficulties recognising emotions or understanding ToM (see Penn, Sanna, & Roberts, 2008, for an overview). In particular, social cognition deficits are a central feature of developmental

disorders such as Autism Spectrum Disorder (ASD; Baron-cohen et al., 1985), where social functioning difficulties are also a defining feature (e.g. DSM-5; American Psychiatric Association, 2013). Specifically, individuals with ASD have commonly been found to be less proficient at age-appropriate ToM tasks and have more difficulties accurately recognising emotions in faces and voices than neurotypical individuals (Uljarevic & Hamilton, 2013). They also find it more difficult to understand the intentions behind socially motivated deception (e.g. Happe, 1994) and behind biological motion (e.g. Abell, Happe, & Frith, 2000). Studies have also found that children with ASD show less affinity to follow the gaze of another individual (e.g. Nation & Penny, 2008) and, as a result partake less in joint attention than neurotypical children (e.g. Dawson et al., 2017). Furthermore, many studies have suggested that children with ASD are less likely to spontaneously imitate others (see Williams, Whiten, & Singh, 2004, for a review) and report lower parent-reported empathy than neurotypical individuals (e.g. Auyeung et al., 2009). Indeed, social cognition difficulties are central to a diagnosis of ASD and, as such, are assessed through the observation and interview schedules used as diagnostic tools (i.e. ADOS and ADI-r; Lord, Rutter, Dilavore, & Risi, 2008; Lord, Rutter, & Le Couteur, 1994). Furthermore, studies of adults with autism have shown that social cognition abilities account for a significant proportion of the variance in social skills, further supporting their place in underlying social skills difficulties (Sasson, Morrison, Kelsven, & Pinkham, 2019).

1.5.2 Social anxiety in children with ASD

Several studies have investigated the link between ASD and social anxiety, finding that the two are often comorbid; with SAD diagnosed more commonly amongst

children with ASD (30-40%; Simonoff et al., 2008; White, Oswald, Ollendick, & Scahill, 2009) than neurotypical children (8.2-12%; R. C. Kessler et al., 2012; D. J. Stein et al., 2017). Indeed, SAD is amongst the most common of the various disorders commonly comorbid with ASD, with nearly a third of children with ASD also being diagnosed with SAD (Simonoff et al., 2008). Furthermore, social anxiety has been specifically associated with social functioning in children with ASD. For example, the clinical severity of SAD has been shown to significantly predict poorer social functioning in children with ASD and comorbid SAD (Chang, Quan, & Wood, 2012). In addition, significant associations have been identified between increased social anxiety symptoms and general adaptive functioning (including social, communication, and community living skills, as well as motor and personal living skills) in children with ASD (Magiati et al., 2016).

1.5.3 Social anxiety and more specific aspects of social cognition

Social anxiety has been found to be associated with more specific aspects of social cognition within pre-adolescent children. For example, significant associations have been identified between elevated social anxiety symptoms and increased latency to recognise basic emotional facial expressions (Melfsen & Florin, 2002) as well as between SAD and reduced accuracy at recognising basic emotional facial expressions (Simonian, Beidel, Turner, Berkes, & Long, 2001). Although this suggests that there may be differences in the nature of the association between emotion recognition and social anxiety disorder or symptoms, significant effects of age and emotion type have also been identified. For example, although Melfsen & Florin, (2002) found an overall association between social anxiety symptoms and the latency to recognise emotions overall, they did not find a significant association for disgust. In addition, Simonian et al.

(2001) recruited a narrower, specifically pre-adolescent, age range (8-12, compared to 9-15). As such, it is unclear whether this pattern of results is a reflection of child age, or differences in relationship with SAD or social anxiety symptoms.

The relationship between social anxiety and other aspects of social cognition has also been investigated. For example, several aspects of ToM have been studied. However, findings from studies assessing individual aspects of ToM are inconsistent. For example, significant associations have been identified between social anxiety symptoms and basic aspects of ToM (e.g. basic levels of pretence and emotion recognition) amongst 4-year-old children (Colonnesi, Nikolić, de Vente, & Bögels, 2017). However, several studies have found no significant association between social anxiety symptoms and false belief understanding (e.g. children's ability to understand that others hold different knowledge and thoughts from oneself) in children up to the age of 9 years old (Broeren, Muris, Diamantopoulou, & Baker, 2013; Colonnesi et al., 2017). This may reflect a clear effect of age, potentially reflecting the developmental trajectory of ToM abilities.

Few studies have investigated more complex and subtle ToM abilities but where they have, they identified significant associations with social anxiety symptoms. For example, Banerjee & Henderson (2001) found that although social anxiety symptoms were not associated with understanding other's beliefs in pre-adolescent children, they were negatively associated with children's ability to understand faux pas' and self-presentational displays. Specifically, children scoring higher on symptoms of social anxiety were less able to identify the motives behind self-presentational displays and the unintended emotional consequences of faux pas. In a later study, Banerjee &

Watling (2010) found that social anxiety symptoms were also significantly associated with less use of self-presentational tactics. However, critically, this scale does not account for the appropriateness of the use of these tactics and so it is unclear whether there was a distinction between ability and affinity here.

Although several studies have investigated the association between social anxiety and children's understanding of other's thought's and beliefs (i.e. cognitive ToM), there are relatively few studies that have investigated the relationship with children's understanding of other's emotions (i.e. affective ToM). Two studies have assessed this relationship, but found no significant association between social anxiety symptoms and children's understanding of complex emotions (i.e. those that require a broader understanding of the context, such as disappointment; Ogawa, Lee, Yamaguchi, Shibata, & Goto, 2017; Usher, Burrows, Schwartz, & Henderson, 2015). However, both of these studies included small sample sizes across a relatively wide age group and used a task in which different types of emotions are not assessed individually (i.e. the reading the mind in the eyes task; Baron-cohen, Wheelwright, Scahill, Lawson, & Spong, 2001). Given the effect of age that has been identified amongst studies assessing cognitive ToM and the effect of both age and emotion type in those assessing emotion recognition, significant associations with social anxiety symptoms may have been masked by these methodological features.

Amongst older children, some significant associations have been identified between social anxiety symptoms and other aspects of social cognition such as perspective taking, but this has not been consistently found. For example, Pile, Haller, Hiu, & Lau (2017) found that adolescents scoring above cut-offs on a measure of social

anxiety symptoms were less able to take the perspective of a "director" character than those scoring below cut offs. However, within a narrower age range of early adolescence, (Batanova & Loukas, 2011) found no significant association between social anxiety symptoms and perspective taking ability. Of note, these studies differed in the age range of children recruited and the approach taken to analyse the findings. As such, it may be the case that significant results were driven by the inclusion of older adolescents, or the use of a cruder dimensional approach to analysis.

Social cognition has clear associations with social skills and plays an important role in social interactions. However, evidence for an association with social anxiety is inconsistent. Particular inconsistencies are present within the literature assessing the relationship between social anxiety and ToM, where studies are not consistent in their measurement and analysis of different aspects and complexities of ToM. In addition, there has been no investigation of the relationship between social anxiety disorder and ToM amongst clinically anxious populations and, as such, conclusions relevant to the treatment of SAD are limited.

1.5.4 Measurement of specific aspects of social cognition.

Social cognition is most often measured using lab based experimental tasks which require a behavioural response as an indication of the underlying cognitive process. As a result, these measures are limited by their simplicity and lack of ecological validity. For example, emotion recognition is typically assessed by asking individuals to name the emotions presented by pictures of faces (e.g. Simonian et al., 2001) and ToM might be measured by asking children to answer questions or explain the behaviours of characters in vignettes (e.g. Kokkinos, Kakarani & Kolovou, 2016). These measures of

social cognition only require the ability to process one type of information at any one time, such as one emotional face. In contrast, social interactions are often complex and require the ability to process a great deal of different and competing pieces of information. Currently, no ecologically valid measures of social cognition exist. As such, conclusions drawn from research assessing social cognition should take into account whether or not findings can be generalised to the real world. This is particularly important when considering the clinical implications of social cognition findings in relation to disorders such as SAD and ASD in children.

1.6 Aims of the thesis.

The aims of this thesis are to first establish whether there are particular profiles of the mechanisms targeted in generic CBT programmes within a sample of children who have been diagnosed with a clinical anxiety disorder. Given hypothesises that a group of socially anxious children with social skills difficulties would emerge, the second broad aim is to further explore the relationship between social anxiety and the social cognitions underlying social skills by (i) quantifying and exploring the nature of the relationship broadly amongst children and adolescents; and (ii) examining the specific relationship between social anxiety and ToM amongst a sample of clinically anxious and non-anxious pre-adolescent children.

1.7 Outline of Papers.

The following sections will outline the questions addressed by each of the papers and give details about relevant methods and definitions used in the papers.

1.7.1 Paper 1: Do clinically anxious children cluster according to their expression of the main maintenance mechanisms that are targeted in cognitive behavioural therapy?

Within this paper, Latent Profile Analysis (LPA) was used to establish whether there are distinct subgroups of clinically anxious children that differ in their expression of the core maintenance mechanisms that are targeted in CBT. Given that impaired outcomes from treatments targeting these mechanisms have been associated with several demographic and clinical characteristics, a further aim was to explore whether these subgroups align with existing diagnostic categories or differ on other clinical and demographic characteristics that commonly predict treatment outcome.

Latent profile analysis is a person-centred clustering technique that estimates the probability of an individual's membership to a group (i.e. the probability that their pattern of scores is more similar to that of the other individuals in one group as opposed to another) based on several indicator variables. A major advantage to LPA over cluster analysis is that groups are based on probability. This provides a more objective assessment of potential latent groups than cluster analysis, which bases groups on the distance of scores within groups compared to between groups and requires the researcher to subjectively assess the nature of the groups. Furthermore, cluster analysis has previously been criticised for resulting in primarily theoretical groupings that are not practically meaningful (Stanley, Kellermanns, & Zellweger, 2017).

1.7.2 Paper 2: The relationship between social anxiety and social cognition in children and adolescents: A systematic review and meta-analysis.

Within this paper, literature assessing the relationship between social anxiety and social cognition in children and adolescents were systematically reviewed and effect sizes within each paper were meta-analysed to estimate an overall effect size for this relationship. In addition, the nature of the relationship between social anxiety and social cognition was investigated by examining several conceptual and methodological features (e.g. the type of social cognition that was measured, the type and informant of the measure, age, gender) as moderators of the relationship.

In the interest of a focussed review, an operational definition of social cognition was developed that defined social cognition as an ability to identify and/or understand the thoughts, feelings and/or perceptions of another. A diagnosis of ASD was included within this definition, given that deficits in social cognition as defined here are central to a diagnosis (American Psychiatric Association, 2013; Baron-cohen et al., 1985). However, this focused definition allowed for the inclusion of only those social cognitions that would not overlap with the measurement of, or be affected by inhibition or social anxiety, nor those associated with broader aspects of functioning. As such, cognitions involved in the production of social skills was not included as these are subject to being affected by inhibition. In particular, the measurement of the production of social signals remains inhibited by the inability to differentiate between a deficit in social signal production as a result of social cognition deficit or inhibition. In addition, deficits in attention, memory and visual or auditory perception (i.e. as in learning difficulties, attention deficit hyperactivity disorder, sight difficulties, or deafness) were not included due to their application across broader aspects of functioning, outside of the social domain.

Social anxiety was defined as a fear of negative evaluation by others and the subsequent avoidance of social situations, or the endurance of feared situations with intense distress; consistent with the DSM-5 diagnostic criteria for social anxiety disorder (American Psychiatric Association, 2013). Although this definition was taken from the diagnostic criteria for social anxiety disorder, social anxiety was considered as being on a continuum that includes shyness, social anxiety and avoidant personality disorder (Rapee & Heimberg, 1997). However, for the purposes of this review, only shyness and social anxiety disorder (or social anxiety symptoms) will be included and avoidant personality disorder will not. This was because avoidant personality disorder would typically not be diagnosed until early adulthood and the diagnosis involves a sensitivity to, rather than a fear of negative evaluation.

Given the relatively broad scope of the review, the literature included is likely to vary on several conceptual, methodological and demographic characteristics and the relationship between social anxiety and social cognition may be moderated by these key study characteristics. For example, the relationship between social anxiety and social cognition may differ between different dimensions of these concepts. Similarly, the relationship may differ between different analytic approaches (i.e. correlational or between groups), where they may be a continuous or dimensional relationship. The relationship between social anxiety and social cognition may also differ according to the type of sample (i.e. clinical or not clinical) and demographic features (e.g. age and gender), where these groups differ on clinical characteristics, developmental and gender differences (e.g. higher social anxiety in girls and more impaired social cognition abilities in boys; Asher & Aderka, 2018; Charman, Health, & Ruffman, 2002). The type of measure and the reporter may also affect the relationship; where different measures and

reporters are likely to differ in their ability to assess underlying cognitions, as opposed to observed behaviour. Therefore, in addition to meta-analysing the data from these studies to identify an overall effect size of the relationship between social anxiety and social cognition, several moderation analyses will be conducted to assess whether this relationship is affected by key study characteristics.

1.7.3 Paper 3: Investigating the relationship between social anxiety and theory of mind in clinically anxious and non-anxious pre-adolescent children.

Within this paper, previous findings regarding the relationship between social anxiety and complex aspects of ToM will be extended by assessing this relationship in a sample of clinically anxious and non-anxious children. Given the differences between aspects of ToM described above, both cognitive and affective aspects of ToM will be assessed to investigate whether social anxiety differs in how it is associated with each of these aspects. Furthermore, ToM abilities will be assessed in relation to social anxiety symptoms as measured on a continuum across the clinical and non-clinical sample, and in relation to social anxiety disorder by comparing between groups of children with SAD, anxiety disorders other than SAD and non-anxious children.

Within this study, cognitive ToM was measured using the Triangles task. This task requires children to allocate actions and intentions to two triangles that are either interacting with each other (within simple behavioural or complex mental state interactions) or moving around randomly with no interaction. Responses are scored for the level of mentalising terms and accuracy to the intended script. As such, this task assesses whether children are able to identify the intentions of others with minimal information. The benefits of this task are that the two scores calculated for each

participant allow for an assessment of the child's ability to establish whether or not a character has an intention (i.e. by their use, or not, of mentalising words), as well as how accurate their identification of the intention is. This distinction is important given previous findings that social anxiety is not associated with false belief tasks (i.e. identifying that others have different beliefs; (Banerjee & Henderson, 2001) but is associated with children's ability to accurately identify the intentions behind actions (Banerjee & Henderson, 2001; Banerjee & Watling, 2010). Furthermore, the inclusion of three types of animation that differ in the level of interaction that is presented allows for conclusions to be drawn about whether the relationship between social anxiety and ToM differs for different interaction complexities.

Affective ToM was measured in this study using the Reading the Mind in the Eyes Test (RMET; Baron-cohen et al., 2001). This task requires children to choose a phrase that describes what a person is thinking or feeling by viewing just the eyes of the individual. Given that many basic emotion recognition tasks are relatively simple, the RMET benefits from being a more complex measure of affective ToM in several ways. For example, only the eye region of the face is presented, restricting the amount of information available to base a judgement on. Furthermore, the emotional expressions presented typically tend to reflect complex emotions (e.g. disappointment) which require which require a deeper understanding of or assumptions about contextual information.

Both of these tasks have previously been used to assess ToM in ASD populations, in which it has been established that ToM difficulties are prevalent (Baron-cohen et al., 1985). For example, compared to neurotypical controls (e.g. Salter, Seigal, Claxton,

Lawrence, & Skuse, 2008) and individuals with learning difficulties (Abell et al., 2000), children with ASD have been found to have difficulties accurately identifying the actions and intentions of the triangles, but did not give any fewer interaction explanations, particularly for more complex ToM animations. This appears to be consistent across pre-adolescents and adolescents. Similarly, impaired abilities on the RMET have been identified amongst children with Asperger Syndrome (AS; an associated social communication disorder) in comparison to same aged peers (Baron-cohen et al., 2001). In addition, significant associations have been identified between this task and other ToM tasks (i.e. Strange stories task; Hayward & Homer, 2017), suggesting sufficient construct validity.

1.8 Summary.

Given the prevalence of anxiety disorder amongst children and the associated negative impact on daily life, effective early interventions are important. However, current treatments leave much room for improvement. An important step to making these improvements is to gain a better understanding of the mechanisms that are thought to maintain anxiety in childhood. Specifically, it is important to establish whether there are particular groups of children for whom more specific treatments might be efficacious that are directed at discrete patterns of difficulties. Given that a diagnosis of SAD is associated with poorer treatment outcomes from general CBT approaches than other anxiety disorders, it is especially important to understand the mechanisms that maintain social anxiety in children. Despite the suggestion that social skills deficits may be an important target for treatment, the literature is hindered by measurement difficulties due to an overlap in the observable behaviours associated with

both social anxiety and social skills difficulties. Additionally, evidence for the relationship between social anxiety and the underlying cognitions involved in social skills is mixed due to the wide range of social cognitions that are assessed, the age within which they are studied, and the statistical methods used to assess relationships.

As such, this thesis aims to improve understanding of the putative maintenance mechanisms in childhood anxiety by (i) investigating the presence of distinct groups that differ in their expression of these mechanisms; (ii) clarify the nature of the relationship between social anxiety and the cognitions that underlie social skills; and (iii) investigate the relationship between social anxiety and specific social cognition (i.e. ToM) amongst a clinically anxious sample. The papers included within this thesis will, therefore, help to draw conclusions about the efficacy of targeting specific treatments for particular groups of anxious children and, in particular, whether there may be any merit to targeting impaired social skills, or cognitions, in socially anxious children.

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Chapter 2; Paper 1

Do clinically anxious children cluster according to their expression of the main maintenance mechanisms that are targeted in cognitive behavioural therapy?

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Research paper

Do clinically anxious children cluster according to their expression of factors that maintain child anxiety?

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ABSTRACT

Background: Cognitive Behaviour Therapy (CBT) is an effective treatment for childhood anxiety disorders, yet a significant proportion of children do not benefit from it. CBT for child anxiety disorders typically includes a range of strategies that may not all be applicable for all affected children. This study explored whether there are distinct subgroups of children with anxiety disorders who are characterized by their responses to measures of the key mechanisms that are targeted in CBT (i.e. interpretation bias, perceived control, avoidance, physiological arousal, and social communication).

Methods: 379 clinically anxious children (7–12 years) provided indices of threat interpretation, perceived control, expected negative emotions and avoidance and measures of heart rate recovery following a speech task. Parents also reported on their children's social communication difficulties using the Social Communication Questionnaire (SCQ).

Results: Latent profile analysis identified three groups, reflecting (i) 'Typically anxious' (the majority of the sample and more likely to have Generalized anxiety disorder); (ii) 'social difficulties' (characterized by high SCQ and more likely to have social anxiety disorder and be male); (iii) 'Avoidant' (characterized by low threat interpretation but high avoidance and low perceived control).

Limitations: Some measures may have been influenced by confounding variables (e.g. physical variability in heart rate recovery). Sample characteristics of the group may limit the generalizability of the results.

Conclusions: Clinically anxious children appear to fall in to subgroups that might benefit from more targeted treatments that focus on specific maintenance factors. Treatment studies are now required to establish whether this approach would lead to more effective and efficient treatments.

1. Introduction

Anxiety disorders affect approximately 6.5% of children worldwide (Polanczyk et al., 2015). The mean age of onset is 11 years of age (Kessler et al., 2005) yet anxiety disorders often persist into adulthood (Kessler et al., 2005) and increase the risk of other psychopathologies throughout life (Bittner et al., 2007). The high prevalence, persistence and impairment associated with childhood anxiety disorders highlights the need for effective interventions.

Currently, the recommended first line treatment for anxiety in pre-adolescents is typically a general form of Cognitive Behavioral Therapy (CBT) that can be applied across a range of anxiety diagnoses (e.g. Kendall, 1994; Kendall et al., 2002; Pilling et al., 2013). Such general forms of CBT typically target mechanisms that appear in adult maintenance models of anxiety (e.g. Rapee and Heimberg, 1997), which are thought to also play a role in maintaining anxiety in children, including negative thinking styles (in particular threatening interpretations of ambiguous information and low self-efficacy), abnormal physiological arousal, avoidance of feared stimuli and, in some cases, social communication deficits (Albano and Kendall, 2009; Rapee et al., 2000).

The effectiveness of general CBT is promising (59.4% recovery) when compared to waitlist controls (17.5%; James et al., 2013) and there are fewer side effects when compared to pharmacotherapy (Rynn et al., 2015). However, almost half of the children who receive CBT retain a diagnosis and, as such, there is clear room for improvement.

In order to improve treatment for children with anxiety disorders, it is necessary to understand the reasons why they are not effective for some children. A number of demographic and clinical characteristics have previously been associated with impaired outcomes (i.e. higher symptom severity, lower socio-economic status (SES) and comorbid

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diagnoses of other anxiety, mood and behavioral disorders; Compton et al., 2014; Hudson et al., 2015). However, it may also be the case that the mechanisms that are targeted in general forms of CBT are not appropriate for all anxious children. Indeed, the evidence for the presence of these mechanisms in childhood anxiety disorders is unclear. For example, negative thinking styles have not consistently been found amongst anxious youth in comparison to non-anxious youth, particularly when samples are restricted to pre-adolescents (Waite et al., 2015; Waters et al., 2008). Furthermore, although avoidance of feared stimuli is often associated with anxiety in children (Lebowitz, 2017) it is not always required for a diagnosis (e.g. in social anxiety disorder where enduring with distress may be an alternative to avoidance; DSM-5, 2013)

Whilst there is some evidence that children with anxiety disorders, compared to non-anxious children, show reduced heart rate (HR) recovery following a stressor (Schmitz et al., 2011, 2013) others have found no, or only marginal differences (e.g. Alkozei et al., 2015; Beidel, 1991). When it comes to social communication deficits, there is some evidence for both self and observer rated social communication deficits in groups of children with both mixed anxiety disorders (e.g. Dodd et al., 2011) and social anxiety disorder specifically (Spence et al., 1999) compared to non-anxious children. However, others have only found evidence for deficits according to self-, but not observer-ratings (e.g. Cartwright-Hatton et al., 2003, 2005). These mixed findings are complicated by the potential for anxiety-driven inhibited behaviors in social situations to be coded as skills deficits (e.g. poor eye contact) in observational studies. Although, notably, recent studies of underlying social communication deficits have indicated that children with anxiety disorders are more likely than non-anxious children to display social communication difficulties (van Steensel et al., 2013).

The inconsistencies that have been found across studies may reflect the presence of subgroups of children for whom these maintenance mechanisms apply to different degrees. Given that many of these studies include samples of children with a variety of anxiety disorders, it is possible that these subgroups represent different diagnostic categories. However, to date there has been little evidence for diagnostic specificity in relation to negative thinking (Creswell et al., 2014) and physiological arousal (Alkozei et al., 2015) although there is some evidence that social communication difficulties may be more common among children with social anxiety disorder than other anxiety disorders (Halls et al., 2015). These findings suggest that, in order to deliver treatments that optimize outcomes, children with anxiety disorders may be better categorized according to the presence of particular maintenance mechanisms than by traditional diagnostic categories.

As such, and in line with the precision psychiatry approach that uses data driven techniques to identify subgroups within standard psychiatric categories (Fernandes et al., 2017), the current paper uses a person centered mixed models approach (Latent Profile Analysis; LPA) to explore the following research questions; (i) are there distinct subgroups of clinically anxious children that differ in their expression of the core maintenance mechanisms that are targeted in CBT (i.e. negative thinking styles (interpretation bias, expected negative emotions and expected control), avoidance, physiological arousal and social communication difficulties)?; (ii) do these subgroups align with existing diagnostic categories for anxiety disorders in children?; and (iii) do these subgroups differ on clinical characteristics that commonly predict treatment outcome (i.e. symptom severity, SES and the presence of SoAD, mood and behavioral disorders)?

2. Method

2.1. Participants

Four hundred and six clinically anxious children were recruited to one of two treatment trials (Creswell et al., 2015; Thirlwall et al., 2013) through the local child and adolescent mental health service (CAMHS) following referral by local health and education professionals. The children included in these trials were aged 7–12 years, met criteria for a primary anxiety disorder diagnosis, did not have a significant physical or intellectual impairment (including autism spectrum disorders), were not currently prescribed psychotropic medication, and their primary carer did not have a significant intellectual impairment (that would have inhibited participation in subsequent treatment). Research assessments were carried out prior to the commencement of any treatment.

Table 1
Sample characteristics.

Gender(female)[a]	195 (51.5)
Age (years)[b]	9.69 (1.57)
Ethnicity (Caucasian)[a]	340 (89.7)
SES (higher professional)[a]	294 (77.6)
Primary diagnosis[a]	
GAD	107 (28.2)
SAD	96 (25.3)
SoAD	82 (21.6)
Specific phobias	60 (15.8)
Agoraphobia (without panic disorder)	15 (4)
Panic Disorder	6 (1.6)
Secondary diagnoses[a]	
SoAD	168 (44.3)
GAD	140 (36.9)
SAD	124 (32.7)
ODD	78 (20.6)
ADHD	58 (15.3)
MDD	30 (7.9)
Dysthymia	23 (6.1)
Severity measures[a]	
CSR of primary anxiety disorder	5.63 (0.79)
SCAS-C	39.6 (18.75)
SCAS-P	39.93 (15.63)

Data reported:
[a] n (% of sample).
[b] Mean (SD).

The current analyses included 379 participants (see Table 1). Children who were excluded ($N = 27$) on the basis of having data for none ($n = 5$) or only one ($n = 16$) of the dependent variables, or being outside of the study age range at the time of assessment ($n = 6$), did not differ significantly from the included sample on age (Welch's $F(1, 10.17) = .005$, $p = .95$), gender ($\chi^2(1) = .15$, $p = .70$) or primary diagnosis CSR (Welch's $F(1, 10.44) = 2.56$, $p = .14$). Compared to non-participants, participants were less likely to have a primary diagnosis of Specific Phobia ($\chi^2(1) = 6.75$, $p = .01$).

2.2. Measures

2.2.1. Diagnoses

Anxiety disorders and other common comorbid diagnoses were determined using the ADIS-c/p (Silverman et al., 1996); a structured diagnostic interview based on DSM-IV criteria (Silverman et al., 2001). Diagnoses were given alongside a clinical severity rating (CSR) of 4 (moderate psychopathology) or more, based on parent or child report, where CSR's range from 0 (complete absence of psychopathology) to 8 (severe psychopathology). ADIS-c/p assessments were conducted by psychology graduates trained to achieve inter-rater reliability of at least 0.85 for diagnoses and CSRs with an experienced diagnostician (a consultant clinical psychologist). After inter-rater reliability had been achieved assessors were required to discuss one in six subsequent interviews to prevent rater drift. Overall reliability was high for presence or absence of diagnosis (kappa = 0.98) and for the CSR (Intra-class correlation = 0.99).

2.2.2. Anxiety symptoms

Child and parent reported anxiety symptoms were assessed with the Spence Children's Anxiety Scale (SCAS-c/p; Nauta et al., 2004; Spence,

1998). Both the child and parent report versions include 38 items (accompanied by 6 filler items in the child-report version) to rate how often the child experiences each symptom from 0 (never) to 3 (always). Elevated anxiety is represented by total scores above 40 in boys and 50 in girls. Internal consistency for the current sample was good for child (α = .89) and parent report (α = .89)

2.2.3. Interpretation of ambiguity

Interpretation of hypothetical, ambiguous situations was assessed using an adapted version of the Ambiguous Scenarios Questionnaire (ASQ; Barrett et al., 1996; Creswell and O'Connor, 2006). The questionnaire presents 12 hypothetical situations (six social, e.g., 'You arrange to have a party at 4 o'clock and by half past 4 no one has arrived'; six non-social, e.g., 'You are lying in bed at night when you hear a big crash in the night') and children (a) rate how they would feel in this situation (0 = not at all upset; 10 = very upset; expected negative emotion), (b) give a free response to the question 'Why do you think this is happening?' (Threat free response), (c) rate how much they would be able to do about this situation (0 = nothing, 10 = a lot; perceived control), (d) choose which of two alternatives (threat/non-threat, counterbalanced across the 12 situations) they would be more likely to think in this situation (threat forced choice), and (e) report what they would do (avoidance free report).

A psychology postgraduate who was blind to participant characteristics coded all free choice responses. Threat free responses were coded as 'Threat' (e.g. 'Nobody wants to come to my party') or 'Non-threat' (e.g. 'They must be in a traffic jam'). A second independent coder (an undergraduate psychology student) coded a sub-sample of responses (n = 30). Inter-rater reliability was established with good intra-class correlations (ICC = .91 (threat); ICC = .75 (avoidance)). Scores were totaled across situations for each domain (distress, threat (free report), control, threat (forced choice)). Free and forced choice threat scores (r = .55, $p < .001$) were combined to reduce the number of variables. Internal consistency for each scale was acceptable (negative emotions α = 0.84; threat α = 0.59; control α = 0.82). Internal consistencies for threat scores were most likely lower as the scales comprise dichotomous variables.

2.2.4. Physiological arousal

Cardiovascular activity during and after a socially relevant stressor task (a presentation performed standing) was used as a measure of physiological arousal. Activity was measured using Actiheart monitors and software (Cambridge Neurotechnology, Cambridge, UK). Two standard ECG electrodes were attached to the child's chest; one just below the sternum and the other towards the left side of the chest. Actiheart calculates average HR (beats per minute, BPM) in 15 s epochs using the number of R waves. In order to ensure that there were no artefacts in the time series used to calculate HR, we used the semi-automated editing software in the Actiheart software to detect and correct artefacts in the inter-beat interval (IBI) time series and visually inspected the time series for any additional artefacts (two independent coders; interrater reliability Kappa > .8).

2.2.5. Social communication deficits

Social communication was assessed using the lifetime version of the Social Communication Questionnaire (SCQ; Berument et al., 1999); a parent report measure based on the Autism Diagnostic Interview-Revised (ADI-R). In keeping with the study rationale, we used the 21 items which have been found to fit well within the Reciprocal Social Interaction (RSI; 13 items, e.g. offering to share or comfort, interest in children and social smiling) and Communication (C; 8 items, e.g. conversation, inappropriate questions and nodding or shaking the head to mean "yes" or "no") domains (Berument et al., 1999). Parents responded "yes" or "no" to items assessing behaviors occurring at any time (6 items; 1 to assess RSI, 5 to assess C) and behaviors between the age of 4 and 5 years (15 items; 12 to assess RSI, 3 to assess C). Internal consistency was good for the combined RSI and C subscales (RSI-C; α = .82).

Table 2
LPA input variables.

Measure.	Variable from measure.	LPA input variable.
ASQ (Cognitive)	Combined threat interpretation.	Negative Interpretation (NI; r = .55)
	Expected negative emotions.	Negative Interpretation (NI; r = .55)
	Expected Avoidance.	Avoidance.
	Expected Control.	Control.
SCQ (Social Communication Deficits)	Social subscale (RSI)	RSI-C.
	Communication subscale (C)	RSI-C.
Presentation task (Physiological)	Heart rate recovery. (Difference between average BPM during and post social stressor task.)	HR.

2.3. Ethical considerations

Both the University of Reading and Berkshire NHS research ethics committees approved this study. Potential participants and their parents received written information and had the opportunity to discuss the study with the research team before taking part. Both written consent from primary caregivers and assent from participating children were provided. Both were fully debriefed upon completion of the testing session.

2.4. Procedure

Diagnostic interviews and symptom questionnaires were administered to participants and their parents either in clinic rooms within the university or in local satellite clinics. Participants were then invited into the University to complete the interpretation and HR measures. Children and their parents were first given 5-min to play a familiar game to become accustomed to the lab. Children then completed the ASQ with a research assistant. Children and their parent, sat to watch a 5-min DVD (heartrate baseline) before being informed that the child would have 5-min to prepare (with parental support) for a 3-min speech to the researcher and a camera on a topic from a given list (e.g. "My family"). Following the speech, children rated how scared they felt during the task on a scale from 0 (not scared at all) to 10 (very scared). Children and their parents then sat to watch the DVD for a further 5-min (recovery).

2.5. Data analysis

Latent Profile Analysis (LPA; carried out with Mplus, Version 7.11 with Combination add-on) was used to investigate the presence of subgroups of children with anxiety disorders. This is a "person-centered" form of cluster analysis that estimates the probability of participants' membership to a class based on several indicator variables. Here, indicator variables related to the putative maintenance mechanisms for childhood anxiety disorders that are targeted in general forms of CBT (Table 2). The number of indicator variables were reduced[1] and, as a result, negative interpretations and expected negative emotions were standardized and summed.

Multiple models, with increasing numbers of latent classes, were tested to identify the best latent class solution (Table 3). Various fit

[1] The LPA was also run with the individual variables, showing the same pattern of results as analyses using the combined variables.

Table 3
Latent profile analysis model fits and proportions.

Model.	Fit indices.	*n* and proportion by Class.			
		Class 1	*Class 2*	*Class 3*	*Class 4*
1 Class	BIC = 9394.48	*N* = 379			
	AIC = 9355.10	100%			
2 Classes	BIC = 9336.85	*n* = 329	*n* = 50		
	AIC = 9273.85	86.81%	13.19%		
3 Classes	BIC = 9328.74	*n* = 303	*n* = 44	*n* = 32	
	AIC = 9242.11	79.95%	11.61%	8.44%	
4 Classes	BIC = 9289.95	*n* = 287	*n* = 45	*n* = 2	*n* = 45
	AIC = 9179.70	75.73%	11.87%	0.53%	11.87%
Average probabilities for membership in each class of the accepted model.	*Class 1*	0.92	0.03	0.05	
	Class 2	0.13	0.85	0.02	
	Class 3	0.16	0.06	0.78	

indices were used to determine the number of classes that fit the data best. First, the sample size adjusted Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC) were used; where lower numbers represent a better fit of one model compared to another. Second, the proportion of the sample in each class was required to be more than 5%. Third, the average probabilities for most likely class membership were considered; with acceptable probabilities being more than .7 for a participant belonging in the class in which they are placed or less than .3 for belonging in other classes (Nagin, 2005). Finally, the interpretability of the classes was also taken into account. After determining the number of latent classes, ANCOVAs were used to compare indicator variable means between latent classes, with gender and age as covariates. A Bonferroni correction was applied to account for multiple analyses. Significant main effects were explored with Scheffe's post hoc comparisons (carried out on the unstandardized residuals of each variables having taken age and gender into account). The classes were compared on the presence of clinical characteristics that have been commonly associated with treatment outcome (i.e. SES and the presence of particular anxiety (GAD, SAD and SoAD; the most prevalent disorders in the current sample), mood and behavioral disorders) using Chi-Squared tests. Given that symptom severity is the most consistent predictor of treatment outcome, we conducted sensitivity analyses controlling for baseline anxiety severity (SCAS-c and p totals) in the latent profile analysis. Furthermore, given that there were three items in the SCQ that could feasibly refer to symptoms of social anxiety, sensitivity analyses were also conducted separately, omitting these items. The number of classes and pattern of differences between classes on input variable means was consistent with the original analyses that did not control for anxiety severity or overlapping questionnaire items. Therefore, the results of the original analyses are presented here.

Missing data was mostly caused by refusal to take part in particular tasks, limited time for completing all tasks, or (in the case of heart rate measures) clean data not being extractable. We applied the full information maximum likelihood method to deal with missing data (Enders, 2010).

3. Results

(i) **Are there distinct subgroups of clinically anxious children that differ in their expression of the core maintenance mechanisms that are targeted in CBT?**

Results from the LPA indicated that the three-class model fit the data best. BIC and AIC reduced between one, two, three and four class models (Table 3). However, one of the classes in the four class model did not retain a sufficient proportion of the sample (0.53%). Additionally, average latent class probabilities (Table 3) and the entropy value (.77) for the three-class model were acceptable. Although the two-class model also fitted the data well, further investigation, using between group tests, indicated that the three-class model was an elaboration of the two-class model; where the third class was interpretable in and of itself and made theoretic sense. As such, the three-class model was chosen as the most appropriate fit for this data. For ease of interpretation, these groups will hence forth be referred to as the "Typical anxiety", "Social difficulties", and "Avoidant" groups.

A significant main effect of group was found for all input variables except HR recovery (NI, $F(2, 354) = 7.97$, $p < .001$,[2] $\eta^2 = .04$; Control, $F(2, 351) = 18.38$, $p < .001$, $\eta^2 = .09$; Avoidance, $F(2, 329) = 105.98$, $p < .001$, $\eta^2 = .39$; RSI-C, $F(2, 325) = 246.23$, $p < .001$, $\eta^2 = .6$; HR, $F(2, 194) = .82$, $p = .44$, $\eta^2 = .01$; Fig. 1). Post-hoc comparisons revealed that the avoidant group made significantly fewer negative interpretations ($M = -1.16$, $SD = 2.26$) and expected less control ($M = 26.66$, $SD = 21.19$) than both the Typical (NI, $M = .08$, $SD = 1.56$, $p < .01$. $d = .57$; control, $M = 51.01$, $SD = 22.72$, $p < .001$, $d = 1.12$) and the Social difficulties groups (NI, $M = .35$, $SD = 1.96$, $p < .01$, $d = .76$; control, $M = 44.68$, $SD = 20.02$, $p < .01$, $d = .91$) who did not significantly differ from one another (NI, $p = .26$, $d = .27$; control, $p = .29$, $d = .28$). The Avoidant group ($M = 6.94$, $SD = 1.72$) also reported significantly higher avoidance than both the Typical ($M = 2.39$, $SD = 1.57$; $p < .001$, $d = 1.12$) and Social difficulties groups ($M = 3.33$, $SD = 1.91$; $p < .001$, $d = .91$), who did not differ significantly from one another ($p = .07$, $d = .28$). The Social difficulties group ($M = 9.84$, $SD = 3.23$) had significantly higher scores for RSI-C (indicating more difficulties) than both the Typical ($M = 1.82$, $SD = 1.87$; $p < .001$, $d = 2.85$) and avoidant group ($M = 2.48$, $SD = 2.76$; $p < .001$, $d = 2.37$), who did not differ significantly from one another ($p = .69$, $d = .17$). Here, all significant results demonstrated large effect sizes.

(ii) **Do these subgroups align with existing diagnostic categories for anxiety disorders in children?**

There was a significant main effect of group (Fig. 2) for the proportion of children with any diagnosis (primary or other) of SoAD (χ^2 (2) = 15.69, p < .001, V = .20) and GAD (χ^2 (2) = 5.85, p = .05, V = .12), but no significant difference for SAD (χ^2 (2) = 1.71, p = .43, V = .07). Post hoc tests revealed that the Social difficulties group contained a higher proportion of children with any diagnosis of both SoAD (90.70%) and GAD (81.40%) when compared to the Typical group (SoAD 61.40%, χ^2 (1) = 14.23, p < .001, ϕ = .20; GAD 62.7%, χ^2 (1) = 5.78, p = .02, ϕ = .13). The Avoidant group did not differ significantly from the Typical (SoAD, χ^2 (1) = 2.29, p = .13, ϕ = −.08; GAD, χ^2 (1) = .001, p = .98, ϕ = .001) nor Social difficulties group (SoAD 75%, χ^2 (1) = 3.36, p = .07, ϕ = .21; GAD 62.50%, χ^2 (1) = 3.35, p = .07, ϕ = .21).

A significant main effect of group was also found for the proportion of children with a primary diagnosis of both SoAD (χ^2 (2) = 21.91, p < .001, V = .24) and GAD (χ^2 (2) = 8.92, p = .01, V = .15), but not of SAD (χ^2 (2) = .23, p = .89, V = .03). Post-hoc

[2] No significant differences were found between groups for threat responses to social and non-social scenarios when analysed separately.

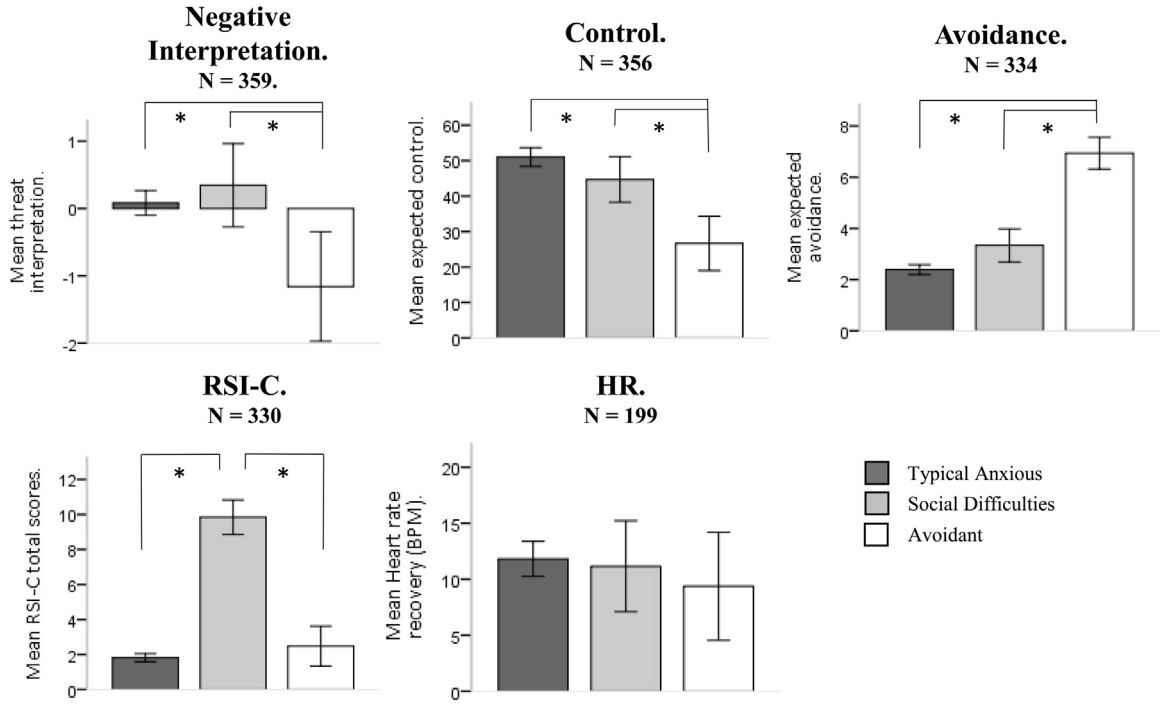

Fig. 1. Inter-class differences for LPA input variables within each group. Error bars show 95% confidence intervals. "*" indicates significant differences of $p < .05$.

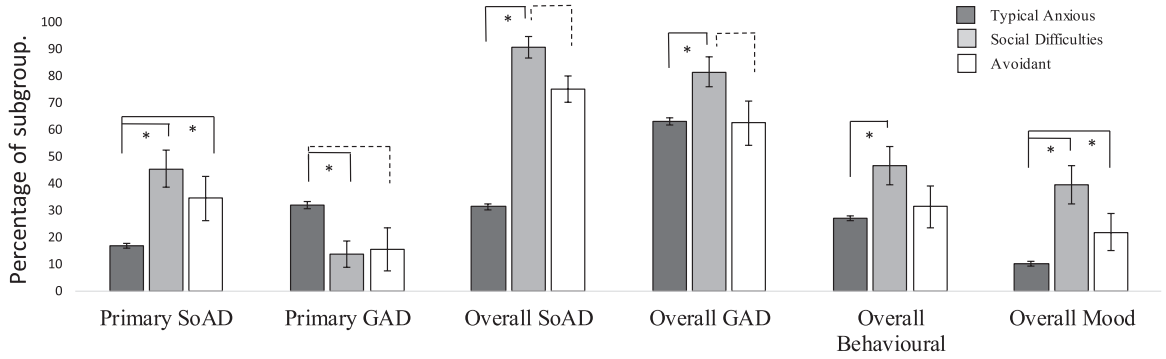

Fig. 2. Inter-class differences for the proportion (%) of children with each diagnosis in each group. Error bars show 95% confidence intervals. "*" indicates significant differences of $p < .05$. Broken lines between groups indicate significance values of $0.07 > p > 0.05$.

tests revealed that the Social difficulties (45.50%) and Avoidant groups (34.40%) had a significantly higher proportion of primary SoAD than the typical group (16.8%; χ^2 (1) = 19.34, p < .001, ϕ = .24; χ^2 (1) = 5.91, p = .02, ϕ = −.13; respectively), but did not differ significantly from one another (χ^2 (1) = .94, p = .33, ϕ = .11). Conversely, the Typical group had a significantly higher proportion of children with a primary diagnosis of GAD (31.70%) than the Social difficulties group (13.60%; χ^2 (1) = 6.03, p = .01, ϕ = −.13). However, the Avoidant group did not significantly differ from the Typical group (15.60%; χ^2 (1) = 3.54, p = .06, ϕ = .10) or the Social difficulties group (χ^2 (1) = .06, p = .81, ϕ = −.03).

(iii) **Do these subgroups differ on clinical characteristics that commonly predict treatment outcome?**

There was a significant main effect of group for age and gender (F(2, 375) = 4.50, p = .01, η^2 = .02; χ^2(2) = 9.68, p = .0, V = .16; Fig. 3). Post hoc comparisons revealed that the Social difficulties group were significantly older (M = 10.27, SD = 1.45) than the Typical group (M = 9.57, SD = 1.57; p = .02, d = .46) but not the Avoidant group (M = 9.97, SD = 1.53; p = .70, d = .20), who did not differ significantly from the Typical group (p = .40, d = .46). There were also significantly higher proportions of males in the Social difficulties (63.6%) and Avoidant groups (65.6%) compared to the Typical group (44.60%; χ^2 (1) = 5.42, p = .02, ϕ = −.13; χ^2 (1) = 5.16, p = .02, ϕ = .12; respectively), with the Social difficulties and Avoidant groups not differing significantly from each other (χ^2 (1) = .03, p = .86, ϕ = .02).
There was a significant main effect of group for children with a secondary diagnosis of a mood (χ^2 (2) = 28.65, $p < .001$, V = .28) or behavioral disorder (χ^2 (2) = 6.88, $p = .03$, $V = .14$; Fig. 3). Post-hoc tests revealed significantly higher proportions of children with a comorbid diagnosis of behavioral (46.50%) and mood disorders (39.50%) in the Social difficulties compared to the Typical group (behavioral: 27.10%, χ^2 (1) = 6.85, $p = .01$, $\phi = .14$; mood: 9.90%, χ^2 (1) = 28.17, $p < .001$, ϕ = .29). The Avoidant group also had a significantly higher proportion of children with a co-morbid diagnosis of a mood disorder (21.90%) compared to the Typical group (χ^2 (1) = 4.22, $p = .04$, $\phi = -.11$), but all other group differences were not significant (Behavioral: Social difficulties and Avoidant (31.30%), χ^2 (1) = 1.78, $p = .18$, $\phi = .15$; Typical and Avoidant, χ^2 (1) = .26, $p = .61$, $\phi = -.03$; Mood: Social difficulties and Avoidant, χ^2 (1) = 2.63, $p = .11$, $\phi = .19$).

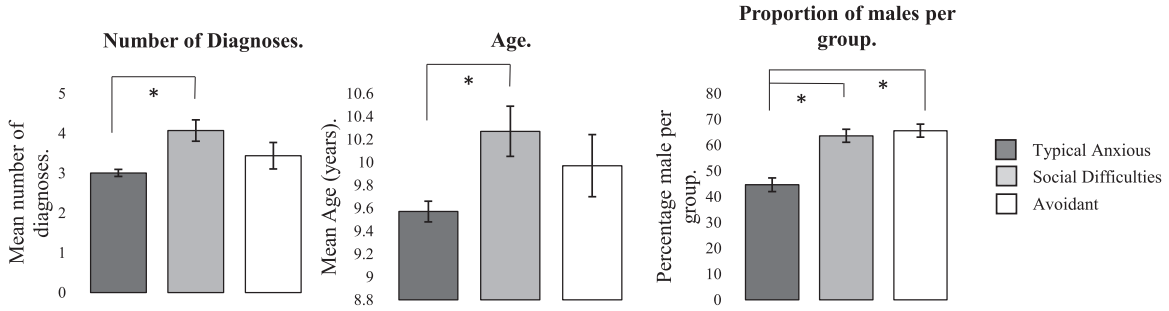

Fig. 3. Inter-class differences for demographic variables within each group. Error bars show 95% confidence intervals. "*" indicates significant differences of $p < .05$.

Finally, there was a significant main effect of group for the number of comorbid disorders diagnosed ($F(2, 373) = 8.80$, $p < .001$, $\eta^2 = .04$). Post hoc comparisons revealed that children in the Social difficulties group had significantly more comorbid diagnoses (Fig. 2; $M = 4.07$, $SD = 1.76$) than in the Typical ($M = 3.00$, $SD = 1.54$; $p < .001$, d = .63), but not Avoidant group ($M = 3.44$, $SD = 1.88$; $p = .28$, $d = .33$) who also did not differ significantly from the Typical group ($p = .34$, $d = .25$).

4. Discussion

This study explored the presence of subgroups of clinically anxious children for whom the putative mechanisms that are commonly targeted in general CBT for child anxiety disorders may apply to different degrees. It also evaluated whether these subgroups were associated with traditional diagnostic categories and with clinical characteristics that predict CBT outcomes. Three latent classes were identified which were characterized as follows: the "typical anxiety group" contained most of the sample (79.95%) and the highest proportion of children with a GAD diagnosis (31.70%). In contrast, the "social difficulties" group had high parent rated social and communication difficulties compared to both other groups. This group had a higher proportion of males (63.30%) which may not be surprising given the higher prevalence of social communication difficulties among males compared to females (Fombonne, 2005). The "social difficulties" group were also older in age and had the highest proportion of children with a primary diagnosis of SoAD (45.50%). As we do not know the age of 'onset' of the child's difficulties, we cannot conclude whether these sorts of difficulties emerge later or whether families seek, or at least access help for these sorts of difficulties later. However the findings are certainly consistent with findings that individuals with social anxiety disorder have particularly long delays between the onset of difficulties and help seeking compared to those with, for example, generalized anxiety disorder (Wang et al., 2005). Notably, children in the "social difficulties" group had more co-morbid disorders than the other groups, yet it remained a distinct group after severity was controlled for. Finally, the "avoidant" group reported high avoidance and low perceived control. It is interesting to note that the 'avoidant' group also reported low levels of negative interpretation and negative emotional responses. It is unclear whether this reflects a tendency to avoid thinking about negative outcomes, or a general tendency for avoidance even in low risk situations; potentially reflecting a general tendency to avoid uncertainty.

Although the subgroups differed on many of the input variables, there were no significant differences between the groups for HR recovery from a presentation task. This may suggest that all anxious children display comparable levels of physiological arousal. However, the sample size was significantly reduced for this variable due to missing data. As such, the analysis was under powered and we are, therefore, unable to confidently draw conclusions from this result.

The current findings may go some way to explaining the inconsistent findings of previous research in to mechanisms that maintain childhood anxiety disorders by identifying subgroups of clinically anxious children who express these mechanisms to varying degrees. Notably, these subgroups did not align neatly with existing diagnostic categories: although, there were associations between some latent classes and diagnostic categories (e.g. GAD in the Typical group and SoAD in the Social difficulties group), with small to medium effect sizes. For example, although the vast majority of children in the 'social difficulties' group had a diagnosis of SoAD (primary or otherwise; 92%), a small proportion did not (8%). Furthermore, only 15.7% of children with a SoAD diagnosis (primary or otherwise) were in the social difficulties group, with 74.7% in the typical group and 9.6% in the avoidant group. These findings suggest that treatments targeting social communication difficulties may benefit some, but not all, children with a SoAD diagnosis. Furthermore, some children with other anxiety disorders (not just SoAD) may also benefit from treatments that target social communication difficulties; approximately 15% of the children with diagnoses of both SAD and GAD were in the "social difficulties" group. Similar proportions of children with SAD and GAD were also classified in the "typical" and "avoidant" groups. These findings suggest that the traditional diagnostic categories may not best tell us which maintenance mechanisms need to be targeted in treatment.

The data driven identification of these subgroups has potential implications for delivery of more targeted treatments that could be more effective and efficient. Indeed, in adult populations, treatments that monitor and target specific maintenance factors have been shown to outperform many other types of treatment, including general forms of psychotherapies (e.g. Cognitive Therapy (CT) for SoAD; Clark et al., 2006).

4.1. Limitations

This study has notable strengths including the inclusion of a relatively large clinical sample and a range of methods to address cognitive, physiological and social domains. However, several limitations should be highlighted. For example, the measure of physiological arousal was limited to heart rate recovery. This was primarily because previous studies have shown slower HR recovery in anxious children after a social stressor and have failed to show differences in HR reactivity (Schmitz et al., 2011; Alkozei et al., 2015). However, findings could have been confounded by differences in state anxiety (Alkozei et al., 2015), excessive movement (e.g., fidgeting in anxious children), body mass index, medical history or exercise patterns. It is also important to note that participants sat for one part of the task and stood for another, limiting the interpretation of the within group repeated measures. These confounds may have contributed to the null results found between groups on HR recovery.

We included a widely used child self-report measure of interpretation of ambiguity in which children are presented with hypothetical scenarios, however the ecological validity of this measure is yet to be established. Our measure of children's social communication difficulties is also widely used and well validated, with items which are clearly distinct from measures of social anxiety. However, the measure relies on subjective parent report and recall.

Sample characteristics that may limit the generalizability of the findings also need to be highlighted. First, this was a treatment seeking sample with relatively high SES. Second, given that differences have been found in the association between anxiety and interpretation in preadolescent and adolescent children (Waite et al., 2015), we restricted the age range to 7–12 year old's so further studies with adolescents are required. Finally, we focused on a restricted range of putative mechanisms of anxiety and characteristics that are associated with CBT outcomes; further studies are required which consider broader, relevant variables such as parental anxiety and parenting styles (Compton et al., 2014).

5. Conclusions

These limitations notwithstanding, the results from this study suggest that there are subgroups of clinically anxious children who differ in the extent to which they express the putative maintenance mechanisms that are targeted in traditional CBT approaches. Further studies are now required to establish whether treatments that target specific mechanisms among particular subgroups of children will lead to more effective and efficient treatments.

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Chapter 3; Paper2.

The relationship between social anxiety and social cognition in children and adolescents: A systematic review and meta-analysis.

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Abstract

Social anxiety disorder (SAD) is common and impairing across the lifespan. It commonly begins to cause significant impairment in early adolescence but is persistent when left untreated and, as such, early intervention is important. Typical generic treatments are less effective for children and adolescents with SAD than those with other anxiety disorders and, although more specific treatments including social skills training tend to be more effective, it is not clear whether this is a direct result of improvements to social skills. Evidence for the relationship between social anxiety and social skills deficits in children is inconsistent and this is partly due to an overlap in the observable behaviours of the two, leading to measurement difficulties. Investigating the social cognitive capacity underlying social skills may be a more effective way of assessing this relationship, but the evidence for a relationship between social anxiety and social cognition is also relatively inconsistent and would benefit from some clarity. The current review and meta-analysis aims to (a) examine the association between social anxiety and social cognition in children and adolescents and (b) examine conceptual and methodological moderators of this relationship. Several databases were searched for studies from which an effect size could be calculated for the relationship between social anxiety and social cognition; identifying a final total of 50 studies to be included int the meta-analysis. An overall significant, but moderate effect size of r = -0.15 was identified such that increased social anxiety was associated with fewer social cognitive abilities. This effect was moderated by conceptual (i.e. the dimension of social cognition measured) and methodological (i.e. study design, sample type, measure type and informant, and age) factors. Implications for research and clinical approaches are discussed.

Introduction

Social anxiety disorder (SAD) is one of the most common mental health difficulties across the lifespan (8.6% prevalence; R. C. Kessler et al., 2005). The age of onset of SAD is commonly during early adolescence (median age of onset 13 years; R. C. 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 lifespan (e.g. Forthofer, Kessler, Story, & Gotlib, 1996; e.g. 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 and 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, 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).

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 non-anxious 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 Communication Questionnaire; Rutter, Bailey, & Lord, 2003) 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.

One approach to overcoming this limitation 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). Studies have begun to explore underlying 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 and dimensions of social cognition in non-clinical children and adolescents, suggesting that they may be more impaired at identifying the intentions, or taking the perspective of other's than non-anxious children and adolescents (e.g. Banerjee & Henderson, 2001; Pile, Haller, Hiu, & Lau, 2017). However, others suggest that neither SAD 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 (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 amongst 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).

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, & 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).

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 (i) systematically review the evidence examining the relationship between social anxiety and social cognition, (ii) establish, through meta-analysis, the strength of the association, and (iii) 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, assessment tool (questionnaire/interview/task), reporter (child/parent/other) and sample demographics (i.e. age and gender)) 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 was accepted within the scope of this definition given that deficits in social cognition, as defined here, is a core feature of an ASD diagnosis (Abell et al., 1999). The measure may assess social cognition in the form of a questionnaire, diagnostic assessment, 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 (PsychInfo, 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 3a 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, 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 post-graduate 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 ($K = 0.91$, $p < 0.001$). 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 were 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 ($K = 0.89$, $p < 0.001$). 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 (i) 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 (ii) information required to investigate the effect of possible moderators on this relationship. These included (*a*) sample characteristics, including mean age, age range, percentage of males, number of clinical and non-clinical 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 and the informant. It is possible that the relationships between the constructs being investigated is 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 & older children" aged 0-12, "Pre-adolescents & adolescents" aged 7-18, and "Full age range" aged 0-18. Detailed information about the coding criteria and the levels of each moderator can be found in Appendices 3b and 3c, respectively.

Where the data required to compute an effect size between social anxiety and social cognition was 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

[1] E.g. 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).

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 3d 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 were also assessed by the first author. Good interrater reliability was reached (ICC = 0.81, p <0.001) 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.

Pearsons 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 non-parametric 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 non-parametric 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 multi-level 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:

$$r_j = \gamma_0 + \gamma_1 Z_{1j} + \gamma_2 Z_{2j} + \cdots \gamma_p Z_{pj} + \mu_j + e_j$$

which states that the effect size, *r*, in study *j* is predicted from (i) the mean effect size across studies, γ_0, (ii) the study characteristics $Z_1 \ldots Z_p$, and their associated parameter estimates, $\gamma_1 \ldots \gamma_p$, (iii) the deviation of the effect in study *j* from the overall mean, μ_j, and (iv) 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:

$$r_j = \gamma_0 + \mu_j + e_j$$

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 was 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.

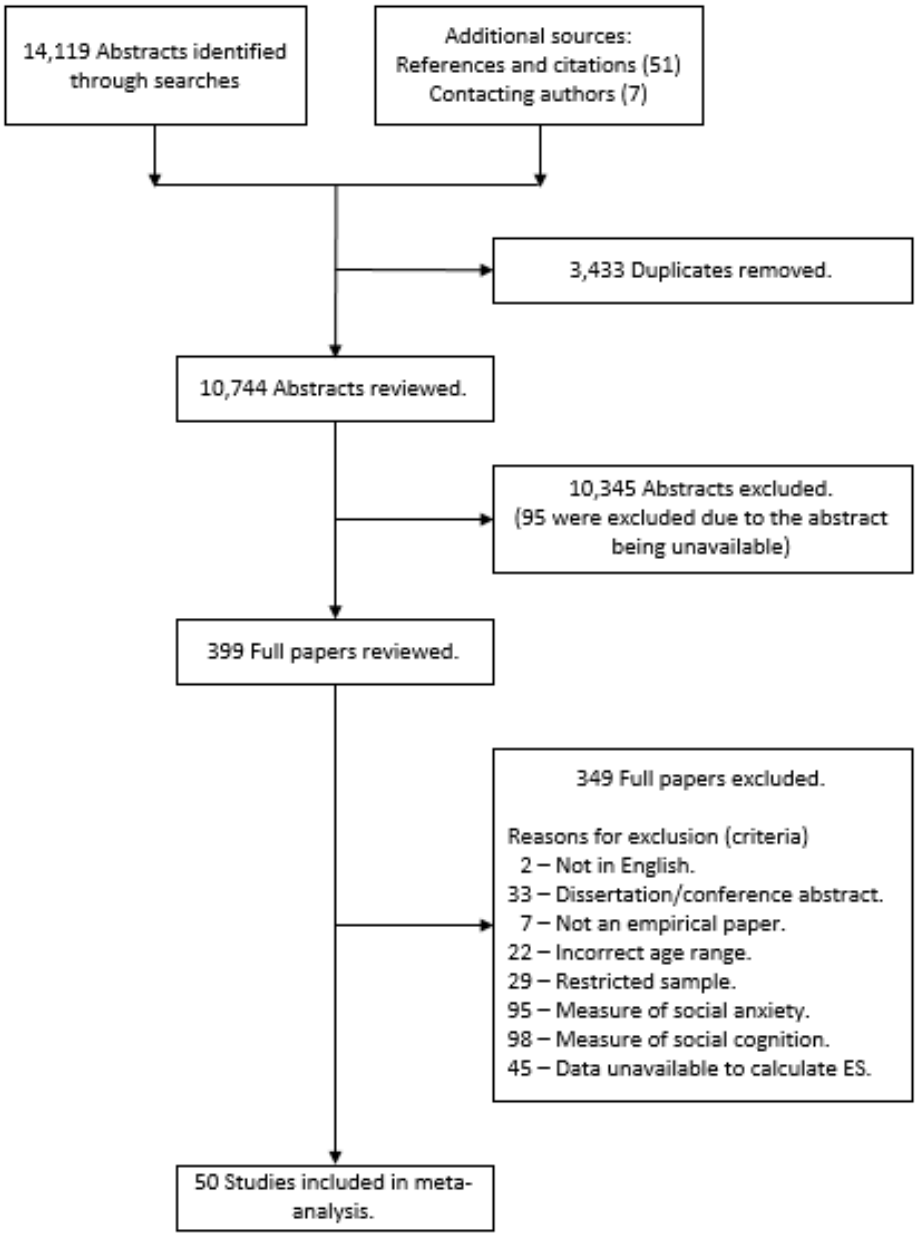

Figure 1 *Flow chart of the number of papers accepted and rejected throughout the eligibility screening process.*

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], Autism Diagnostic Interview revised [ADI-r], 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.

Table 1. *Study Characteristics*

	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	0.22	2	9	1	0
Banerjee et al. (2001)	56	103.57 (-)	-	-	Social anxiety	ToM	-0.19	3	7	3	0
Banerjee et al. (2010)	196	108.36 (-)	-	-	Social anxiety	ToM	-0.19	1	8	0	0
Batanova et al. (2011)	262	140.16 (9.00)	-	-	Social anxiety	ToM	0.04	2	10	0	0
Bender et al. (2015)	16	124.56 (1.54)	16	-	Social anxiety	Emotion recognition	-0.16	1	8	0	0
Broeren et al. (2013)	224	73.08 (18.60)	-	-	Social anxiety	ToM	-0.04	1	9	0	0
Burrows et al. (2016)	198	16.32 (23.52)	104	ASD	Shyness	ASD	-0.82*	1	11	0	2
Burrows et al. (2018)	223	156.72 (27.12)	110	ASD	Social anxiety	ASD	-0.44*	2	11	1	1
Caputi et al. (2018)	318	135.00 (21.00)	-	-	Social anxiety	ToM	-0.04	1	10	0	0
Colonnesi et al. (2010)	62	69.24	-	-	Shyness	ToM	0.08	1	8	0	0

		(6.00)									
Colonnesi et al. (2017)	101	53.46 (1.70)	-	-	Social anxiety	ToM	-0.06	1	9	0	0
Corbett et al. (2009)	27	109.20 (18.00)	12	ASD	Social anxiety	ASD	-0.02*	1	8	1	0
de Rosnay et al. (2014)	129	78.80 (-)	-	-	Shyness	Emotion recognition/ ToM	-0.27	3	6	2	1
Hallett et al. (2013)	231	159.38 (9.20)	107	ASD	Social anxiety	ASD	-0.12*	4	10	2	0
Henning et al. (2011)	172	59.00 (11.00)	-	-	Shyness	ToM	0.09	2	6	3	0
Kaboski et al. (2015)	16	- (-)	8	ASD	Social anxiety/ FNE/ A&D	ASD	-0.47*	4	7	4	0
Kokkinos et al. (2016)	177	129.93 (-)	-	-	Shyness	ToM	-0.08	2	9	0	1
Kuusikko et al. (2008)	359	144.60 (25.50)	54	ASD	Social anxiety	ASD	-0.19*	2	11	1	0
LaBounty et al. (2017)	34	43.20 (7.80)	-	-	Shyness	ToM	0.34	2	6	0	1
Lee et al. (2013)	122	99.60 (16.63)	10	SAD	Social anxiety	Emotion recognition	0.08*	1	10	1	0
McClure et al. (2001)	62	107.64 (7.20)	-	-	FNW/ A&D	Emotion recognition	-0.14	12	8	0	1
Melfsen et al. (2002)	75	122.97	17	SAD	Social anxiety	Emotion	-0.12*	16	9	1	0

		(13.21)				recognition					
Mewhort-Buist (2013)	88	118.00 (-)	-	-	Shyness	ToM	-0.19	5	9	0	0
Mikita et al. (2015)	74	157.68 (23.64)	47	ASD	Social anxiety	ASD	-0.55*	2	12	1	0
Mink et al. (2014)	88	27.48 (0.55)		-	Shyness	ToM	0.25	2	6	2	0
Montazeri et al. (2019)	2143	133.08 (6.72)	126	ASD	Social anxiety	ASD	-0.01*	1	8	1	1
Neil et al. (2019)	47	119.28 (25.20)	22	ASD	Social anxiety	ASD	-0.20*	2	8	1	1
Ogawa et al. (2017)	12	132.00 (6.00)	-	-	Social anxiety	ToM	-0.35	1	10	2	0
Orinstein et al. (2015)	98	162.84 (34.92)	64	-	Social anxiety	ASD	-0.36	1	9	3	0
Palser et al. (2018)	58	146.16 (35.46)	29	ASD	Social anxiety	ASD	-0.08*	1	9	1	1
Pecora et al. (2018)	98	41.12 (-)	-	-	Shyness	ToM	-0.16	1	10	0	0
Pile et al. (2017)	59	183.12 (24.96)	-	High social anxiety	Social anxiety	ToM	-0.23*	1	8	1	0
Scharfstien et al. (2011)	60	127.02 (21.60)	30	ASD	Social anxiety	ASD	-0.20*	1	10	1	1

Schermerhorn (2019)	101	125.88 (10.44)	-	-	Shyness	Emotion recognition	0.01	6	7	1	0
Schiltz et al.(2017)	97	138.47 (26.36)	57	ASD	Social anxiety	ASD	-0.09*	2	7	5	0
Sette et al. (2016)	163	53.29 (14.48)	-	-	Shyness	Emotion recognition	-0.08	2	7	1	0
Simonian et al. (2001)	29	139.24 (-)	15	SAD	Social anxiety	Emotion recognition	-0.40*	6	10	2	0
South et al. (2011)	60	153.36 (34.22)	36	ASD	Social anxiety	ASD	-0.21*	1	9	2	0
Strand et al. (2008)	338	53.00 (6.52)	-	-	Shyness	Emotion recognition/ ToM	-0.12	6	8	1	0
Usher et al. (2015)	73/ 37	159.17 (32.06)	37/ -	ASD	Social anxiety	ASD / ToM	-0.08*	3	11	0	0
van Rijn et al. (2014)	164	143.56 (31.95)	58	ASD	Social anxiety	ASD	-0.11*	1	11	1	0
van Steensel et al. (2012)	237	148.08 (32.16)	237	ASD	Social anxiety	ASD	0.11*	1	6	4	0
van Steensel et al. (2013)	84	143.28 (22.44)	42	-	Social anxiety	ASD	-0.40	2	9	2	0
van Steensel et al. (2015)	174	148.26 (33.01)	174	ASD	Social anxiety	ASD	0.08*	1	10	0	0
Vanhalst et al. (2017)	170	163.80 (6.84)	-	-	FNE	Emotion recognition	0.10	6	8	1	0

Verron et al. (2018)	119	57.38 (-)	-	-	Shyness	Emotion recognition/ ToM	-0.01	6	8	1	0
Walker (2005)	63	50.46 (4.04)	-	-	Shyness	ToM	-0.27	2	7	1	1
Wellman et al. (2011)	146	54.00 (-)	-	-	Shyness	ToM	0.14	1	5	1	0
Willcutt et al. (2011)	7634	131.04 (34.92)	2457	-	Social anxiety	Social cognition	-0.56	1	6	1	1
Wong et al. (2012)	38	119.04 (18.96)	17	SAD	Social anxiety	Emotion recognition	-0.07*	20	11	1	0

**Denotes between groups studies in which the r statistic has been estimated from d.*

For quality analysis, overall ratings are out of a possible 11 for correlational and 14 for between groups studies.

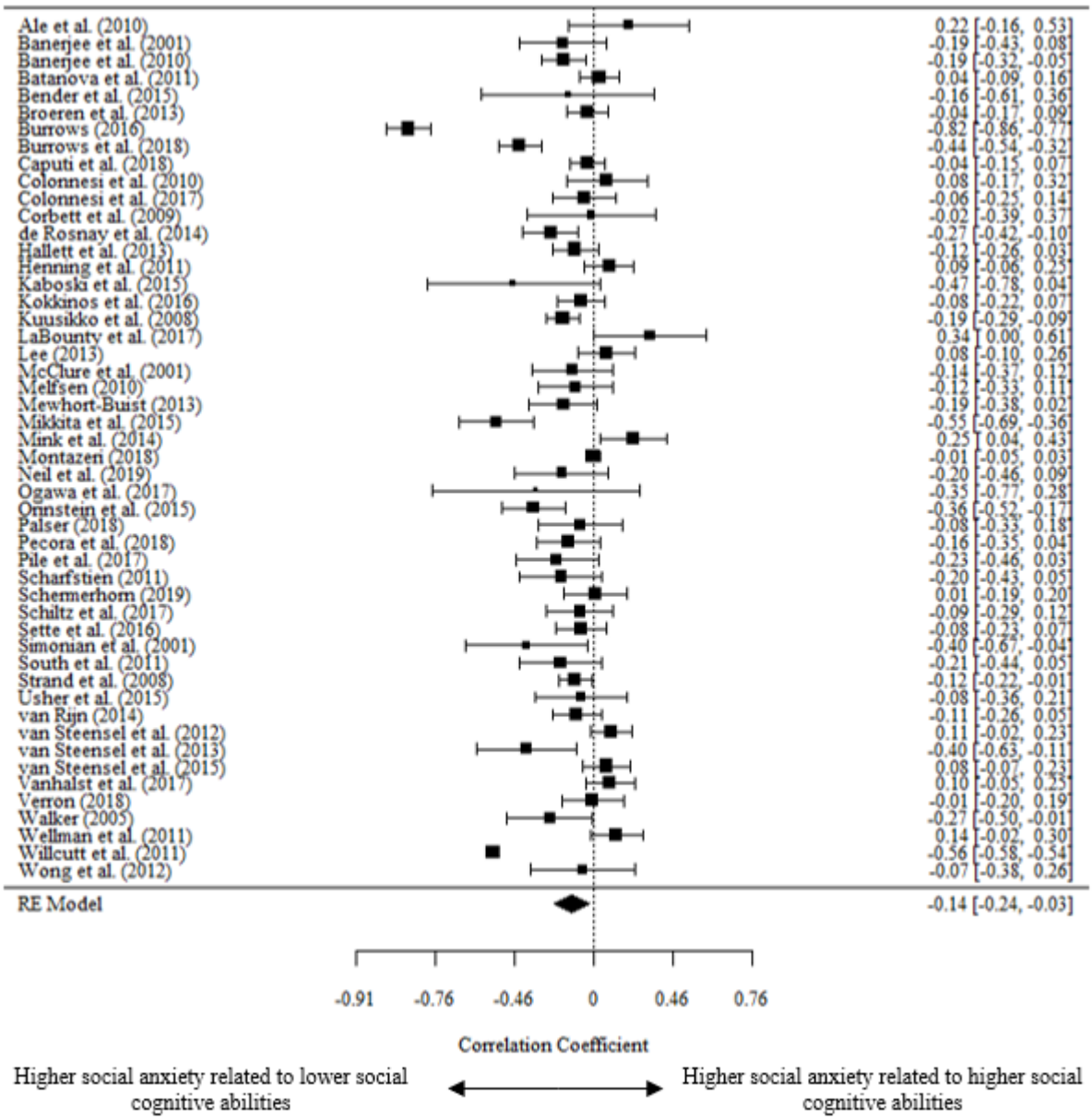

Figure 2. *Forrest plot of aggregated effect sizes.*

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 = -0.15 ($p < 0.001$; table 2). However, there was a significant amount of heterogeneity between the effect sizes (Q = 231.04, p < 0.001) 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, $p = 0.73$). However, the dimension/phenotype of social cognition that was measured did (QM = 9.68, $p = 0.01$); as shown in table 2, there was a significant negative association between social anxiety and social cognition for studies measuring ASD symptomatology ($r = -0.28$, $p < 0.001$), but not for studies measuring the specific constructs of ToM ($r = -0.05$, $p = 0.16$) or emotion recognition ($r = -0.07$, $p = 0.12$). ToM sub-type significantly moderated the relationship between social anxiety and social cognition (QM = 6.50, $p = 0.04$), such that a significant association between the two was found when presentational displays were measured ($r = -0.12$, $p = 0.05$), but not when false belief ($r = -0.01$, $p = 0.85$) or affective ToM was measured ($r = -0.08$, $p = 0.33$). In contrast, emotion recognition subtype (i.e. accuracy or sensitivity) did not significantly moderate the relationship between social anxiety and social cognition (QM = 1.09, $p = 0.78$).

Methodological features.

Variance in effect sizes was significantly accounted for by study design (QM = 5.75, p = 0.02) and sample type (QM = 19.48, $p < 0.001$). Specifically, significant negative associations between social anxiety and social cognition were found amongst studies using between groups (r = -0.26, $p < 0.001$), rather than correlational (r = -0.07, p = 0.06), designs and when clinical and non-clinical groups were compared (r = -0.31, $p < 0.001$), but not when samples included clinical only (r = -0.02, p = 0.86) or community only samples (r = -0.05, p = 0.13).

The type of measure used to measure social anxiety did not account for a significant amount of variance amongst effect sizes (QM = 2.46, p = 0.48). However, the type of measure used to assess social cognition (QM = 9.72, p = 0.02), as well as the informant of both the social cognition (QM = 16.65, $p < 0.01$) and social anxiety measures did (QM = 10.23, p = 0.02). 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 = -0.28, $p < 0.001$; clinician reported, r = -0.34, $p < 0.001$) and within those that used self- or parent-reported social anxiety measures (r = -0.18, $p < 0.01$; r = -0.16, p = 0.01). Overall significant effects were not found amongst studies that used experimental tasks (r = -0.06, p = 0.09) or those using self-report, r = -0.05, p = 0.08; or parent-report, r = -0.20, p = 0.11 to assess social cognition. Neither were significant effects found for those using clinician or teacher report to assess social anxiety (r = -0.09, p = 0.29; r = -0.13, p = 0.12). 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 = 0.37), but the valence of the face did (QM = 16.60, p

= 0.01). 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* = 0.02), but not by gender (*QM* = 0.21, *p* = 0.65). Specifically, a significant negative association was found between social anxiety and social cognition among studies that included pre-adolescent (*r* = -0.21, *p* < 0.001) and combined pre-adolescent and adolescent samples (*r* = -0.25, *p* < 0.001). However, a significant *positive* association was found based on effect sizes from the one study that included an adolescent only sample (*r* = 0.10, *p* < 0.01). Overall significant effects were not found for studies including only young children (*r* = 0.03, *p* = 0.63), those including younger and older children (*r* = -0.09, *p* = 0.23), or those including participants from across the full child and adolescent age range (i.e. 0-18 years old; *r* = -0.33, *p* = 0.06).

Table 2. *Meta-analytic results.*

	N Studies	k	r	95% CI	QM	p
Overall	50	150	-0.15	-0.22, -0.07		
Moderators.						
Conceptual factors:						
Social anxiety dimension.	50	150			0.64	0.73
Social cognition dimension/ phenotype.	49	149			9.68	0.01**
ASD	19	31	-0.28***	-0.42, -0.14		
Emotion recognition (ER)	12	81	-0.05	-0.14, 0.04		
ToM	21	37	-0.05	-0.13, 0.02		
ER Sub-type	12	76			1.09	0.78
ER Face Type	9	73			1.99	0.37
ER Face Valence	11	58			16.60	0.01**

Happy	5	10	-0.13	-0.37, 0.11		
Afraid	3	4	-0.05	-0.25, 0.15		
Anger	4	8	-0.13	-0.27, 0.02		
Disgusted	2	5	-0.20	-0.83, 0.44		
Sad	4	8	-0.11	-0.29, 0.08		
Combined	7	23	-0.03	-0.14, 0.08		
ToM Sub-type	18	29			6.50	0.04*
False belief	11	13	-0.01	-0.12, 0.10		
Presentational display	6	9	-0.12*	-0.23, -0.00		
Affective ToM	6	7	-0.08	-0.25, 0.08		
Methodological factors:						
Study design.	50	150			4.34	0.04*
Correlation.	29	78	-0.08!	-0.15, 0.00		
Between groups.	22	72	-0.24***	-0.37, -0.11		
Sample type.	50	150			19.48	< 0.001***
Community.	27	74	-0.05	-0.11, 0.01		
Clinical.	5	5	-0.02	-0.18, 0.15		
Mixed	20	71	-0.31***	-0.43, -0.18		
Type of social anxiety measure.	50	150			2.46	0.48
Type of social cognition measure.	50	150			9.72	0.02*
Clinical assessment.	19	31	-0.28***	-0.42, -0.14		
Experimental task.	26	100	-0.06	-0.13, 0.01		
Interview.	4	16	-0.05	-0.16, 0.07		
Informant of social anxiety measure.	50	150			10.23	0.02*
Self-report	25	62	-0.18***	-0.28, -0.07		
Parent report	21	37	-0.16*	-0.29, -0.03		
Teacher report	4	14	-0.13	-0.30, 0.04		
Clinician report	6	37	-0.09	-0.26, 0.08		
Informant of social cognition measure.	50	150			16.65	< 0.01**
Self-report.	31	117	-0.05	-0.11, 0.01		
Parent report.	6	7	-0.20	-0.44, 0.04		
Clinician report.	14	25	-0.34***	-0.52, -0.17		
Demographic factors:						
Age group.	50	150			13.55	0.02*
Young children (</= 6)	11	27	0.03	-0.08, 0.13		

Pre-adolescents (7-12)	18	62	-0.21***	-0.31, -0.11		
Adolescents (>/= 13)	1	6	0.10**	0.04, 0.17		
Younger & older children (</= 12).	9	5	-0.09	-0.23, 0.06		
Pre-adolescents & adolescents (>/= 7)	22	60	-0.25***	-0.38, -0.13		
Full age range (0-18)	3	4	-0.33[!]	-0.67, 0.01		
Gender.	48	145			0.21	0.65

The first level under each moderator is the reference category.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; [!] $p = 0.05$

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 ($z = -0.11$, $p = 0.91$). 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.

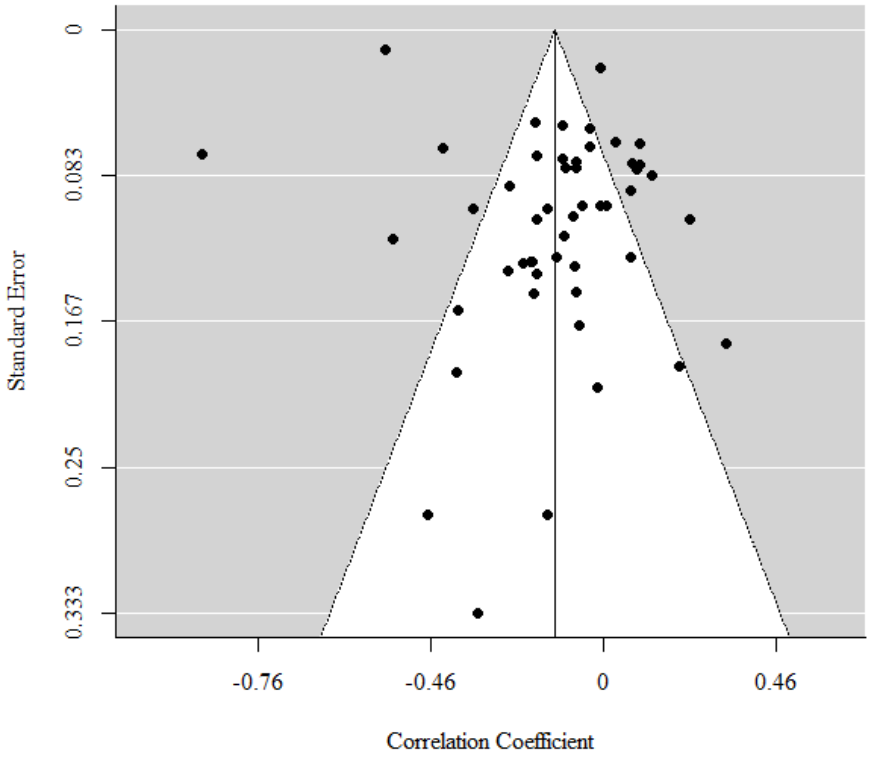

Figure 3 Funnel plot

Discussion

This meta-analysis identified a small, but significant, association between social anxiety and social cognition amongst 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 amongst 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 and, as such, it is difficult to disentangle the extent to which findings were influenced by each of these 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 a pre-adolescent and/or adolescent sample, and 100% used clinical assessment as the measure). Furthermore, studies in which findings were not significant, such as those examining emotion recognition, typically used correlational designs within community samples (i.e. methodological features in which significant relationships were also not found). Notably, the methodology of studies which investigated subtypes of ToM and found a significant effect did not differ systematically 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 sub-types of ToM. However, qualitative assessment suggest 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 significant associations were found with shyness amongst 12-month olds, but not 3-6-year-old children (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.

We did not find that the type of social anxiety measured (i.e. social anxiety and shyness) moderated the association with social cognition, 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.

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, most studies with ASD populations used clinical measures to assess the clinical group only, with comparison groups receiving a screening measure that did not meet this reviews definition of a measure of social cognition. This procedure is common practice in many clinical control studies so excluding these studies would have omitted a significant amount of important data from this review. 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.

Our findings showed that pre-adolescents and adolescents with ASD typically have elevated social anxiety symptoms. In addition, the results suggest that increased social anxiety symptoms may be related to difficulties in specific aspects of complex ToM abilities. This highlights important questions for future research and treatment of social anxiety in neurotypical children, as well as children with ASD. Of particular note, the evidence for a relationship between social anxiety and social cognition outside of ASD populations was mixed, where there was little evidence of a significant association with emotion recognition, but evidence of a significant association with specific sub-types of ToM. As such, a focus on addressing social skills deficits more broadly may not be required to effectively treat SAD in neurotypical children, however a focus on complex aspects of social interaction may be more appropriate. Finally, given the robust support for the association between ASD and elevated social anxiety, effective programmes to improve identification and treatment of social anxiety among ASD populations are clearly warranted.

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3.2 Appendices.

Appendix 3a

Search Criteria.

Search Terms.

Social anxiety search terms:

((anxi* SAME social*) OR (worr* SAME social*) OR (fear* SAME social*) OR (phobi* SAME social*) OR "social anxiety" OR "socially anxious" OR "Social anxiety disorder" OR "Social phobia" OR "socially phobic" OR shy* OR (fear SAME negative* SAME evaluat*)) NOT (mouse OR mice OR rat OR chick* OR sheep OR dog OR monkey* OR animal*).

Autism Spectrum Disorder (ASD) terms (and relevant co-morbid conditions)[2]:

(Autis* OR Asperger* OR ASD OR ASC OR PDD OR "autis* spectrum disorder" OR "autis* spectrum condition" OR "Asperger* syndrome" OR "social communication disorder" OR "Pervasive developmental disorder" OR "Rett syndrome" OR "Fragile X" OR "Tuberous sclerosis") NOT (mouse OR mice OR rat OR chick* OR sheep OR dog OR monkey* OR animal*)

Social cognition terms:

("social cognit*" OR mentali$ing OR "theory of mind" OR "perspective taking" OR "belief tracking" OR "emotion* expression" OR "emotion recognition" OR "emotion* perception" OR "emotion* processing" OR "emotion* identification" OR "social knowledge" OR "affect recognition" OR "affect perception" OR "affect identification" OR

[2] Genetic disorders highly co-morbid with ASD (i.e. Rett Syndrome, Fragile X and Tuberous Sclerosis) were initially included, but were later excluded through screening as a diagnosis of these disorders does not require a deficit in social cognition, as in ASD.

"affect processing") NOT (mouse OR mice OR rat OR chick* OR sheep OR dog OR monkey* OR animal*)

Combination of search terms:

(Social anxiety term AND autism spectrum disorder term) OR (Social anxiety term AND social cognition term)

Additional search limits for each database:

All databases included a limit of date, from 1980 – present.

Web of Science

- Databases: Core collection.
- Category:
    - Psychiatry, Psychology clinical, neurosciences, psychology developmental, psychology multidisciplinary, psychology, psychology social, psychology experimental, clinical neurology, behavioural sciences, paediatrics, psychology applied, psychology educational, social sciences interdisciplinary, psychology biological.
- Document types:
    - Article, Review, proceedings paper, book chapter, meeting abstract, letter, book.
- Language: English.

Psych Info

- Databases:
    - All except: CAB abstracts, ICONDA and the philosopher's index.
- Limits: English language, English and humans (In
- Search tools (thesaurus):
    - Social skills (include "ability", "social behaviour" and "social skills training"); combine with social communication terms with an OR)

Medline

- Limits: Humans.
- Proximity terms not applicable in this database.

EMBASE

- Limits: Human, English language.

ERIC

- Publication Type: Books, Collected Works (All), Dissertations/Theses (All), ERIC Publications, Information analyses, Journal Articles, Reference Materials (Bibliographies, general), Reports (All), tests/questionnaires.
- Language: English; Search modes - Boolean/Phrase

Appendix 3b

Eligibility Criteria.

1. The full paper should be available in English.
2. The paper should present original data and not be a review (including systematic review, narrative review or meta-analysis, theory paper, letter/response to a paper).
3. The study should include a human child, adolescent or youth population. The ages of participant should be less than 21 years, with a mean age less than 18 years.
4. The sample should not be restricted in such a way that:
    a. The full variance of either social anxiety or social communication are not represented.
        i. For example, papers will be rejected if they include only a socially anxious or Autistic sample, or if they include only children that score above a cut off on questionnaire measures of either of these.
    b. The restriction affects the association between social anxiety and social communication.
        i. For example, if a sample is recruited from a population which is likely to affect scores on social anxiety or social communication (e.g. children with OCD or ADHD).

5. The study should include a standardised, age appropriate, trait or symptom/diagnostic measure of social anxiety completed by parent, child, teacher or independent observer should be included.

Social anxiety is defined as in Kashdan (2007) as "fear and avoidance of social situations in which a person might be exposed to negative evaluation by others."

This is to also include shyness, but does not include aspects related to (social) anxiety such as selective mutism or behavioural inhibition (which does not involve fear of negative evaluation).

6. A measure of social cognition, defined as a measure of a child's ability (i.e. accuracy rather than a passive response) to identify and/or understand the thoughts, feelings and/or perceptions of another.

This may include a measure of:

a. Identifying another's thoughts, intentions, beliefs, inferences and emotions/feelings.

b. Understanding the above, as well as another's reactions, attributions and perceptions.

c. Any other tasks that you feel meets the definition, code as unclear. (keep in mind that we are not including tasks that measure friendship quality, for example)

NB: Diagnostic measures may be included, where children are required to have a "deficit" in all areas in order to gain a diagnosis. However, questionnaire measures based on these diagnoses will not be included as a score on these measures does not

imply a deficit in all areas. As a result, genetic disorders related to ASD will also not be included as these diagnoses are based on genetic assessments and not necessarily an assessment of the specific deficits in ASD.

7. Measures of social anxiety and social communication may be in the form of:

- **a.** A standardised questionnaire, where at least 60% of the items in the full scale or relevant subscale assesses one or other of constructs of interest as defined above
- **b.** A standardised clinical assessment (e.g. the ADIS, KSADS, ADOS, ADI-R), assessing one or other of constructs of interest as defined above, may be included.
- **c.** Observational measures may be included where children's behaviour relating to one or other of the constructs as defined above is coded using a standardised observation schedule.

"Standardised" is defined as a measure that can be applied consistently across the sample. For example, this would not include a peer nomination, where it is unclear by which parameters each peer is choosing their nomination.

8. The design of the study must allow for an effect size to be calculated for the relationship between social anxiety and social communication at baseline. Accepted designs may include:

- **a.** Quasi-experimental:
  - **i.** High anxiety group must be either clinically anxious (determined with diagnostic interview), score more than 1SD above normative

mean on standardised social anxiety measure, or score above cut off recommended by author of measure.

ii. Same criteria also to apply to groups that are split based on social communication rather than anxiety.

b. Experimental (ie treatment trials for social based therapy) –

i. Participants must be randomised into groups.

ii. There must be a control group undergoing either wait list or alternative treatment (such as CBT).

iii. Must measure both anxiety and social communication/ASD pre-treatment (and report relationship).

iv. Must meet criteria for non-restricted group.

c. Correlations: Need to meet all previous criteria.

Appendix 3C

Moderators and definitions.

Conceptual Moderators

- Social anxiety (as defined in appendix 2).
    - Social anxiety.
    - Shyness.
- Social cognition (as defined in appendix 2):
    - Autism Spectrum Disorders.
    - Emotion recognition.
        - Emotion recognition sub-type:
            - Accuracy (i.e. accuracy in naming an emotional expression)
            - Sensitivity (i.e. speed in naming an emotional expression)
        - Emotion recognition face type:
            - Adult, child, cartoon/drawing.
        - Emotion recognition face valence:
            - Happy, afraid, anger, disgusted, sad, combined score.
    - Theory of Mind (ToM)
        - False belief (i.e. the ability to identify and understand that others have different knowledge or beliefs as oneself)
        - Presentational display (i.e. identifying or understanding deceptive behaviours)
        - Affective ToM (i.e. understanding other's emotional responses)

Methodological Factors

- Study design:
    - Correlation.
    - Between groups.
- Sample type:
    - Community
    - Clinical
    - Mixed (i.e. clinical and community)
- Type of measure (for social anxiety and social cognition)
    - Clinical assessment.
    - Experimental task.
    - Interview.
    - Questionnaire.
- Informant of measure (for social anxiety and social cognition)
    - Self-repot
    - Parent report
    - Teacher report
    - Clinician report

Demographic factors

- Age group (see figure 1; based on age ranges that are conventional within the literature):
    - Young children – where all children in the sample were less than 6 years old (inclusive).

- Pre-adolescent children – Where all children in the sample were between 7-12 years old (inclusive)
- Adolescents – Where all children in the sample were older than 13 years old (inclusive)
- Younger and older children – where all children in the sample were younger than 12 years old (inclusive)
- Pre-adolescents and adolescents – Where all children in the sample were older than 7 years old.
- Full age range – Where the youngest participant in the sample is 6 years old or younger, and the oldest participant was 13 or older.

- Gender: Percentage of males in the sample.

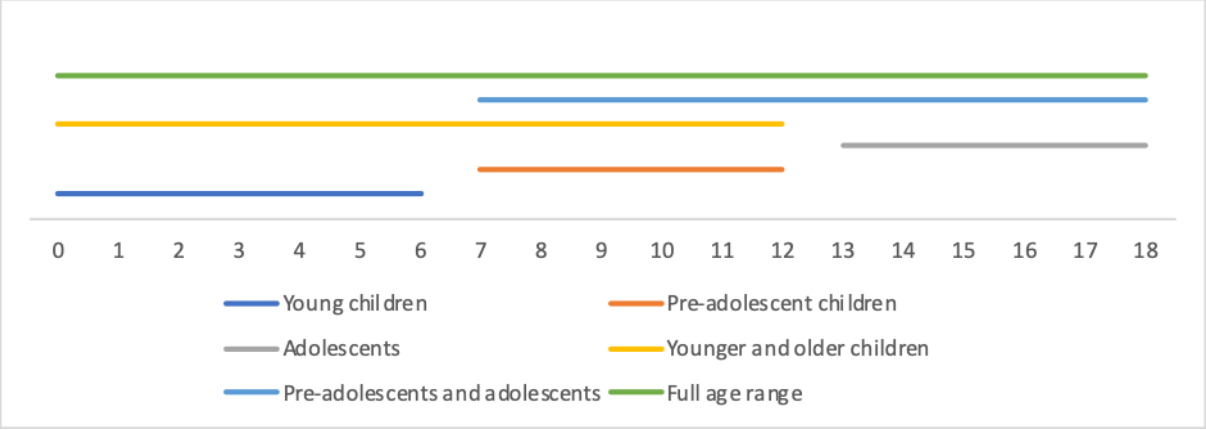

Figure 1. The distribution of age ranges that studies were grouped into.

Appendix 3d

Quality Assessment.

Scoring:

1: "yes", or that the paper satisfies the criteria.

0: "No", or that the paper does not satisfy the criteria.

CD: Cannot determine (if it is not clear whether or not the paper satisfies the criteria)

NA: Not applicable (If that criteria is not applicable to the paper being reviewed)

NR: Not reported (If the authors have not reported the information required to determine whether or not they satisfied that criteria)

For all papers:

1. **Was the research question or objective in this paper clearly stated?**

Did the authors describe their goal in conducting this research? Is it easy to understand what they were looking to find? This issue is important for any scientific paper of any type. High quality scientific research explicitly defines a research question.

2. **Was the study population clearly specified and defined?**

Did the authors describe the group of individuals from which the cases and controls were selected or recruited, while using demographics, location, and time period? If the investigators conducted this study again, would they know exactly who to recruit, from where, and from what time period?

3. **Did the authors include a sample size justification?**

Did the authors discuss their reasons for selecting or recruiting the number of individuals included? Did they discuss the statistical power of the study and provide a

sample size calculation to ensure that the study is adequately powered to detect an association (if one exists)? This question does not refer to a description of the manner in which different groups were included or excluded using the inclusion/exclusion criteria (e.g., "Final study size was 1,378 participants after exclusion of 461 patients with missing data" is not considered a sample size justification for the purposes of this question).

4. **Were the definitions, inclusion and exclusion criteria, algorithms or processes used to identify or select participants valid, reliable, and implemented consistently across all study participants?**

Were the inclusion and exclusion criteria developed prior to recruitment or selection of the study population? Were the same underlying criteria used for all of the groups involved? To answer this question, reviewers determined if the investigators developed I/E criteria prior to recruitment or selection of the study population and if they used the same underlying criteria for all groups. The investigators should have used the same selection criteria, except for study participants who had the disease or condition, which would be different for cases and controls by definition. Therefore, the investigators use the same age (or age range), gender, race, and other characteristics to select cases and controls. Information on this topic is usually found in a paper's section on the description of the study population.

5. **If less than 100% of eligible participants were selected for the study, were the cases randomly selected from those eligible?**

If a case-control study did not use 100 percent of eligible cases and/or controls (e.g., not all disease-free participants were included as controls), did the authors indicate that random sampling was used to select controls? When it is possible to

identify the source population fairly explicitly (e.g., in a nested case-control study, or in a registry-based study), then random sampling of controls is preferred. When investigators used consecutive sampling, which is frequently done for cases in prospective studies, then study participants are not considered randomly selected. In this case, the reviewers would answer "no" to Question 8. However, this would not be considered a fatal flaw.

If investigators included all eligible cases and controls as study participants, then reviewers marked "NA" in the tool. For between groups studies, if 100 percent of cases were included (e.g., NA for cases) but only 50 percent of eligible controls, then the response would be "yes" if the controls were randomly selected, and "no" if they were not. If this cannot be determined, the appropriate response is "CD."

6. Were the measures of interest clearly defined, valid, reliable and implemented consistently (including the same time period) across all study participants?

Were the measures defined in detail? Were the tools or methods used to measure exposure accurate and reliable–for example, have they been validated or are they objective? This is important, as it influences confidence in the reported exposures. For between groups studies, it is equally important whether the exposures were assessed in the same manner within groups and between groups. This question pertains to bias resulting from exposure misclassification (i.e., exposure ascertainment).

7. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between dependant variables?

Were key potential confounding variables measured and adjusted for, such as by statistical adjustment for baseline differences? Investigators often use logistic regression or other regression methods to account for the influence of variables not of interest.

For between groups studies:

1. **Were controls selected or recruited from the same or similar population that gave rise to the cases (including the same timeframe)?**

To determine whether cases and controls were recruited from the same population, one can ask hypothetically, "If a control was to develop the outcome of interest (the condition that was used to select cases), would that person have been eligible to become a case?" Case-control studies begin with the selection of the cases (those with the outcome of interest, e.g., lung cancer) and controls (those in whom the outcome is absent). Cases and controls are then evaluated and categorized by their exposure status. For the lung cancer example, cases and controls were recruited from hospitals in a given region. One may reasonably assume that controls in the catchment area for the hospitals, or those already in the hospitals for a different reason, would attend those hospitals if they became a case; therefore, the controls are drawn from the same population as the cases. If the controls were recruited or selected from a different region (e.g., a State other than Texas) or time period (e.g., 1991-2000), then the cases and controls were recruited from different populations, and the answer to this question would be "no."

2. **Were the cases clearly defined and differentiated from controls?**

For this question, reviewers looked for descriptions of the validity of case and control definitions and processes or tools used to identify study participants as such. Was a specific description of "case" and "control" provided? Is there a discussion of the validity of the case and control definitions and the processes or tools used to identify study participants as such? They determined if the tools or methods were accurate, reliable, and objective.

3. Use of concurrent controls?

A concurrent control is a control selected at the time another person became a case, usually on the same day. This means that one or more controls are recruited or selected from the population without the outcome of interest at the time a case is diagnosed. Investigators can use this method in both prospective case-control studies and retrospective case-control studies.

Chapter 4; Paper 3

Investigating the relationship between social anxiety and theory of mind in clinically anxious and non-anxious pre-adolescent children.

Abstract

Social anxiety disorder is common and impairing amongst children, but children with SAD do less well from generic cognitive behaviour treatments (CBT). Better outcomes have been found using treatments that specifically target social skills, but there is inconsistent evidence for the presence of social skills deficits in children with SAD. Given the overlap in observable symptoms, studies have begun to assess the social cognitions that underlie social skills, such as Theory of Mind (ToM); finding initial associations with social anxiety symptoms amongst non-clinical children. This study aims to investigate the relationship of social anxiety symptoms and disorder with both affective and cognitive ToM amongst a clinically anxious and non-anxious sample. Children aged 7-12 were recruited into a social anxiety (n = 29), other anxiety (n = 23) and non-anxious group (n = 49) and completed tasks measuring cognitive and affective ToM, as well as measures of social anxiety symptoms, IQ and parent reported social communication difficulties. Results showed that affective ToM was not significantly predicted by either social anxiety symptoms or disorder. However, children with SAD performed significantly worse than those with other anxiety disorders on aspects of cognitive ToM; specifically, their accuracy in identifying the intentions of triangle characters. However, no differences between groups, or associations with social anxiety symptoms were identified for parent reported social communication difficulties. These results suggest impairments in specific aspects of cognitive ToM for children with SAD

specifically, which may have significant implications for the development of SAD treatments.

Introduction:

Social anxiety disorder (SAD) is the most common mental health disorder across the lifespan. The onset of SAD is typically reported to be in early adolescence (Kessler et al., 2005), but adults with SAD commonly describe having had difficulties from early childhood (Bourdon et al., 1988) and rates of social anxiety disorder are relatively high among pre-adolescent clinical populations (e.g. 45%; Waite & Creswell, 2014). When left untreated, childhood SAD often runs a chronic course (Bittner et al., 2007) and has significant negative implications for an individuals' wider mental health and quality of life (e.g. comorbid anxiety and depression, school refusal, loneliness and friendship problems; Beidel, Turner, & Morris, 1999). It is clearly important to ensure that effective early interventions are available for children with SAD.

Cognitive behavioural therapy with a focus on social skills training is currently the first line of recommended treatment for children with SAD (National Institute for Health and Care Excellence [NICE], 2013). In addition to generic components of CBT, these treatments can include, for example, teaching children how to start and maintain conversations, using non-verbal communication (e.g. gestures, facial expressions), listening, assertiveness and social problem solving (Beidel, Turner, & Morris, 2000; Spence, 2003). Treatment trials have suggested that this approach is effective for up to 87% of children (Beidel et al., 2000; Spence, Donovan, & Brechman-toussaint, 2000). However, it remains unclear whether children with SAD actually have social skills deficits and whether or not social skills training is a necessary component of effective treatment of SAD in children. For example, while some studies have found results consistent with

there being social skills deficits among children with SAD (Greco & Morris, 2005; Halls, Cooper, & Creswell, 2014; Morgan & Banerjee, 2006; Scharfstein, Beidel, Sims, & Finnell, 2011; Spence, Donovan, & Brechman-Toussaint, 1999; Tuschen-caffier, Kühl, & Bender, 2011), other studies suggest that children with SAD may have a self-perception bias, based on significant associations between social anxiety and self-reported, but not observer-rated, social skills (Cartwright-Hatton, Hodges, & Porter, 2003; Cartwright-Hatton, Tschernitz, & Gomersall, 2005).

Inconsistencies in the literature on social anxiety and social skills in children may not be surprising given the inherent challenge in assessing their relationship caused by the similarities in their behavioural manifestations (e.g. difficulties with eye contact, stumbling over words, social withdrawal, not looking friendly). One way to overcome this difficulty is to measure the social cognitive abilities that underlie social skills, rather than observing the resultant behaviours. For example, difficulties in social communication have been linked to atypicalities in different aspects of Theory of Mind (ToM; Baron-cohen, Leslie, & Frith, 1985; Happe, 1994; Klin, 2000; Wellman, Cross, & Watson, 2001). These include the ability to understand that others have different beliefs or emotions (i.e. false belief understanding and emotion recognition; e.g. Baron-cohen et al., 1985; Baron-cohen, Wheelwright, Scahill, Lawson, & Spong, 2001), take the perspective of others (e.g. Hamilton, Brindley, & Frith, 2009; Pearson, Ropar, & Hamilton, 2013) and, in particular, identify and understand deceptive self-presentational displays (e.g. Kaland, Callesen, Lykke, & Lars, 2008), faux pas (e.g. Baron-cohen, Stone, & Plaisted, 1999), sarcasm (e.g. Kaland et al., 2002), and other's intentions (e.g. Abell, Happe, & Frith, 2000).

Given the hypothesis that children with SAD have social skills deficits (e.g. Spence, 2003) and the strong association between social anxiety and ASD (e.g. Pearcey et al., n.d.; White, Oswald, Ollendick, & Scahill, 2009), it is conceivable that ToM deficits may also underlie social interaction difficulties that are thought to be present in childhood SAD. However, the evidence for an association between social anxiety and ToM specifically is mixed. For example, many studies have not found a significant relationship between social anxiety and general measures of ToM (Henning, Spinath, & Aschersleben, 2011), or individual aspects of ToM such as perspective taking (e.g. Batanova & Loukas, 2011) and false belief (e.g. Broeren, Muris, Diamantopoulou, & Baker, 2013; Caputi & Schoenborn, 2018) within community samples of children. However, there is some evidence that higher social anxiety is associated with impaired identification of others' intentions (but not beliefs), also in community samples (Banerjee & Henderson, 2001; Banerjee & Watling, 2010).

Several methodological limitations may account for the inconsistencies in findings on the association between social anxiety and ToM. For example, studies vary in whether they measure cognitive (understanding of beliefs and intentions) or affective (understanding of emotions) aspects of ToM and in the complexity involved, with some studies examining ToM used in simple interactions (i.e. first order false belief), and others examining ToM used in more complex interactions (i.e. self-presentational displays). Given that different types of ToM are often not related to one another (Kaland et al., 2008), they may have different associations with social anxiety. In addition, there is a lack of research investigating the relationship between social anxiety and ToM within clinically anxious populations, where the nature of the association with ToM may differ from community populations, and as such the generalisability of findings to clinical

populations is limited. Finally, there is evidence that greater ToM difficulties are associated with higher levels of general anxiety symptoms within ASD samples (Lei & Ventola, 2018; White et al., 2009). Community studies of the association between social anxiety and ToM have generally failed to account for potential overlap with other anxiety symptoms, limiting the extent to which we can draw conclusions about the specificity of the association.

The aim of this study is to overcome the limitations of previous research in order to investigate the relationship between social anxiety and ToM within clinically anxious and non-clinical samples of pre-adolescent children. Specifically, the aims are to (i) investigate the association between social anxiety symptoms and both affective and cognitive aspects of ToM, in interactions that differ in complexity, within a mixed clinically anxious and non-anxious sample; (ii) to investigate whether diagnostic group (i.e. SAD, anxiety disorders other than SAD, or no anxiety diagnosis) predicts the same affective and cognitive ToM abilities. Given the current evidence (e.g. Pearcey et al., n.d.), affective ToM is not expected to be significantly associated with social anxiety symptoms or disorder. In addition, less complex aspects of cognitive ToM are not expected to be significantly associated with social anxiety symptoms or disorder. In contrast, more complex aspects of cognitive ToM are expected to be significantly associated with social anxiety symptoms and disorder.

Methods

Participants.

Participants were 101 children aged 7-12 years. We sampled from both clinically anxious populations and community populations to ensure we achieved variability in both social and general anxiety symptoms and to allow for comparisons between diagnostic groups. All children included in this study were typically developing, fluent English speakers and were within the normal range of intelligence based on the Wechsler Abbreviated Scale of Intelligence (WASI-II; Wechsler, 2011). The sample were 89% Caucasian, and 70% of families included at least one parent with a higher education and 81.6% of families with at least one parent in full time work.

Children with social anxiety disorder (SAD; n = 29) and other anxiety disorders (ANX; n = 23) were recruited through a University based research clinic in the south of England. Children with SAD had received either a primary or co-morbid diagnosis of SAD, those with ANX had received a primary diagnosis of another anxiety disorder but no diagnosis of SAD.

Community children (COM; n = 49) were recruited through advertisements via local schools and social media, or had previously taken part in other unrelated research and agreed to being re-contacted. Parents of community children initially completed a screening measure of anxiety and depression (Revised Children's Anxiety and Depression Scale, RCADS; Chorpita, Yim, Mo, Umemoto, & Francis, 2000) and children were invited to participate if they scored below clinical cut offs on all RCADS subscales (including both anxiety subscales and depression), or if children scored above the cut offs parents were

required to confirm that the child did not experience any interference due to anxiety in a follow-up discussion [3].

Measures.

Diagnostic measures.

Diagnoses were assigned using a semi-structured clinical interview which combined the anxiety and behavioural disorders sections from the Anxiety Disorders Interview Schedule (ADIS-C/P; Silverman, W., Albano, A., & Barlow, 1996; Silverman, W. K., & Nelles, 1988) and the mood disorder sections from the Kiddie Schedule for Schizophrenia and Affective Disorders (K-SADS; Kaufman, 1997). Both are the gold standard for their respective disorders, have well established psychometric properties and have been validated for use with children and adolescents from 7 years of age (Kaufman, 1997; Silverman, W. K., & Nelles, 1988). A Clinician Severity Rating (CSR; 0-8) is given, for parent and child reports individually, for each disorder reaching the required symptom count for a diagnosis. A diagnosis is given if either of these ratings indicate clinically relevant levels of severity (i.e. are 4 or above) and the highest of the two ratings is taken as the overall CSR rating. For the K-SADS, diagnoses were based on the combined information obtained from both interviews.

Interviews were conducted by psychology graduates with parents and children separately. The assessors were trained to administer these assessments through verbal instruction, listening to assessment audio-recordings, role-play and participating in diagnostic consensus discussions. Assessor competence was evaluated using an

[3] This was the case for one community participant (GAD, t score= 72; Separation t score = 73). The parent reported minimal levels of interference with reference to difficulties getting to sleep that did not reach clinical significance.

observed structural clinical assessment, which was scored by senior members of the assessment team (supervisors). Once trained, all assessments were discussed with a supervisor, to agree on consensus diagnoses. Supervisors had all completed reliability checks to ensure consistency across supervision. Inter-rater reliability between supervisors for presence of a K-SADS depression diagnosis was k = 1.00. Reliability for presence or absence of anxiety diagnosis on the ADIS-C/P was k = 1.00, and for CSR ICC = 0.93.

Screening measures.

Children and their parents completed the Revised Children's Anxiety and Depression Scale (RCADS; Chorpita et al., 2000) to screen for anxiety and mood difficulties amongst the community sample. The RCADS is a 47-item parent and child report questionnaire assessing symptoms of anxiety disorders (i.e. separation anxiety disorder, social anxiety disorder, generalized anxiety disorder, panic disorder), obsessive compulsive disorder and major depressive disorder. Each item is rated on the frequency that it is experienced by the child from 0 ("never") to 3 ("always"). The RCADS has been shown to have robust psychometric properties in children and young people aged 7-18 years (Chorpita, Moffitt, & Gray, 2005) and the internal consistency in the current study was good (Parent α = 0.96; Child α = 0.94).

Intellectual functioning (IQ Scale).

Intellectual functioning (including verbal ability) was assessed using the Weschler Abbreviated Scale of Intelligence (WASI-II; Wechsler, 2011) which is validated for use with individuals aged 6-89 years. The full battery consists of four sub-tests giving a

standardised score of verbal comprehension (VCI), perceptual reasoning (PRI) and IQ based on 2 or 4 scales (FSIQ-2, FSIQ-4, respectively). For the purposes of this study, FSIQ-4 is reported for most participants. Two participants were unable to complete all four subscales (i.e. due to time constraints), so the two subscale IQ has been reported. For these children FSIQ-2 scores (90 and 97) differed significantly from the total sample mean FSIQ-2 score (M = 107.59; t = 13.04, $p < 0.001$; t = 7.85, $p < 0.001$ respectively), however both were within the normal range.

Social Communication

Parents reported on their children's broader social communication abilities using the lifetime version of the Social Communication Questionnaire (SCQ; Rutter, Bailey, & Lord, 2003)**.** The SCQ is a 40-item measure of social communication, based on the Autism Diagnostic Interview Revised (ADI-R) and has been established as a reliable screening measure for ASD in children (Chesnut, Wei, Barnard-brak, & Richman, 2017). The three SCQ subscales assess reciprocal social interaction (RSI; 13 items, e.g. offering to share or comfort, interest in other children and social smiling), communication (C; 8 items, e.g. conversation, inappropriate questions and nodding or shaking the head to mean "yes" or "no") and repetitive and restrictive behaviours (RRBI; 18 items, e.g. preoccupying interests and odd or repetitive movements). Parents respond "yes" or "no" to items assessing behaviours across the lifetime (18 items; 1 to assess RSI, 5 to assess C, 12 to assess RRBI) and between the ages of 4 and 5 years (21 items; 12 to assess RSI, 3 to assess C, 6 to assess RRBI). The SCQ-lifetime has been shown to have good psychometric properties amongst individuals aged from 4-32 years and with various clinical diagnoses including anxiety disorders (Halls et al., 2014; Rutter et al.,

2003). Total scores range from 0-40, where a score of "0" suggests no social communication difficulties. Internal consistency within the current sample was good (α = 0.79).

Social anxiety symptoms

The Liebowitz Social Anxiety Scale for Children and Adolescents (LSAS-C/A; Masia, Klein, & Liebowitz, 1999) includes 24 items, for which children rate their fear and avoidance of social interactions and performance on a scale from 'none'/'never' (0) to 'severe'/'usually' (3). Total scores range from 0 to 144, where higher scores represent more severe social anxiety. The LSAS-C/A has well established psychometric properties when administered to children and young people from 7 to 18 years of age (Masia-warner, Storch, & Pincus, 2003). Internal consistency for the current sample was good (α = 0.97).

Theory of Mind Tasks

ToM was assessed using two experimental tasks. The Reading the Mind in the Eyes Test for children (RMET-C; Baron-cohen et al., 2001) assesses complex emotion and mental state recognition (i.e. affective aspects of ToM). Children view 28 black and white photographs of the eye region of faces (i.e. a region extending from mid-way up the nose to just above the eyebrow) displaying a range of expressions and are asked to choose one of four mental state words (affective and non-affective) presented alongside it that "best describes what the person is thinking or feeling". Stimuli were presented through an online experiment builder (Collector; Garcia, Blake, Kerr, & Haffey, n.d.), where item order was consistent across participants and the position of the correct answer was randomised across items. Participants received a score of 1 for each correct

response and responses were totalled across items, resulting in a total score between 0-28, where higher scores represent better performance. This task has been used to assess ToM in both typically developing children and children with Asperger's Syndrome (AS) aged 6-14, with accuracy scores falling at around 17.2 or 20.29 for neuro-typical children and around 13.35 for children with AS (Baron-cohen et al., 2001; Hayward & Homer, 2017).

The triangles task (Abell et al., 2000) was used to assess cognitive aspects of ToM. The task measures children's ability to identify the intentions of moving objects within three types of animation differing in the complexity of interaction; (i) random animations In which there is non-deliberate action with no interaction (control script; e.g. triangles drifting or bouncing around a space), (ii) goal-directed animations in which there is deliberate action, interaction between shapes, but no implication of mental state attributions (GD script; e.g. dancing together or chasing one another), or (iii) ToM animations, in which one triangle has the intention to affect the other triangles mental state (ToM script; e.g. persuading, mocking, or bluffing). The task involves a total of 15 animations (35 – 45 seconds long); including three practice trials (one of each script type) followed by four trial animations of each script type. Trial animations were presented in a random order through the E-Prime 3.0 software (Psychology Software Tools, Pittsburgh, PA). Children were told to watch the animation carefully and then, at the end, to tell the researcher what they thought was happening. Responses were recorded on a voice recorder placed on the table in front of the child. For those who were not comfortable being recorded, their responses were written down by the researcher (this was the case for 5 SAD, 3 anxiety and 4 community children).

Responses to each animation were coded for accuracy (with respect to the story script that the animation was based on) and use of mental state terms on a scale of 0-2 (see supplementary materials) by the first author. Accuracy and mental state scores were totalled for each script type resulting in 6 scores (each ranging from 0-8) for each participant, where a higher score represent better accuracy and more depth of mental state attributions. To assess reliability, a subsection of responses (47%) were rated by an undergraduate psychology student. Additionally, reliability of both raters within the study were assessed against raters from a large European study of ToM in autism (EU-AIMS, 2018). In both cases, reliability was good (ICC = 0.87 within study; 86.67-93.34% agreement with EU-AIMS).

Procedure

Diagnostic interviews were administered to clinical participants within University clinic rooms as part of routine clinical assessments and then parents of eligible children were invited to take part. Families completed consent and assent forms during a follow up appointment; approximately 70% of the clinical families also completed all the questionnaire measures during this appointment. Community participants were screened by either returning the screening measures by email, post or online. All participants then attended a lab session in which they completed a battery of computer tasks (including the ToM tasks), followed by the WASI and the questionnaires (for all community participants and the remaining 30% of clinical participants). Due to constraints on children's time and availability, 10% of community children completed this lab session in two visits; completing the computer tasks in the first visit and

returning to complete the WASI and questionnaires during a second visit. On all occasions, the second visit took place no more than a week after the first visit.

During each session, potential for perceiving negative evaluation was minimized by reminding children that there were no right or wrong answers. Furthermore, the ToM tasks were placed in the middle and end of the battery of computer tasks so that children were first able to acclimatize to the researcher and to the lab, in order to assess ToM abilities with minimal interference from state social anxiety.

Data analysis

Intentionality and accuracy scores (totalled for each script type) were calculated from the triangles task and total score from the RMET. To address the first aim, a linear model was used to predict RMET total from LSAS score; and individual linear mixed effects models were used to predict triangles use of mental state terms and accuracy as functions of LSAS, and animation type (i.e. random, GD, ToM). The effect of the interaction between LSAS and animation type on mental state terms and accuracy was also explored given the suggestion that children with elevated social anxiety may respond differently according to the complexity of ToM. To address the second aim, LSAS was replaced by diagnostic group. Associations were investigated between dependant variables, predictors and potential confounding variables (including age, gender, full scale IQ, verbal ability, and SCQ score) using correlations, ANOVA's and Chi-squared analyses as appropriate. A number of these variables violated parametric test assumptions and, where this was the case, results from non-parametric tests are reported. Where dependant variables and predictors were significantly associated with potential confounds, these were included within the relevant models. Where potential

confounds were associated with some, but not all, animation types in the triangles task, appropriate interactions were included in the relevant models. Significant interactions between predictors in any of the models were followed up within separate exploratory linear models. Due to missing data, sample sizes differed between analyses. The n for each analysis is reported along with each finding.

Descriptive analyses were conducted in SPSS (Version 25). Linear Models were fitted with R 3.5.0 (R Core Team, 2018) using the lm() function in the Base package and the lmer() function with Satterthwaite approximations in the lmerTest package (Kuznetsova, Brockhoff, & Christensen, 2017). Data processing was carried out using the reshape package (Wickham, 2007). Participants were included in the analyses where they had full data on the LSAS, at least one of the ToM tasks and all control measures. Where less than 25% of the data for a particular measure was missing, items were replaced via mean replacement and the data were included in the analysis. Where more than 25% of the data for a measure was missing, the data was not included in the analysis. Power calculations suggested that the study sample size was large enough to conduct the planned primary analysis (i.e. the initial linear models and multinomial regressions) and detect a medium effect size (F^2 = 0.15) with a power of 0.80 and an alpha of 0.05. Interactions and subsequent exploration of significant interactions were not fully powered and, as such, were carried out as exploratory analyses.

Results

Preliminary analyses.

Although the sample as a whole were within a relatively narrow age range (85-155 months), older child age was associated with higher social anxiety symptoms (LSAS; r_{sp} = 0.27, p = .01) and with the presence of social anxiety disorder (see table 2) compared to the ANX group (p = 0.05, CI[0.10, 23.99]), as assessed by Tukey's post-hoc test. Gender was not significantly associated with social anxiety symptoms (U = 1114.00, p = .22), but was significantly associated with social anxiety disorder, with a significantly lower proportion of males in the SAD group compared to the COM group ($\chi^2(1) = 7.70$, p = .01). Full Scale IQ and VCI scores were not significantly associated with social anxiety symptoms (FSIQ4: r_{sp} = -0.11, p = .28; VCI: r_{sp} = -0.15, p = .15) or disorder (table 2). However for FSIQ4, although all scores were within the average range, Tukey's post-hoc test revealed that the SAD group had significantly lower scores than the COM group (p = .01, CI[-16.67, -1.87]), . As such, covariates of age, gender and FSIQ4 were included in ANCOVA's within table 2 and in models that examined ToM as a predictor of disorder group. Age was included in models that assessed ToM as a predictor of LSAS.

As expected, the SAD group had significantly higher LSAS scores than the ANX and COM groups ($t(52) = 4.22$. $p < .001$, CI[17.60, 49.50]; $t(77) = 6.88$, $p < .001$, CI[28.99, 52.61]), who did not differ significantly from one another ($t(69) = 1.27$, p = .21, CI[-4.17, 18.66]). Self and parent-reported levels of anxiety symptoms other than social anxiety did not differ between the SAD and ANX groups ($t(47) = 1.85$, p = .07, CI[-0.46, 10.98]; $t(48) = 0.83$, p = .41, CI[-3.51, 8.41], respectively), but both SAD and ANX were rated as

being more anxious than the COM group on both self (SAD vs COM: $t(43.84) = 4.55$, $p < .001$, CI[5.91, 15.32]; ANX vs COM: $t(67) = 2.55$, $p = .01$, CI[1.16, 9.54]) and parent-reported (non-social) anxiety measures (SAD vs COM: $t(36.01) = 8.85$, $p < .001$, CI[16.31, 25.99]; ANX vs COM: $t(65) = 10.42$, $p < .001$, CI[15.12, 22.28]). Parent reported social and communication difficulties were not associated with social anxiety symptoms ($r_p = 0.10$, $p = .34$; controlling for age), nor with social anxiety diagnosis (see table 2).

Table 2: Sample characteristics.

	SAD (n = 29)	**ANX** (n = 23)	**COM** (n = 49)	**Total** (n = 101)	
Age	128.13(17.41); 99-155	116.09(17.47); 88-150	119.18(17.08); 85-152	121.18(18.67); 85-155	$F(2, 86) = 3.44$, $p = .04$, $\eta_p^2 = 0.06$
Gender (% male)	35.5	43.5	67.3	52.4	$\chi^2(2) = 8.68$, $p = .01$, $\phi = 0.01$
FSIQ-4	99.96(9.87); 78-119	102.64(11.58); 81-122	109.50(14.85); 72-134	105.20(13.45); 72-134	$F(2, 94) = 5.20$, $p = .01$, $\eta_p^2 = 0.10$
VCI	102.26(10.36); 72-123	104.83(9.24); 82-119	108.34(15.39); 73-139	105.81(13.00); 72-139	$F(2, 94) = 2.00$, $p = .14$, $\eta_p^2 = 0.04$
LSAS total	69.89(31.43)	36.34(25.01)	29.10(21.33)	43.13(31.07)	$F(2, 90) = 15.30$, $p < .001$[a], $\eta_p^2 = 0.25$
RCADS Total Anxiety[b]: ***Child report***	58.66(13.00)	48.73(9.69)	43.48(10.50)	49.05(12.76)	$F(2, 87) = 17.74$, $p < .001$[a], $\eta_p^2 = 0.29$
RCADS non-social Anxiety[b]: ***Child report.***	55.76(10.80)	50.49(8.40)	45.14(7.85)	49.36(9.94)	$F(2,87) = 14.69$, $p < .001$[a], $\eta_p^2 = 0.25$
RCADS Total Anxiety[b]: ***Parent report***	76.48(13.18)	68.25(10.82)	46.28(7.56)	60.27(17.02)	$F(2, 86) = 63.49$, $p < .001$[a], $\eta_p^2 = 0.60$
RCADS non-social Anxiety[b]: ***Parent report.***	68.65 (11.71)	66.20(8.45)	47.50(6.02)	58.06(13.21)	$F(2, 86) = 48.11$, $p < .001$[a], $\eta_p^2 = 0.53$
SCQ	5.93(4.85)	4.74(3.18)	3.66(3.95)	4.55(4.14)	$F(2, 91) = 1.62$, $p = .20$[a], $\eta_p^2 = 0.03$[a]

Primary diagnoses;				
n(%)	13 (41.9)	0 (-)	-	-
Social anxiety	5 (16.1)	6 (26.1)	-	-
Separation anxiety	6 (19.4)	8 (34.8)	-	-
Generalised anxiety	5 (16.1)	6 (26.1)	-	-
Specific Phobia	0 (-)	1 (4.3)	-	-
Panic (without agoraphobia)				
Secondary				
diagnoses	15	0	-	-
Social anxiety	12	2	-	-
Separation anxiety	12	6	-	-
Generalised anxiety	7	4	-	-
Specific Phobia	1	1	-	-
Panic (without	2	-	-	-
agoraphobia)	-	1	-	-
OCD	-	1	-	-
MDD	4	1	-	-
Dysthymia				
ADHD				

[a] Analyses including age, gender and FSIQ-4 as covariates.

[b] t scores standardised by age and gender.

Means and standard deviations for total RMET accuracy and total triangles accuracy and mental state scores in each animation type are presented in Table 3. Triangles accuracy significantly differed across animation type ($\chi^2(2) = 46.01$, $p < .001$) such that children were significantly more accurate in the goal directed than the random

(Z = -3.46, $p < .01$) and ToM animations (Z = -7.38, $p < .001$) and in the random compared to ToM animations (Z = -2.97, $p < .01$). As expected, mentalising score also differed across animation type ($\chi^2(2) = 122.04$, $p < .001$) such that children used significantly more mentalising terms to describe ToM animations than goal directed (Z = -7.34, $p < .001$) or random animations (Z = -7.91, $p < .001$) and to describe goal than directed random animations (Z = -2.97, $p < .01$).

Table 3: Means, standard deviations and score ranges for ToM tasks across the sample and for each group.

		Total	**SAD**	**ANX**	**COM**
RMET total accuracy		18.94(3.17); 11-24	19.04(3.23); 11-24	19.36(3.29); 12-23	18.61(3.08); 11-24
Random animations	Accuracy.	4.42(2.48); 0-8	4.50(2.94); 0-8	5.09(2.26); 0-8	4.02(2.37); 0-8
	Mental state terms.	0.34(0.73); 0-3	0.12(0.43); 0-2	0.43(0.90); 0-3	0.38(0.74); 0-3
Goal directed animation	Accuracy.	5.39(1.53); 1-8	5.12(1.84); 2-8	5.04(1.67); 1-8	5.70(1.27); 3-8
	Mental state terms.	0.62(1.03); 0-5	0.42(0.76); 0-3	0.74(1.29); 0-5	0.68(1.05); 0-5
ToM animations	Accuracy.	3.44(1.77); 0-8	2.93(1.27); 0-6	3.52(2.00); 1-7	3.69(1.87); 0-8
	Mental state terms.	2.29(1.64); 0-6	2.04(1.56); 0-5	2.52(1.59); 0-6	2.32(1.70); 0-6

Model Results

Neither LSAS nor diagnostic group significantly predicted RMET accuracy (N = 98, $F(2, 97) = 0.59$, p = .56; N = 97, $F(5, 91) = 1.02$, p = .41 respectively) or triangles intentionality or accuracy scores (Table 4). Furthermore, there was not a significant interaction between LSAS or group and animation type on mental state score, nor between LSAS and animation type on accuracy scores (Table 4). However, there was a significant interaction between group and animation type on triangles accuracy ($F(4,184) = 2.82$, p = .03), which reflected a significant difference between the SAD and ANX groups on ToM animations (Table 5). Additionally, the difference between the SAD and COM group on ToM animation accuracy and between ANX and COM groups on random animation accuracy scores approached significance (Table 5).

Table 4: Model results for the triangles task.

	Triangles Intentionality	**Triangles Accuracy Only**
	N = 95	*N* = 95
LSAS Models		
LSAS	*F*(1,95) = 0.07, *p* = .79	*F*(1,90) = 0.04, *p* = .84
Animation type	*F*(2,190) = 0.28, *p* = .76	*F*(2,184) = 3.23, *p* = .04*
Age	*F*(1,95) = 1.88, *p* = .17	*F*(1,90) = 5.12, *p* = .03*
Gender	*F*(1,95) = 0.00, *p* = .96	*F*(1,90) = 9.66, *p* < .01**
FSIQ	*F*(1,95) = 3.85, *p* = .05	*F*(1,90) = 0.32, *p* = .58
*LSAS*Animation type*	*F*(2,190) = 0.29, *p* = .75	*F*(2,184) = 0.21, *p* = .81
*Animation type*Age*	-	*F*(2,184) = 2.27, *p* = .11
*Animation*FSIQ*	*F*(2,190) = 3.02, *p* = .05	-
*Animation*Gender*	-	*F*(2,182) = 0.53, *p* = .59
Group Models		
Group	*F*(2,96) = 1.64, *p* = .20	*F*(2,90) = 1.27, *p* = .29
Animation type	*F*(2,192) = 0.30, *p* = .74	*F*(2,184) = 4.11, *p* = .02*
Age	*F*(1,96) = 2.93, *p* = .09	*F*(1,90) = 6.73, *p* = .01*
Gender	*F*(1,96) = 0.01, *p* = .91	*F*(1,90) = 10.04, *p* < .01**
FSIQ	*F*(1,96) = 3.47, *p* = .07	*F*(1,90) = 0.35, *p* = .56
*Group*Animation type*	*F*(4,190) = 0.31, *p* = .87	*F*(4,184) = 2.82, *p* = .03*
*Animation type*Age*	-	*F*(2,184) = 2.82, *p* = .06
*Animation*FSIQ*	*F*(2,192) = 3.40, *p* = .04*	-
*Animation*Gender*	-	*F*(2,182) = 1.00, *p* = .37

*$p < .05$; **$p < .01$.

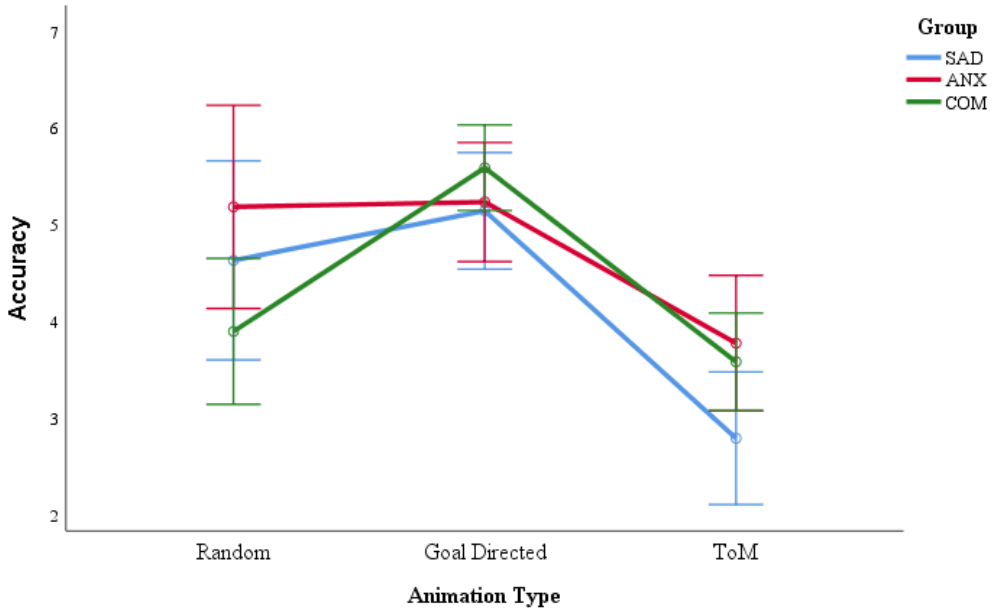

Figure 1: Group means for Triangles total accuracy across each animation type (Error bars are representative of 95% CIs)

Table 5: Triangles accuracy group by animation type estimates.

Animation Type	Group	Beta	*t* Value	*p* Value
Random	*ANX Vs SAD*	0.554	0.75	.46
	COM Vs SAD	-0.734	-1.10	.28
	COM Vs ANX	-1.288	-1.95	.05$^{\$}$
Goal directed	*ANX Vs SAD*	0.091	0.21	.83
	COM Vs SAD	0.445	1.14	.26
	COM Vs ANX	0.354	0.92	.36
ToM	*ANX Vs SAD*	0.983	2.00	.05*
	COM Vs SAD	0.791	1.77	.08
	COM Vs ANX	-0.192	-0.44	.66

All models included age, gender and FSIQ4 as covariates

*$p < .05$; $^{\$}p < .06$

Discussion.

The aims of this study were to investigate the association between social anxiety disorder and symptoms with both cognitive and affective ToM, within a clinically anxious and non-anxious sample of pre-adolescent children. Neither social anxiety symptoms nor diagnostic group predicted children's ability to identify complex emotions, the number of mental state terms used to describe intentions, the accuracy with which children described intentions generally, or children's general social functioning. However, children with SAD were less likely than children with other types of anxiety disorder to accurately describe intentions where this required Theory of Mind in complex interactions (and the difference with community children approached conventional levels of significance). The different associations between social anxiety and each of the ToM tasks in this study support the conclusion that social anxiety is related to some, but not all, aspects of ToM and at different levels of complexity. Specifically, our findings suggest that SAD is associated with cognitive ToM in complex interactions, but may not be associated with affective ToM, or ToM involved in simple interactions.

These findings are important as they may have significant implications for maintenance models and treatments of SAD in childhood. For example, maintenance models of SAD in adulthood include biases in cognitive processes such as attention to and interpretation of social information. However, the current results suggest that it might be beneficial to consider the presence of an additional and specific cognitive deficit (i.e. in ToM) in the development of maintenance models for children. Furthermore, the results suggest that general social skills training (including e.g. emotion recognition) may not be warranted for children with SAD. Instead, a more nuanced

approach which focuses on promoting accurate understanding of intentions in complex social situations (such as deception, or persuasion) may be more efficient and effective. The lack of significant associations between social anxiety symptoms/disorder and emotion recognition are consistent with previous findings (Pearcey et al., n.d.), and extend previous research to show that this is the case even when recognising emotions that require affective ToM abilities within a clinically anxious sample (Ogawa, Lee, Yamaguchi, Shibata, & Goto, 2017; Usher, Burrows, Schwartz, & Henderson, 2015). Indeed, accuracy scores on the RMET test, across all groups in the current study, were similar to the scores of neurotypical children found in previous studies (Baron-cohen et al., 2001; Hayward & Homer, 2017).

Some inconsistencies with previous research should also be noted. In particular, in contrast to Banerjee & Henderson (2001), we did not find evidence of a linear association between any aspect of ToM and *symptoms* of social anxiety. Whether this reflects differences in our samples (i.e. our sample included children with clinically elevated levels of social and other anxiety symptoms) or differences in the tasks used remains unclear. For example, Banerjee & Henderson (2001) and Banerjee & Watling (2010) assessed intentions within self-presentational display, where intentions are inconsistent with the behaviour shown, whereas in the current study intentions of the triangles were consistent with behaviours. The triangles task was used in this study particularly so that the effect of increasing complexity in interactions could be examined. However, future studies would benefit from inclusion of more complex aspects of ToM, particularly assessing their use in real life complex interactions. Nevertheless, the additional level of complexity assessed by Banerjee & Henderson (2001) and Banerjee & Watling (2010) may have been more sensitive to assessing ToM

difficulties within a neurotypical population, and as such more able to detect an association when social anxiety is assessed continuously.

Unlike, Halls et al. (2014) we also failed to observe a significant association between social anxiety symptoms or disorder and broader social functioning difficulties (as reported by parents on the SCQ). In particular, whereas Halls et al. (2014) identified a medium effect size for the difference between clinically anxious children with and without SAD (d = 0.55) the results here demonstrated only a small effect size for both social anxiety disorder and symptoms. Notably Halls did not control for IQ, which did reduce the size of the effect in this study (from d = 0.35 to d = 0.20).

Interestingly, non-anxious children gave less accurate descriptions of random animations than those with (non SAD) anxiety disorders. Specifically, the less accurate responses given by non-anxious children tended to describe deliberate actions and intentions where there were none. This finding approached conventional levels of significance and may reflect greater confidence of the non-anxious children, compared to the anxious children, in “making up” a story to go with the animation.

This study has several strengths, including the inclusion of a clinically anxious sample with and without social anxiety disorder, which allowed us to build on previous work to draw conclusions about diagnostic specificity. The inclusion of both a categorical and continuous social anxiety variable in the analysis was a particular strength of this study; allowing for the assessment of both clinical differences, and symptom level associations across the sample. In addition, the inclusion of objective measures of both affective and cognitive ToM measures limited the potential for self-report or observer bias, again strengthening the conclusions that can be drawn. Furthermore, given the

specificity of findings to particular domains within the triangles task, it is unlikely that the results were a result of the child feeling inhibited while taking part in the task, which would be expected to have a more consistent effect across the results. However, given the range of ToM skills that children apply in social situations, future research would benefit from assessing additional aspects of cognitive ToM to further examine specific areas of ToM that may be compromised among children with Social Anxiety Disorder (i.e. as in Banerjee & Henderson, 2001; Banerjee & Watling, 2010). Furthermore, although a relatively large sample was included in this study, it was not possible to match groups on age, gender and IQ. Although group differences on these variables were controlled for in our analyses, there may have also been differences in related variables (e.g. memory and information processing) that can have an impact on ToM ability (Kaland et al., 2008). Finally, it is important to acknowledge that the complexity of the ToM triangle animations introduces a greater amount of ambiguity than is present in the goal directed animations, introducing the possibility that impaired performance may reflect a cognitive 'distortion', rather than a 'deficit' (e.g. Stuijfzand, Creswell, Field, Pearcey, & Dodd, 2018). Although there did not appear to be a greater number of disproportionately negative responses amongst the SAD group compared to the other groups, this should be borne in mind when interpreting the results.

With these caveats in mind, our findings suggest that children with elevated social anxiety symptoms and social anxiety disorder do not have deficits in many aspects of ToM (i.e. affective ToM and some aspects of cognitive ToM), however children with SAD appear to be less able to identify other's intentions within complex interactions than non-anxious children and those with other anxiety disorders. As such, it may be the case that a specific focus on children's ability to use their ToM abilities to navigate more

intricate social interactions, rather than generic social skills training, may enable more efficient, targeted treatments for children with SAD.

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4.2 Supplementary materials

Table 1. Scoring for the triangles task.

Score	Mental state terms	Accuracy
0	Attributing no mental state; e.g. "Running", "Chasing", "following"	Inaccurate; or focussing on a single, unimportant event.
1	Attributing first order mental states, i.e. to one or other triangles actions; e.g. "wanting", "angry", "annoying"	Partially correct, or giving part of the story whilst missing the critical point.
2	Attributing second order mental states, i.e. affecting another, or about another's beliefs; e.g. "pretending", "deceiving", "convincing"	Fully correct including the critical point of the story.

Chapter 5

General Discussion.

This thesis aimed to address two main gaps in the literature. The first aim was to investigate potential subgroups of clinically anxious children with profiles based on the putative maintenance mechanisms of childhood anxiety disorders. On the basis of the early findings, the second aim was to explore the relationship between social anxiety and social skills difficulties in more depth, specifically, by investigating the relationship between social anxiety and social cognitions that underlie social skills. The following will give an overview of the findings from the three papers in this thesis and discuss these findings together, with reference to the maintenance of anxiety disorders, and specifically social anxiety disorder, in preadolescent children. The implications of these findings for treatment of anxiety disorders in childhood and for future research will be discussed.

5.1 Overview of Findings.

5.1.1 Paper 1: Do clinically anxious children cluster according to their expression of the main maintenance mechanisms that are targeted in cognitive behavioural therapy?

Within this study, latent profile analysis (LPA) was used to explore the presence of subgroups of clinically anxious children who differ in their expression of the main maintenance mechanisms that are targeted in cognitive behavioural therapy. In addition, overlaps between the identified subgroups and existing diagnostic categories

were assessed, as well as their associations with factors that are commonly associated with impaired treatment outcomes. Three latent groups were identified that could be distinguished by children who had social difficulties, those who were particularly avoidant of feared stimuli, and those who appeared to represent a "typical" anxiety profile. These subgroups were associated with particular diagnoses (e.g. the social difficulties group included a disproportionate number of children with SAD; and the typical anxiety group included a disproportionate number with GAD), but did not align neatly. In addition, those with social difficulties, in particular, were older and had more comorbid diagnoses than the majority of the rest of the sample, which may indicate that those with social difficulties may have poorer treatment outcomes than those in the other groups. The findings may go some way to explaining inconsistent results in the literature assessing the presence of the putative maintenance mechanisms of CBT in childhood anxiety disorders.

5.1.2 Paper 2: The relationship between social anxiety and social cognition in children and adolescents: A systematic review and meta-analysis.

Paper 1 identified that children with SAD were more likely to have social difficulties than children with other anxiety disorder diagnoses, however this relied on parent report on a range of areas of social functioning. Given the overlap in observable symptoms of social anxiety and social skills difficulties, it is likely that greater clarity will come from examining associations between social anxiety and the skills that underlie effective social communication (i.e. social cognitions). However, previous evidence for an association between social anxiety and social cognition difficulties has been mixed. As such, the aim of study two was to quantify and examine the nature of the relationship

between social anxiety and social cognition in children and adolescents by systematically reviewing the literature and conducting a meta-analysis of effect sizes.

The results revealed a significant association between social anxiety and social cognition among children and adolescents with a moderate effect size; where increased social anxiety was related to decreased social cognition abilities. This effect size was moderated by several conceptual and methodological factors such that significant effects were observed among studies (i) measuring an ASD diagnosis or specific aspects of ToM (i.e. self-presentational displays) as the measure of social cognition, (ii) using a between groups study design, (iii) recruiting a mixed clinical and community sample, (iv) using a clinical assessment as the method of assessing social cognition, (v) using self- or parent report on social anxiety and clinician report on social cognition, and (vi) among children aged above 7 years. Of note, a number of the methodological moderators overlapped with the conceptual moderator of type of social cognition dimension measured; such that the majority of studies including an ASD diagnosis also used a between groups design, recruited a mixed sample of pre-adolescents and/or adolescents and used a clinician reported clinical assessment as the measure of social cognition. In addition, although no significant effect was observed among studies measuring ToM as the social cognition dimension overall, a significant association was identified with a specific aspect of ToM (i.e. self-presentational displays). However, it remains unclear whether there may be a significant association between social anxiety and other individual aspects of ToM (e.g. cognitive and affective) where there were insufficient effect sizes to investigate this. The main conclusion from the meta-analysis was that children and young people with a diagnosis of ASD have elevated social anxiety, however there was limited evidence for an association between social anxiety and social

cognition amongst neurotypical children, suggesting that a focus on social skills training may not be a necessary focus of treatment for social anxiety outside of ASD populations.

5.1.3 Paper 3: Investigating the relationship between social anxiety and theory of mind in clinically anxious and non-anxious pre-adolescent children.

In order to overcome methodological limitations identified in previous research, particularly the confounded measurement of social skills and inhibition and the lack of focus on specific aspects of social cognition, study three aimed to explore the relationship between social anxiety and Theory of Mind (ToM), which is thought to be one of the core social cognitions underlying social communication skills, and to examine whether specific aspects of ToM (i.e. affective or cognitive) were differently associated with social anxiety symptoms or disorder. This study also built on previous research by including clinically anxious and non-anxious children and examining whether this the association was specific to social, rather than other, anxiety disorders.

The results from study three suggested that neither affective nor cognitive ToM were associated with social anxiety symptoms and affective ToM was also not associated with social anxiety disorder. However, while social anxiety disorder was not associated with the level of mentalising terms that children used to describe animations in the triangles task, children with SAD were less accurate at identifying intentions when animations involved more complex interactions. Despite these specific differences on their ToM accuracy in complex situations, and in contrast to previous research, there were no associations between social anxiety symptoms or disorder on parent reported social communication difficulties. These results strengthen the suggestion that social skills training, particularly those that include emotion recognition, may not be required

for effective treatment for socially anxious children. However, specific treatments for childhood SAD may benefit from a focus on targeting complex aspects of ToM (see section 5.5.2).

5.2. Implications for interpreting wider research

The results of study 1 may go some way to explaining the inconsistent findings in the literature assessing the presence of the putative maintenance mechanisms of child anxiety disorders. Specifically, it may be the case that sampling differences have led to the recruitment of study groups that include a mixture of latent groups (as identified in study one). For example, the pattern of results seen within the "avoidant group" in study one is consistent with previous research suggesting that pre-adolescent children do not necessarily display an interpretation bias, but do show reduced self-efficacy (Waite, Codd, & Creswell, 2015). In contrast, the pattern of results seen within the "Typical anxious" group is more consistent with other studies that identify an interpretation bias amongst anxious compared to non-anxious children (e.g. Stuijfzand, Creswell, Field, Pearcey, & Dodd, 2018). Equally, where previous studies have identified significant social skills difficulties amongst children with SAD (e.g. Halls, Cooper, & Creswell, 2014; Scharfstein & Beidel, 2015), it is possible that these studies primarily recruited children with difficulties similar to those in the social difficulties group. In contrast, in other studies (e.g. Dodd et al., 2011) and in study 3, no significant differences in general social communication difficulties were identified between those with and without a diagnosis of SAD. This is consistent with the finding in study 1 that, although the majority of children with heightened social communication difficulties had a diagnosis of SAD, not all did, and the majority of children with SAD did not have social communication

difficulties. Notably, however, despite not finding a difference in general social communication difficulties, in study 3 children with SAD did appear to have particular difficulties with specific aspects of ToM (i.e. the accuracy with which they are able to identify characters intentions within complex interactions).

5.3 Implications for understanding social anxiety disorder in children

The results from the studies presented here suggest that social anxiety disorder may be associated with deficits in very specific aspects of complex social cognition (i.e. specific aspects of ToM like the ability to understand self-presentational displays and accurately identify intentions). This is consistent with previous research finding a significant association between social anxiety symptoms and specific aspects of ToM in children. Specifically, Banerjee & Henderson (2001) found a significant association between social anxiety symptoms and complex forms of ToM, such as self-presentational displays and identification of intentions) but not with more basic aspects of ToM (e.g. first and second order false belief). Similarly, the meta-analysis in study 2 failed to identify overall evidence for a significant association between social anxiety symptoms/disorder and recognition of emotional facial expressions, across different emotion recognition measures. The results from study three suggest that this remains the case even for the recognition of complex emotions, such as jealousy or disbelief.

While a significant and social anxiety disorder specific association was found with accuracy of identifying the intentions of triangles, it is important to note that children with social anxiety disorder were considered here as one group. This approach is contrary to the implications of study one, which suggested that there might be subgroups of children with social (and other) anxiety disorders where different cognitive

deficits/distortions apply. Given the number of anxious children that could be recruited in to study three within a realistic time window, it was not possible to carry out a similar analysis to investigate the possible presence of subgroups there. Indeed, in order to do so would have required several hundred anxious participants to guarantee a well powered analysis (Wurpts & Geiser, 2014). However, examination of the distribution of scores on the triangles test did not indicate that there were likely to be a subgroup of children with deficits in accurately identifying intentions. Instead, the distribution appeared relatively normally distributed, with a slight bimodal distribution indicating a possible subgroup with advanced accuracy in identifying intentions in ToM animations. However, future, large, multicentre studies will be required in order to further examine these possible subgroups of children with Social (and other) Anxiety Disorders that are characterised by particular ToM difficulties.

5.3.1 The association between social anxiety and specific aspects of ToM versus more general social functioning.

Given that complex aspects of ToM were observed amongst socially anxious children compared to children with other anxiety disorders in study 3, it is notable that group differences in general social communication were not identified, in contrast to previous studies (Halls et al., 2014; Spence, Donovan, & Brechman-Toussaint, 1999). The finding from study 3 that groups differed on aspects of complex ToM ability also contrasts with the findings of study 1 suggesting that only a subgroup of socially anxious children display observable social communication difficulties. There are several explanations for this finding, including that the ToM difficulties that were identified were specific to the use of ToM in complex interactions. As such, it is possible that the

resulting social communication difficulties are similarly specific and so not captured by fairly general measures of parent observed social communication. It is also possible that some neurotypical children with high social anxiety may successfully develop compensation techniques so that difficulties with complex ToM are not observable. Indeed, this suggestion is consistent with findings from studies with ASD populations that young people with ASD who show deficits in ToM ability, but relatively intact social functioning abilities may be more able to compensate (e.g. due to higher IQ's and executive functioning abilities) than those who have both ToM and social functioning deficits (Livingston, Colvert, Study, Bolton, & Happè, 2019).

The finding in paper 3 that children with SAD had impaired complex ToM but did not have general social communication difficulties may also account for the self-perception bias observed by Cartwright-Hatton and colleagues (Cartwright-Hatton, Hodges, & Porter, 2003; Cartwright-Hatton, Tschernitz, & Gomersall, 2005). The authors suggested that, even when social functioning is not observably impaired, there may still be unobserved social cognitive difficulties that the socially anxious child themselves may be aware of. Indeed, Livingston et al. (2019) identified that children with ASD who compensate for ToM difficulties report significantly more general anxiety symptoms than those who do not compensate. This suggests that the use of compensation may be responsible for heightened anxiety symptoms in general, and potentially higher social anxiety symptoms specifically.

5.3.2 The association between social anxiety symptoms versus social anxiety disorder and ToM.

Although a significant association was found, in study three, between social anxiety disorder and complex aspects of ToM, there was not a significant linear association with social anxiety symptoms. This is not consistent with previous research that has identified a linear association between social anxiety symptoms and similar complex ToM difficulties amongst non-anxious children (Banerjee & Henderson, 2001; Banerjee & Watling, 2010). However, this inconsistency may be accounted for by differences in the task used in study three differed from those used by Banerjee & Henderson (2001). For example, Banerjee & Henderson (2001) used a self-presentational display task and faux pas test, in which children were required to identify the motives behind deceptive self-presentational displays, and the intentions of faux pas. In both cases, the motives and intentions tend to be inconsistent with the observed behaviour. In contrast, intentions in the triangles task were always consistent with the behaviour displayed (e.g. not crying after getting hurt in self-presentational displays or persuading a character to leave a room in the triangles task). As such, despite the limited information provided in the triangles task, it may have been easier than the presentational display or faux pas tasks and less sensitive to gradual increases in social anxiety symptoms. However, the pattern identified in study 3, in which an association was found between ToM and social anxiety disorder, but not symptoms, is consistent with previous research where fewer studies have found significant associations between observable social skills and social anxiety symptoms in community populations than with SAD (e.g. see review by Halldorsson & Creswell, 2017).

Of note, unlike the mixed clinical and community sample recruited in study three, previous studies identifying a continuous relationship between social anxiety and

complex aspects of ToM have done so in community only samples. As such, several factors that distinguish clinical (i.e. those with a diagnosis of SAD) and community populations (i.e. those with a range of social anxiety symptoms) may account for this pattern of results. For example, children with SAD have more severe social anxiety symptoms than children without SAD and there may be some aspects of ToM that are specifically associated with severe but not mild symptoms (i.e. not operating on a continuum). In addition, significantly greater interference in day-to-day life is experienced by children with SAD compared to those without. This interference may interact with ToM and, as such, alter its relationship with social anxiety. For example, children with SAD may limit their opportunities to practice and develop their ToM abilities due to their increased tendencies to avoid more social situations and have a greater reliance on other people, or on behavioural tactics that they believe will reduce the likelihood of a feared outcome. It will be important for future research to examine ToM abilities in relation to the factors that distinguish social anxiety disorder from social anxiety symptoms so that the role of ToM deficits in the development or maintenance of SAD specifically can be clarified.

It is also important to note that, within study 3, the finding that SAD, but not social anxiety symptoms are associated with ToM also differs in the type of analysis used and this could also go some way to explaining this inconsistency. For example, to investigate the association between SAD and ToM abilities, categorical groups were used (i.e. SAD, ANX and COM). In contrast, social anxiety symptoms were measured on a continuous scale. The use of categorical groups limits the sensitivity of these analyses and, as such, increases it's vulnerability to type 1 error. However, as discussed, the use

of categorical groups that represent the presence or absence of a clinical diagnosis of SAD includes additional information that is not measured with a social anxiety symptom scale (i.e. the interference of these symptoms in daily life). In addition, the power analysis conducted for study 3 indicated that they sample was large enough to power an analysis using a categorical approach.

5.3.3 The association between social anxiety and ASD in children

Despite only finding evidence for a specific association between social anxiety disorder and a particular aspect of ToM, the meta-analysis did find a robust association between social anxiety and ASD. ASD is commonly associated with deficits in ToM, however, given the lack of significant association between many elements of ToM and social anxiety in neurotypical children, it remains unclear whether ToM difficulties underlie the relationship between social anxiety and ASD or whether this is accounted for by other characteristics or experiences that are common among children with ASD. Alternatively, social anxiety may only be associated with ASD when all, or some combination, of the central components are taken together. Indeed, there are several components of ASD that may be associated with social anxiety. For example, many children with ASD display repetitive and restricted behaviours (RRB). RRBs are commonly associated with anxiety (e.g. Rodgers, Glod, Connolly, & Mcconachie, 2012), and it has been suggested that this association is potentially mediated by intolerance of uncertainty (IU; Boulter, Freeston, South, & Rodgers, 2014; Joyce et al., 2017). While the directional nature of this relationship remains unclear (e.g. Wood, Angeles, & Gadow, 2010) there is evidence that IU is associated with specific components of social anxiety in adults (i.e. fear of negative evaluation; Carleton, Collimore, & Asmundson, 2010),

although notably it is also commonly associated with other types of anxiety in children (e.g. worry; Osmanagaoglu, Creswell, & Dodd, 2018).

Alternatively, there may be other aspects associated with social skills deficits that underlie the relationship between social anxiety and ASD in children; such as negative social interactions and poor peer relationships. For example, several researchers have suggested that social anxiety in adults may be a consequence, at least in part, of the interaction between early social skills difficulties and negative peer interactions (e.g. Rapee & Heimberg, 1997; Ronald M Rapee & Spence, 2004; Rubin, 1985; Spence et al., 1999). Indeed, social anxiety in children has been associated with peer rejection and victimisation as well as poor friendship quality (e.g. Bell-dolan et al., 1995; Erath, Flanagan, & Bierman, 2007). Similarly, children with ASD have been reported to experience more victimisation and bullying, and fewer and poorer quality friendships than neurotypical children (e.g. see Mazurek & Kanne, 2010; Schroeder, Cappadocia, & Weiss, 2014), and victimisation has been specifically associated with both internalising symptoms and communication difficulties (Cappadocia, Weiss, & Pepler, 2012). Of note, some studies report more victimisation and internalising difficulties in higher functioning individuals with ASD than neurotypical children or high functioning children with ASD in special educational needs schools (e.g. Mazurek & Kanne, 2010; Rowley et al., 2012). This potentially reflects a “perfect storm” of increased interactions, but fewer social skills leading to more negative interactions and more anxiety. Further research is needed to better understand the characteristics and/or experiences that underlie the association between ASD and social anxiety in children, in order to ultimately identify appropriate methods to prevent and treat social anxiety disorder in children with ASD.

5.4 Implications for existing models of social anxiety disorder in children and future directions

Currently, there are no models of what maintains social anxiety disorder in childhood, i.e. what prevents social anxiety from self-correcting despite the opportunity for new learning from social experiences. However, there are robust models within the adult literature (e.g. Clark & Wells, 1995; Rapee & Heimberg, 1997), and several of the mechanisms appearing in these adult models, as well as those in developmental models, have been assessed within childhood samples (e.g. see review by Halldorsson & Creswell, 2017). The following section considers the current results in the context of research investigating these mechanisms and factors in childhood.

5.4.1 Focus of attention and the development of social cognition.

Several studies have investigated the relationship between social anxiety and focus of attention within both clinical and community populations of young people, and findings appear consistent, at least in part, with adult models of social anxiety (e.g. Rapee & Heimberg, 1997). For example, children with higher social anxiety, or with SAD, tend to focus more attention inwardly (to internal thoughts and feelings) than children with lower social anxiety, or non-anxious children (e.g. Hodson, Mcmanus, & Clark, 2008; Kley, Tuschen-caf, & Heinrichs, 2012). Fewer studies have investigated external focus of attention. However, available findings suggest that the presence of SAD may also be associated with a tendency to focus more attention externally (to their surroundings; Kley et al., 2012). These findings are interesting in the light of studies 2 and 3, where potential difficulties in complex ToM were associated with higher social anxiety in children- as the important role of joint attention and social referencing (both

requiring an external focus of attention) has been highlighted in the development of ToM within ASD populations (e.g. Charman, 2003). Whilst tentative, it is possible that early increases in self-focussed attention may have a negative impact on both children's developing ToM and social anxiety. Future longitudinal studies would usefully elucidate the directional and interacting relationships between focus of attention, ToM and social anxiety.

5.4.2 Interpretation bias and the ability to understand other's intentions.

As already described, the tendency to interpret ambiguous self-referential information as negative (i.e. negative interpretation bias) is central in adult models of social anxiety and its association with social anxiety has also been established amongst children (Stuijfzand et al., 2018). As discussed in paper 3, a negative interpretation bias was ruled out as an explanation for the triangles task results because, although interpretations of the ToM animations were less accurate when made by children with SAD compared to those without, visual inspection of the data suggested they were not more negative than the other groups. In addition, the scenarios in the triangles task did not involve potential threat directed toward the child. However, the triangles findings illustrate how ambiguous information may be wrongly interpreted in *general* by socially anxious children. It is also worth bearing in mind that ToM difficulties may interact with interpretation biases. For example, the intentions of others tend to be private, and subtle pieces of social information are required to work out what they are. The privacy of intentions also makes them relatively ambiguous, and an inability to read the complex social information about intentions (i.e. a ToM deficit) increases their ambiguity further. As such, a ToM deficit may increase the need to make assumptions about other's

intentions and subsequently increase the likelihood of an inaccurate interpretation. Future studies would benefit from specific consideration of this hypothesis.

5.4.3 Safety behaviours and social cognition.

Another mechanism commonly included in adult maintenance models of social anxiety is safety seeking behaviours (e.g. Clark & Wells, 1995). These are behaviours that are carried out in the belief that they will reduce the chance or impact of a feared outcome. The presence of safety behaviours amongst children with SAD or heightened social anxiety symptoms has been investigated in only a small number of studies, yet these have found that the use of more social anxiety related safety behaviours is associated with higher levels of social anxiety symptoms amongst non-clinical children (Hodson et al., 2008). In addition, children with SAD report both a greater range and higher frequency of safety behaviour use than both children with high social anxiety symptoms (but not SAD) and non-anxious children (Kley et al., 2012). Social anxiety related safety behaviours tend to include behaviours such as speaking too much or too little, making an effort to get your words right, avoiding eye contact, rehearsing sentences in your mind, staying on the edge of groups and having an excuse or "get out" planned (Clark, 2005). As well as having consequences for the maintenance of social anxiety, these behaviours may have an impact on social functioning in several ways. For example, many of these behaviours are likely to increase withdrawal and, as a result, limit the opportunities that children have to develop and use social skills. Furthermore, many of these behaviours may limit children's ability to interact with peers effectively when they are in social situations, reducing opportunities to develop social communication generally and ToM more specifically.

An alternative explanation for an association between social anxiety, social cognition and safety behaviours, is that previous research may have misidentified safety behaviours as social skills deficits. For example, making an effort to get words right and rehearsing sentences before saying them may lead to increased speech latency; a behaviour that, along with reduced eye contact, is often coded in observational measures of social skills (e.g. Scharfstein, Beidel, Sims, & Finnell, 2011). Future studies should further explore the relationship between safety seeking behaviours, ToM abilities and social communication skills, and social anxiety, using measures that can carefully distinguish between these constructs, in order to identify appropriate targets for treatment of SAD in children.

5.4.4 Peer relationships and social cognition.

As discussed above, peer relationship difficulties are experienced by both children with social anxiety (e.g. Spence et al., 1999), and children with disorders particularly defined by social cognition difficulties (i.e. ASD; e.g. Schroeder et al., 2014). This suggests a potential interaction between social cognition deficits, peer interactions and social anxiety. Of note, the complex ToM abilities assessed within study 3 tend to develop later in childhood (Carpendale & Chandler, 1996) and so it is likely that negative peer relationships inhibit the development of ToM abilities, rather than being a consequence of ToM deficits. For example, increased peer rejection and victimisation is likely to lead to fewer interactions than are experienced by non-anxious neurotypical children, limiting the opportunities to use and practice ToM abilities.

Of particular note, previous research suggests that more anxiety and peer problems may be experienced by children with ASD who have fewer social

communication difficulties compared to those with more difficulties (e.g. Rowley et al., 2012), potentially as a result of more frequent interactions amongst high functioning children with ASD compared to low functioning children. This may reflect a developmental cycle of ToM development, negative peer interactions and social anxiety. For example, there may be individual differences in the development of social cognitive skills and social communication abilities which means that, as children begin to interact with each other more independently (i.e. away from the social structure provided by parents), those with less well-developed social communication difficulties may experience more negative interactions with their peers and, as such, become more withdrawn and have fewer opportunities to continue to develop the more subtle and complex social cognition abilities assessed in study 3.

5.4.5 Parenting and social cognition.

Several parenting factors have been investigated in relation to anxiety in children; most commonly parental over-control and negativity (e.g. see review by Halldorsson & Creswell, 2017). Although findings are mixed, overall there is fairly consistent evidence for a significant association between social anxiety symptoms and parental over-control, but less consistent evidence for an association with parental negativity (e.g. Halldorsson & Creswell, 2017). Of note, significant associations between children's social anxiety have been identified with children's perceptions of their parents' overcontrol (Festa & Ginsburg, 2011; Gruner, Muris, & Merckelbach, 1999), however significant associations have not been found with observed parental overcontrol (e.g. Festa & Ginsburg, 2011; Greco & Morris, 2002; Rork & Morris, 2009). In the context of findings presented here, this could tentatively be explained by socially

anxious children's impaired ability to identify the intentions behind parent's behaviour. Although tentative, this may be an important consideration when including children as informants on parenting in future research.

5.5 Clinical Implications.

5.5.1 The use of generic versus disorder specific treatments for anxiety disorders in childhood.

Recovery rates for current generic treatments for child anxiety disorders are only 60% (James, James, Cowdrey, Soler, & Choke, 2015) suggesting that these treatments may not effectively alter critical maintenance factors in a significant subgroup of children. The results from study one suggest that the putative maintenance factors of child anxiety disorders that are targeted in general forms of CBT are present in 80% of a clinically anxious sample (who grouped in to the "typical anxiety group"). However, two subgroups of anxious children were identified for whom a more specific approach may be more effective. Children in the avoidant group were particularly characterised by increased expected avoidance of and decreased expected control over feared situations. As such, these children may benefit from a more behavioural approach focussing on in session exposure. Exposure is typically seen as the central ingredient for effective CBT for child anxiety disorders (e.g. Kendall et al., 1997), however therapists rarely conduct appropriate exposure within treatments (e.g. Whiteside, Deacon, Benito, & Stewart, 2017). It is possible that for other subgroups of children, discussing the principle of exposure and setting them up to conduct exposure between sessions may be sufficient, however for the most avoidant children in session exposure with therapist modelling and support may be particularly useful. In addition, children in the social difficulties

group may benefit from a different behavioural approach that focusses on effective communication in social interactions. For children with SAD more generally, however, a more specific focus on identifying the intentions of others in these interactions may be of most use.

Although there were significant associations between the subgroups identified in study one and some existing diagnostic categories, these ways of categorising children with anxiety disorders did not neatly align. As such, a transdiagnostic approach that targets specific mechanisms may be more beneficial than a diagnosis specific approach to treatment for those who do not fit with the general anxiety group. For example, approximately half of the children in the Avoidant group had a primary diagnosis of either SAD or GAD and, although specific treatments for SAD have emphasised social skills training, many children with SAD do not appear to have general social communication difficulties and a small proportion of children with social communication difficulties do not have SAD.

5.5.2 The use of social skills training to treat social anxiety disorder in childhood.

Meta-analyses of treatment trials for childhood social anxiety disorder have suggested that CBT with social skills training has better outcomes for socially anxious children than CBT with no social skills training (National Institute for Health and Care Excellence., 2013; Reynolds, Clark, Smith, & Langdon, 2013). However, when these interventions have been compared head to head no additional benefit of social skills training has been identified (Spence, Donovan, March, Kenardy, & Hearn, 2017). Of note, this comparison of CBT with and without social skills training included a wide age range (8-17 years old) and, as such, it is unclear whether this finding would hold with

pre-adolescents specifically. However, the findings of studies 1, 2 and 3 indicate that broad social skills training may not be necessary for the majority of children with SAD, with only approximately 15% of socially anxious children having broad social communication difficulties. These findings are important given the significant amount of therapy time and resource required for some of these treatments. For example, SET-C (Beidel, Turner, & Morris, 2000) involves approximately 3.5 hours of therapy time per week over a 12-week period (compared to 14-16 one hour per week over 12-16 weeks for CBT alone, e.g. Kendall et al., 1997; Piacentini, Bennett, & Compton, 2015), during which time psychoeducation, social skills training, in session exposures, and peer generalisation sessions (involving groups of other non-anxious peers and trips to, for example, bowling or other group activities) are conducted. Other specific treatments include the addition of concurrent parent training requiring parents to attend 30-minute group sessions whilst their child attended a 90-minute treatment session (Spence, Donovan, & Brechman-toussaint, 2000). Indeed, it is possible that where good outcomes have been achieved from CBT+ social skills training programmes this is a result of the substantial amount of therapy time and intensity, parent involvement and/or specificity of other treatment components to fear-relevant situations (Beidel et al., 2000; Spence et al., 2000).

Rather than a broad approach to social skills training, the results from studies two and three may suggest that a focus on specific aspects of complex ToM may be more relevant to specific treatments for SAD in children. As such, future specific treatments for SAD in childhood may benefit from the inclusion of adapted components from treatments used to target complex social cognitions in other disorders. For example, several treatments that specifically address ToM have been proposed for

improving social skills in children with ASD (Fisher & Happe, 2005; Oakes, 2001; Ozonoff & Miller, J., 1995; Swettenham, 1996). However, these have tended to focus on basic aspects of ToM, relating to first and second order false belief, so may not target the appropriate level of ToM difficulties for neurotypical populations in their current forms. Where other treatments (e.g. those targeting social cognition in schizophrenic populations and adapted for adults with ASD (e.g. social cognition training; Turner-brown, Perry, Dichter, Bodfish, & Penn, 2008) have targeted more complex aspects of social cognition, these have tended to focus on components that do not appear to be relevant to childhood social anxiety disorder (e.g. emotion training). Future research would usefully explore adaptations of current treatments that target ToM to train the specific aspects of ToM that were found to be impaired in children with SAD (i.e. understanding self-presentational displays and the accurate identification of other's intentions) in order to examine whether this leads to a reduction in social anxiety in typically developing children.

5.6 Strengths and Limitations

The research within this thesis has several strengths in overcoming some of the methodological limitations of previous studies and allowing firmer conclusions to be drawn about the nature of social skills difficulties among socially anxious children. Specifically, study one used robust clustering methods to take a transdiagnostic view of the putative maintenance mechanisms of childhood anxiety disorders. Furthermore, the meta-analysis has brought some clarity to the literature assessing the relationship between social anxiety and multiple aspects of social cognition. In addition, it has brought together two perspectives of the research into this relationship (i.e. from the

perspective of anxiety literature, and developmental disorders literature), which has not been considered in previous reviews. Furthermore, methodological limitations in the study of social skills difficulties in socially anxious children were overcome by assessing the social cognitions that underlie social interactions, therefore allowing for the independent assessment of the two constructs. In particular, the objective measure used to assess ToM abilities overcame limitations of using self- or parent-report measures of social skills (such as reporter bias and implications of genetic confounds). Finally, study three assessed the relationship between different aspects of ToM (i.e. affective and cognitive) within clinically anxious and non-anxious samples.

Despite these strengths, there are several limitations, many of which have been discussed within individual papers. However, the conclusions drawn from this thesis more generally must be done with the consideration of several broader limitations. Following the identification of a subgroup of socially anxious children with increased social communication difficulties, the results from study three may be accounted for by a similar subgroup. However, the relatively small sample of socially anxious children in study three did not provide enough power to investigate this. In addition, there are several putative maintenance mechanisms that were not assessed within study one, and other potentially relevant mechanisms (parenting styles and anxiety, or safety seeking behaviours) may have had an effect on the results. Importantly, although the studies in this thesis have addressed questions relating to the putative maintenance mechanism of childhood anxiety disorders, given the cross-sectional design of all of the studies presented here, and those included within the meta-analysis, it is not possible to examine the direction of the associations identified and, as such, it cannot be concluded that any variables examined here actually have a role in the development or

maintenance of SAD. However, they do identify key variables that warrant further examination in experimental and/or longitudinal studies (i.e. complex aspects of ToM, observable social skills).

A further limitation was that several aspects of social cognition were not included in the meta-analysis. For example, the operational definition was restricted to include the identification or understanding of social signals, but not their production. The production of social signals and non-verbal aspects of social cognition (e.g. mimicry) are arguably important aspects of one's ability to understand those same signals produced by others (e.g. Frith, 2008). However, the production of social signals, and the measurement of this production in particular, is subject to being affected by inhibition. As a result, it is difficult to differentiate between a deficit in social signal production as a result of social cognition deficit or inhibition. In addition, the operational definition did not allow for the inclusion of broader aspects of social cognition that have influence across domains and are not specific to social skills. For example, whilst cognitive processes such as attention, memory and visual perception all effect social cognition in general, they are also involved in broader cognitive processing that is not related to the social domain (e.g. learning). As such, deficits in these components of cognition could reflect a deficit in areas of functioning other than social cognition (e.g. learning difficulties, attention deficit hyperactivity disorder, or sight difficulties).

5.7 Future Directions

5.7.1 Future research to overcome the current limitations.

Future studies should seek to overcome some of the limitations that have been identified here where these might provide important additions to the literature. For

example, although inspection of the distribution of theory of mind scores did not appear to suggest it, it is possible that the finding that socially anxious children are impaired in their ability to accurately identify the intentions of others within complex interactions in study three may be accounted for by a subgroup of socially anxious children with the identified ToM difficulty. This may have important clinical implications with respect to particular groups that may be an important focus for specific treatments. Although the current research was not powered to perform the required analysis to assess the presence of subgroups of socially anxious children with ToM difficulties, this will be an important next step for future research. In addition, it may be interesting to explore how substituting a measure of parent-reported social communication difficulties with a more objective measure of ToM would affect the results of study one. This approach may help to confirm the diagnostic specificity of ToM difficulties by assessing them across anxiety disorders with a more sensitive approach, whilst also exploring their interaction with other putative maintenance mechanisms of anxiety disorders in children. Given the inconsistencies between study three and previous research with community populations of children (Banerjee & Henderson, 2001), a more direct replication of the Banerjee study is also warranted, but with the inclusion of clinic populations. In particular, it will be important to clarify whether further specific, aspects of ToM are associated with SAD specifically, or social anxiety symptoms more broadly, and whether different aspects of ToM have different associations with social anxiety disorder or symptoms.

A strength of the meta-analysis was its breadth in covering literature from multiple research areas (i.e. from the anxiety literature and ASD literature). In contrast, previous reviews have focussed on children with ASD, but have assessed anxiety symptoms and disorders more generally (e.g. White, Oswald, Ollendick, & Scahill, 2009).

However, given the high prevalence of SAD in children with ASD, it is important to fully understand this relationship. In particular, and as previously discussed, there may be several aspects of ASD, other than social cognition, that create a risk for social anxiety among children with ASD; greater understanding of this will bring the potential to develop more efficient and effective treatments.

Finally, as noted above, it is currently not possible to determine the direction of the relationships identified here, given that all of the approaches were cross-sectional. Future studies should employ longitudinal and experimental approaches to determine whether deficits in the identification of intentions play a role in the development or maintenance of SAD. This will allow firm conclusions to be drawn as to whether ToM difficulties may be an effective target for treatment or prevention of SAD.

5.7.2 New questions to answer in future research.

Several ways in which the findings from the studies presented here may interact with mechanisms identified as putative maintenance factors in childhood SAD have been discussed. However, many of these associations have not been specifically assessed in previous research. In order to establish a robust maintenance model for social anxiety disorder amongst children, it is important to establish (i) what factors are associated with social anxiety in children; (ii) how they are associated with social anxiety (i.e. do they create a risk for the development of, contribute to maintenance, are a result of, or co-exist with social anxiety?); and (iii) how they interact with each other in their association with social anxiety. Although a great deal of research is being carried out to assess points (i) and (ii), there is little research on how these factors interact and, specifically, where social skills and social cognition difficulties fit into models of the

development and maintenance of social anxiety disorder in children. In addition, given the absence of social skills difficulties in adult models of social anxiety, longitudinal research will be important to establish the developmental trajectory of social communication and cognition difficulties amongst socially anxious individuals.

A number of potential alternative treatment approaches for SAD that target specific aspects of social cognition have also been discussed here, however many have not been evaluated with clinically anxious children. Given the clear room for improvement from current approaches, future investigation of these alternative approaches may be beneficial. In particular, targeting subgroups of children who have particular difficulties, rather than particular diagnoses, may increase the efficiency and efficacy of treatments. However, robust assessment measures are required in order to identify children groups of children with distinct patterns of difficulties and this should be a focus of future research.

5.8 Conclusions.

There is a lack of understanding of the factors that maintain childhood anxiety disorders. As a result, the effectiveness of treatments is limited, particularly for those with SAD. The results from the papers in this thesis suggest that there may be distinct patterns of difficulties relating to the putative maintenance mechanisms of child anxiety disorders that may not be diagnosis specific. Previous studies have also been limited by methodological factors that are particularly problematic when measuring mechanisms that are hypothesised to specifically maintain SAD. However, the approach taken here has been able to overcome this; identifying specific associations between SAD and particular aspects of social cognition.

Taken together, the results of these papers contribute to the understanding of social anxiety in children by highlighting that general social skills difficulties may be present in only a small proportion of children with SAD, but that underlying difficulties in specific aspects of complex ToM (i.e. identifying the intentions of others in complex interactions) may be related to SAD more broadly. Several areas have been highlighted that warrant further research. In particular, the association of children's ability to accurately identify intentions with other putative maintenance mechanisms of SAD is an important direction for future research. Importantly, future research needs to establish the direction of the association between SAD and intention identification deficits in order to establish whether this deficit is a factor in the development and/or maintenance of SAD; and, subsequently, to draw firm conclusions about its potential place as a target for treatment. Going forward, it will be important that future research builds upon the current and previous results to take steps towards the development of a maintenance model for social anxiety in children. Nonetheless, the current results also have important implications for treatments as they stand. In particular, it appears to be unlikely that social skills training is responsible for the improved outcomes achieved by social anxiety-specific compared to generic treatments. Instead, more efficient treatments for SAD might result from a focus on training the use of ToM abilities in complex interactions, with more extensive social skills training reserved for the smaller subgroup of socially anxious children who display general social communication difficulties.

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Chapter 6, Appendices.

Appendix 1: Ethics Committee Approval Letters.

SL38 Progress report reminder
Version 4.0, April 2009

NHS
National Research Ethics Service
Berkshire Research Ethics Committee

Building L27
University of Reading
London Road
Reading
RG1 5AQ

Tel: [redacted]

26 November 2009

Professor Peter Cooper
Professor of Psychopathology
University of Reading
School of Psychology
University of Reading
Reading, Berkshire
RG6 6AL

Dear Professor Cooper

Full title of study: **Guided Self-help Treatment of Child Anxiety Disorder: A Randomised Controlled Trial**

REC reference number: **07/H0505/157**

The REC gave a favourable ethical opinion to this study on 16 November 2007.

It is a condition of approval by the Research Ethics Committee that the Chief Investigator should submit a progress report for the study 12 months after the date on which the favourable opinion was given, and then annually thereafter. To date, the Committee has not yet received the annual progress report for the study, which was due on 16 November 2009. It would be appreciated if you could complete and submit the report by no later than 26 December 2009.

Guidance on progress reports and a copy of the standard NRES progress report form is available at http://www.nres.npsa.nhs.uk/applications/after-ethical-review/progress-reports/

There is also guidance on declaring the end of the study at
http://www.nres.npsa.nhs.uk/applications/after-ethical-review/endofproject/
If the study has finished please just send a copy of the end of study: you do not need to send in a progress report aswell.

Failure to submit progress reports may lead to a suspension of the favourable ethical opinion for the study.

REC reference number: 07/H0505/157 **Please quote this number on all correspondence**

Yours sincerely

[redacted]

Ms Lavenda Lee
Assistant Co-ordinator
Email: scsha.berksrec@nhs.net

Copy to: Dr Mike Proven, University of Reading

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This Research Ethics Committee is an advisory committee to South Central Strategic Health Authority

The National Research Ethics Service (NRES) represents the NRES Directorate within the National Patient Safety Agency and Research Ethics Committees in England

NHS

National Research Ethics Service

Berkshire Research Ethics Committee

Building L27
University of Reading
London Road
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RG1 5AQ

Telephone:
Facsimile:

13 November 2007

Professor Peter Cooper
Professor of Psychopathology
University of Reading
School of Psychology
University of Reading
Reading, Berkshire
RG6 6AL

Dear Professor Cooper

Full title of study: **Treatment of Child Anxiety Disorder in the Context of Maternal Anxiety: A Randomised Controlled Trial**

REC reference number: **07/H0505/156**

Thank you for your letter of 05 November 2007, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

Ethical review of research sites

The favourable opinion applies to the research sites listed on the attached form.

Conditions of approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Application		14 August 2007
Investigator CV		08 August 2007
Protocol	1	01 August 2007
Covering Letter		08 August 2007
Summary/Synopsis	1	01 August 2007

Letter from Sponsor		14 August 2007
Interview Schedules/Topic Guides	1	01 August 2007
Questionnaire: Social Communication questionnaire for Children (SCQ): Parent report	1.2	29 August 2007
Questionnaire: Spence Children's Anxiety Scale (Parent Report)	1.2	29 August 2007
Questionnaire: Spence Children's Anxiety Scale	1.2	29 August 2007
Questionnaire: Teacher report: Child adjustment to school	1.2	29 August 2007
Questionnaire: Spence Children's Anxiety Scale (Teacher Report)	1.2	29 August 2007
Questionnaire: Mattick-Social Phobia Scale	1.2	29 August 2007
Questionnaire: Penn-State Worry	1.2	29 August 2007
Questionnaire: Depression, Anxiety, Stress Scales (DASS21T)	1.2	29 August 2007
Questionnaire: Child Anxiety Impact Scale (CAIS-C)	1.2	29 August 2007
Questionnaire: Child Anxiety Impact Scale (CAIS-P)	1.2	29 August 2007
Questionnaire: Mattick-Social Interaction Assessment Scale	1.2	01 January 1900
GP/Consultant Information Sheets	1.2	29 October 2007
Participant Information Sheet: Parent/Guardian	1.2	29 October 2007
Participant Information Sheet: Children	1.2	29 October 2007
Participant Consent Form	1.2	29 October 2007
Response to Request for Further Information		05 November 2007
Teacher report form (6-18)	1.2	29 August 2007
Assent form for children	1.2	29 October 2007
Cover letter to child's teacher	1.2	29 October 2007
Referee's reports		06 October 2006
Letter from funder		23 May 2007
Statement re: Insurance		14 August 2007

R&D approval

All researchers and research collaborators who will be participating in the research at NHS sites should apply for R&D approval from the relevant care organisation, if they have not yet done so. R&D approval is required, whether or not the study is exempt from SSA. You should advise researchers and local collaborators accordingly.

Guidance on applying for R&D approval is available from http://www.rdforum.nhs.uk/rdform.htm.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Now that you have completed the application process please visit the National Research Ethics Website > After Review

Here you will find links to the following

a) Providing feedback. You are invited to give your view of the service that you have received from the National Research Ethics Service on the application procedure. If

you wish to make your views known please use the feedback form available on the website.

b) Progress Reports. Please refer to the attached Standard conditions of approval by Research Ethics Committees.
c) Safety Reports. Please refer to the attached Standard conditions of approval by Research Ethics Committees.
d) Amendments. Please refer to the attached Standard conditions of approval by Research Ethics Committees.
e) End of Study/Project. Please refer to the attached Standard conditions of approval by Research Ethics Committees.

We would also like to inform you that we consult regularly with stakeholders to improve our service. If you would like to join our Reference Group please email referencegroup@nationalres.org.uk .

07/H0505/156	**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project

Yours sincerely

[redacted]

Professor Nigel Wellman
Chair

Email: scsha.berksrec@nhs.net

Enclosures: Standard approval conditions
Site approval form

Copy to: Dr Mike Proven, University of Reading

University of Reading

Director of Quality Support
David Stannard BA

Academic Services Directorate
Whiteknights, PO Box 217
Reading RG6 6AH
phone [redacted]
fax
email d.a.stannard@reading.ac.uk

Professor P.J.Cooper
School of Psychology and Clinical Language Sciences

24 January 2008

Dear Professor Cooper

Research Ethics Committee
Project 07/48: Treatment of Child Anxiety Disorder in the Context of Maternal Anxiety: A Randomised Controlled Trial

Project 07/49: Guided Self-help Treatment of Child Anxiety Disorder: A Randomised Controlled Trial

Project 07/50: Treatment of Child Anxiety: Predictors and Outcomes of Treatment

Thank you for your letter of 18 January 2008 regarding the above project, providing appropriately revised information. As indicated in my letter of 14 January 2008, the Chair is happy for the project to proceed.

Yours sincerely

[redacted]

D.A.Stannard
Director of Quality Support

cc Professor E.J.Cooke, School of Law
Dr J.A.Ellis, School of Psychology and Clinical Language Sciences
Ms V.Williams, School of Health and Social Care

NHS
Health Research Authority
South Central - Oxford B Research Ethics Committee
Whitefriars
Level 3, Block B
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BS1 2NT

Telephone: [redacted]

Please note: This is the favourable opinion of the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval

21 October 2016

Professor Cathy Creswell
Anxiety and Depression in Young People Research Unit (AnDY)
School of Psychology & Clinical Language Sciences
University of Reading
RG6 6AL

Dear Professor Creswell

Study title:	**Understanding what maintains social anxiety disorder in children**
REC reference:	**16/SC/0463**
Protocol number:	**1**
IRAS project ID:	**209508**

Thank you for your letter of 17 October 2016, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information was considered in correspondence by a Sub-Committee of the REC, A list of the Sub-Committee members is attached.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to make a request to postpone publication, please contact the REC Manager, Mr Stephan Ramey, nrescommittee.southcentral-oxfordb@nhs.net.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Conditions of the favourable opinion

The REC favourable opinion is subject to the following conditions being met prior to the start of the study.

You should notify the REC once all conditions have been met (except for site approvals from host organisations) and provide copies of any revised documentation with updated version numbers. Revised documents should be submitted to the REC electronically from IRAS. The REC will acknowledge receipt and provide a final list of the approved documentation for the study, which you can make available to host organisations to facilitate their permission for the study. Failure to provide the final versions to the REC may cause delay in obtaining permissions.

Management permission must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements. Each NHS organisation must confirm through the signing of agreements and/or other documents that it has given permission for the research to proceed (except where explicitly specified otherwise).

Guidance on applying for NHS permission for research is available in the Integrated Research Application System, www.hra.nhs.uk or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of management permissions from host organisations

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database within 6 weeks of recruitment of the first participant (for medical device studies, within the timeline determined by the current registration and publication trees).

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to contest the need for registration they should contact Catherine Blewett (catherineblewett@nhs.net), the HRA does not, however, expect exceptions to be made. Guidance on where to register is provided within IRAS.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Ethical review of research sites

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Copies of advertisement materials for research participants [School newsletter advert_Version 1_08.08.2016]	Version 1	08 August 2016
Copies of advertisement materials for research participants [Flyer for schools and clubs_Version 1_08.08.2016]	Version 1	08 August 2016
Copies of advertisement materials for research participants [School newsletter advert_Version 1_08.08.2016]	2	23 September 2016
Covering letter on headed paper [Cover Letter_Version 1_08.08.2016]	Version 1	08 August 2016
Covering letter on headed paper [Cover Letter]	Version 1	08 August 2016
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [Evidence of Sponsor Insurance]	Version 1	10 August 2016
Interview schedules or topic guides for participants [University of Reading Home Visit Procedure_Version 1_08.08.2016]	Version 1	08 August 2016
Interview schedules or topic guides for participants [Indicative Topic Guide - Qualitative Interview Schedule_Version 1_08.08.2016]	Version 1	08 August 2016
IRAS Application Form [IRAS_Form_11082016]		11 August 2016
IRAS Checklist XML [Checklist_11082016]		11 August 2016
IRAS Checklist XML [Checklist_17102016]		17 October 2016
Letter from funder [Letter from funder_Version 1_08.08.2016]	Version 1	24 June 2014

Letter from sponsor [Letter from Sponsor]	Version 1	10 August 2016
Letters of invitation to participant [Letter of Invitation to Schools_Version 1_08.08.2016]	Version 1	08 August 2016
Non-validated questionnaire [Research Screening Questionnaire]	Version 1	08 August 2016
Other [Cover Letter - Amendment]	Version 2	13 October 2016
Participant consent form [Child Assent form_Clinical_Version 1_08.08.2016]	Version 1	08 August 2016
Participant consent form [Child Assent Form_Community_Version 1_08.08.2016]	Version 1	08 August 2016
Participant consent form [Parent Consent Form_Clinical_Version 1_08.08.2016]	Version 1	08 August 2016
Participant consent form [Parent Consent Form_Community_Version 1_08.08.2016]	Version 1	08 August 2016
Participant consent form [Child Assent form_Clinical_Version 1_08.08.2016]	2	23 September 2016
Participant information sheet (PIS) [Child info sheet_Clinical_Version 1_08.08.2016]	2	23 September 2016
Participant information sheet (PIS) [Child info sheet 10-12 years - Clinical Phase 2 (Version 2_23.09.2016)]	2	23 September 2016
Participant information sheet (PIS) [Short child info sheet 7-9 years - Clinical Phase 1 (Version1_23.09.2016)]	1	23 September 2016
Participant information sheet (PIS) [Short child info sheet 7-9 years - Clinical Phase 2 (Version1_23.09.2016)]	1	23 September 2016
Participant information sheet (PIS) [Short child info sheet 7-9 years - Community (Version1_13.10.2016)]	1	13 October 2016
Participant information sheet (PIS) [Parent info sheet_Clinical_Version 1_08.08.2016]	2	23 September 2016
Participant information sheet (PIS) [Parent info sheet - Clinical Phase 2 (Version 2_23.09.2016)]	2	23 September 2016
Referee's report or other scientific critique report [Referees Report_Version 1_08.08.2016]	Version 1	24 January 2014
Research protocol or project proposal [Research Protocol with Appendices]	Version 1	08 August 2016
Research protocol or project proposal [Research Protocol with Appendices]	2	08 October 2016
Summary CV for Chief Investigator (CI) [CI_CV_Version 1_08.08.2016]	Version 1	08 August 2016
Summary CV for student [Student CV_Version 1_08.08.2016]	Version 1	08 August 2016
Summary CV for supervisor (student research) [Academic Supervisor CV_Version 1_08.08.2016]	Version 1	08 August 2016
Summary, synopsis or diagram (flowchart) of protocol in non technical language [Flowchart for study phases_Version 1_08.08.2016]	Version 1	08 August 2016
Validated questionnaire [Child self report questionnaires]	Version 1	08 August 2016
Validated questionnaire [Parent report questionnaires_Version 1_08.08.2016]	Version 1	08 August 2016
Validated questionnaire [Child self report questionnaires]	2	13 October 2016
Validated questionnaire [Parent report questionnaires_Version 1_08.08.2016]	2	13 October 2016

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document *"After ethical review – guidance for researchers"* gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The HRA website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website:
http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/

HRA Training

We are pleased to welcome researchers and R&D staff at our training days – see details at http://www.hra.nhs.uk/hra-training/

16/SC/0463	Please quote this number on all correspondence

With the Committee's best wishes for the success of this project.

Yours sincerely

[redacted]

PP
Chris Foy

A Research Ethics Committee established by the Health Research Authority

University of Reading

Coordinator for Quality Assurance in Research
Dr Mike Proven, BSc(Hons), PhD

Academic and Governance Services

Whiteknights House
Whiteknights, PO Box 217
Reading RG6 6AH

phone [redacted]
fax
email m.j.proven@reading.ac.uk

Professor Cathy Creswell
Professor of Developmental Clinical Psychology
School of Psychology and Clinical Language Sciences
University of Reading
RG6 6AL

6 December2016

Dear Cathy

UREC 16/52: Understanding What Maintains Social Anxiety Disorder in Children. *Favourable opinion*

Thank you for the response (email dated 24 October 2016 from Sam Pearcey, including attachments, refers) addressing the issues raised by the UREC Sub-committee at its October 2016 meeting. On the basis of these responses and the revised documentation (*including the additional amendment, adding a further child self-report questionnaire*), I can confirm that the Chair is pleased to confirm a favourable ethical opinion.

Please note that the Committee will monitor the progress of projects to which it has given favourable ethical opinion approximately one year after such agreement, and then on a regular basis until its completion.

Please also find attached Safety Note 59: Incident Reporting in Human Interventional Studies at the University of Reading, to be followed should there be an incident arising from the conduct of this research.

The University Board for Research and Innovation has also asked that recipients of favourable ethical opinions from UREC be reminded of the provisions of the University Code of Good Practice in Research. A copy is attached and further information may be obtained here:

http://www.reading.ac.uk/internal/res/QualityAssuranceInResearch/reas-RSqar.aspx .

Yours sincerely

[redacted]

Dr M J Proven
Coordinator for Quality Assurance in Research (UREC Secretary)
cc: Dr John Wright (Chair); Professor Laurie Butler (Head of School); Samantha Pearcey (PhD student)

Appendix 2: Information leaflets for parents and children.

Berkshire Research Ethics reference number: 07/H0505/156- 157-175
University of Reading Ethics reference number: 07/48-49-50
Version 1.5 (6.2.08)

Berkshire Healthcare NHS
NHS Foundation Trust

Study Centre Address:
School of Psychology, University of Reading , Whiteknights, PO Box 238 , Reading RG6 6AL

Clinical Research Team:

Clinical Director: Dr Lucy Willetts [redacted], l.e.willetts@reading.ac.uk
Trials Manager: Dr Rachel Gilau [redacted] r.gilau@reading.ac.uk
Study Assessors: Sarah Cook; s.e.cook@reading.ac.uk; Amy Corcoran; a.corcoran@reading.ac.uk; Jenny Crosby; j.crosby@reading.ac.uk; Ray Percy; r.s.percy@reading.ac.uk; Rebecca O'Grady; r.r.ogrady@reading.ac.uk
Trials Secretary: Brendan Lawrence; b.lawrence@reading.ac.uk
Research Director: Professor Peter Cooper (Tel: [redacted]; p.j.cooper@reading.ac.uk

INFORMATION SHEET FOR PARENT/GUARDIAN

Study of the Treatment of Anxiety in Children

You and your child are being invited to take part in a research study we are doing in Berkshire Healthcare NHS Foundation Trust and the University of Reading. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Do discuss this matter with others if you wish.

There is a standard talking treatment for anxious children (called 'cognitive behaviour therapy'). Studies have shown that this treatment is very helpful to lots of children. However this treatment is often not readily available within the health service as it is costly and involves highly trained staff. We have developed a brief form of this treatment that parents can use with their children, with the support of a psychologist. This 'guided self-help' approach to treatment has been found to be very helpful for a range of other types of difficulties that children experience.

Over a period of 30 months we are inviting all parents, who are not themselves anxious, who bring their children for help with anxiety and their children to participate in our study. It is entirely up to you and your child to decide whether to take part or not. If you do decide to participate, you will be given this Information Sheet (and your child will also be given one) and you will be asked to sign a consent form (a copy of which you will be given to keep). We will inform your GP that you are helping us, and we will keep in touch with your GP about your child's progress in the normal way. If you are happy, we would also like to contact your child's teacher to request information about how your child is getting on at school at the beginning and end of the study. A copy of the letter and questionnaires we would send to your child's teacher if you agree is attached. You will be free to withdraw from the study at any time without having to give any reason. If

you or your child decide not to participate, or you or your child decide to participate and then have a change of mind, this will not affect the standard of care your child will receive.

The study involves both assessment and treatment.

1 Assessment

The study involves our team making a detailed enquiry of how you are and how your child is (especially as regards problems with anxiety) before treatment begins, at the end of the course of treatment, and then six months after treatment ends. These enquiries will involve your completing some questionnaires and you and your child being asked a standard set of questions. The responses you and your child give will be treated as entirely confidential. In fact, they will be coded and entered into a computer file with anonymity completely preserved (there will be no names in the file).

2. Treatment

Two thirds of the families in the study will be offered treatment immediately. The other third will be placed on a waiting list for three months and then receive treatment if it is still needed (as studies have shown that some children recover without treatment). All children in the study will receive treatment within a shorter time period than is typically the case in local and national child and adolescent mental health services. To make sure that the groups receiving the treatment immediately or after a short wait are comparable to begin with, who goes in each group is decided randomly.

The treatment involves parent(s) meeting with a Psychologist face-to-face and having telephone appointments. Half of the parents will have 8 appointments, (four face-to-face and four telephone appointments). The other half will have four appointments (two face-to-face and two over the telephone). To make sure that the groups receiving four or eight appointments are comparable to begin with, who goes in each group is decided randomly. Parents will also be provided with a book entitled 'Overcoming your child's fears and worries'. The psychologist will help you to use the book to help your child to learn to manage his/her anxiety problems.

If the assessments show that your child has not experienced a clear reduction in anxiety following treatment, we will offer you and your child further treatment within our clinic; or if other problems emerge we will discuss this with your local child and adolescent mental health team.

In order for us to be sure that all the different forms of treatment are being delivered by the study therapists in the same way, we ask mothers and children if we can make tape recordings of the therapy sessions. Also, to understand exactly how your child reacts to stress, and your own response to this, on two occasions we will ask if we can make a

short video-tape and record your own and your child's heart rate whilst we do this. Specific permission will be sought to make these recordings. The audio and video tapes will be heard and seen only by members of the research team; and they will be destroyed at the end of the research study.

Medication

One of the requirements of this trial is that participants (parents and children) must either not be prescribed medication aimed at changing their mood or behaviour (e.g. anti-depressant medication or Ritalin) or this must have been prescribed at a stable dose for at least one month prior to joining the trial, with agreement to maintain that dose throughout the study. If medication does need to be changed whilst you are taking part, you would have to withdraw from the study (however we would not withdraw treatment). If you have any concerns regarding this requirement please do not hesitate to discuss this with us and/or your general practitioner.

To summarise, if you and your child decide to take part in this study, you will be helped to work with your child to manage his/her anxiety problems. This will either begin immediately or after a three-month wait. We will ask you and your child standard questions to find out how you both are before treatment begins and on two subsequent occasions. All information collected in this study is treated as confidential and nothing will be divulged to any other party (the exception being, if we learn that you or your child is at risk of harm). Our intention is to publish the results of this study in a medical journal. When we do this, no personal information will be given and the findings will be reported as anonymous summary statistics. If we quote anything that has been said by participants in the study, these will be anonymous and will not be traceable to a particular individual. If you would like a report of the findings of our study, we will be happy to provide it.

We anticipate that the children and parents who participate in this study will benefit considerably. However, there will be a review assessment of each mother and child at the final assessment, and if further treatment is judged to be necessary, we will ensure that this is provided.

This study was given a favourable ethical opinion for conduct by both the University of Reading Research Ethics Committee and the Berkshire Research Ethics Committee. Everyone working on this study has been through the formal Criminal Records Bureau Disclosure process and has been approved by the School of Psychology of the University of Reading to work with children.

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50
Version 1.5 (6.2.08)

If you have any questions or concerns about this study, now or at any time in the future, please do ask one of us.

Yours sincerely

Lucy Willetts Clinical Director	Dr Sue Cruddace Trial Manager	Professor Peter Cooper Research Director

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50.
Version 1.5 (12.8.08)

ISRCTN19762288

Berkshire Healthcare NHS
NHS Foundation Trust

Study Centre Address:
School of Psychology, University of Reading , Whiteknights, PO Box 238 , Reading RG6 6AL

Clinical Research Team:
Clinical Director: Dr Lucy Willetts (Tel: [redacted]; l.e.willetts@reading.ac.uk
Trials Manager: Dr Rachel Gitau (Tel: [redacted]; r.gitau@reading.ac.uk
Study Assessors: Sarah Cook; s.e.cook@reading.ac.uk, Amy Corcoran; a.corcoran@reading.ac.uk, Jenny Crosby; j.crosby@reading.ac.uk, Ray Percy; r.s.percy@reading.ac.uk, Sarah Shaw; sxs07ses@reading.ac.uk.
Trials Secretary: Jackie Barton; j.m.barton@reading.ac.uk
Research Director: Professor Peter Cooper (Tel: [redacted]; p.j.cooper@reading.ac.uk

INFORMATION SHEET FOR PARENT/GUARDIAN

Study of the Treatment of Anxiety in Children

You and your child are being invited to take part in a research study we are doing, funded jointly by the Medical Research Council and the Berkshire Healthcare NHS Foundation Trust. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Do discuss this matter with others if you wish.

There is a standard talking treatment for anxious children (called 'cognitive behaviour therapy'). Studies have shown that this treatment is very helpful to lots of children. However, some children do not benefit as much as we would like. One group who do not always do as well as we would wish is children whose mothers also have problems with anxiety. In our clinic we have been trying out various ways of helping these children. We now want to do a study to test whether the outcome for children who receive the standard treatment is actually improved by the additional help we offer.

Over a period of 30 months we are inviting all mothers who bring their children for help with anxiety, who themselves are also anxious, and their children, to participate in our study. You are being invited because you have told us that you have some problems with anxiety. It is entirely up to you and your child to decide whether to take part or not. If you do decide to participate, you will be given this Information Sheet (and your child will also be given one) and you will be asked to sign a consent form (a copy of which you will be given to keep). We will inform your GP that you are helping us, and we will keep in touch with your GP about your child's progress in the normal way. If you are happy, we would also like to contact your child's teacher to request information about how your child is getting on at school at the beginning and end of the study. A copy of the letter and questionnaires we would send to your child's teacher if you agree is attached. You will be free to withdraw from the study at any time without having to give

any reason. If you or your child decide not to participate, or you or your child decide to participate and then have a change of mind, this will not affect the standard of care your child will receive.

The study involves both assessment and treatment.

1 Assessment

The study involves our team making a detailed enquiry of how you are and how your child is (especially as regards problems with anxiety) before treatment begins, mid-way through the treatment, at the end of the course of treatment, and then six and twelve months later. These enquiries will involve your completing some questionnaires and you and your child being asked a standard set of questions. The responses you and your child give will be treated as entirely confidential. In fact, they will be coded and entered into a computer file with anonymity completely preserved (there will be no names in the file).

2. Treatment

As noted above, all the children who take part in the study receive the standard treatment we routinely offer all children in our clinic. This involves eight weekly 50 minute sessions in which the child is seen by a clinical psychologist. In our current study, as part of our effort to help children more, before we begin treatment with the children, mothers receive help with their own difficulties **over an eight week period**. Then, during the phase when the children receive the usual treatment, there are an extra four to eight therapy sessions involving guidance on issues of family health or on child **management**. To ensure that the groups receiving the different forms of additional help are comparable to begin with, which families receive which of these extra treatments is decided randomly.

In order for us to be sure that all the different forms of treatment are being delivered by the study therapists in the same way, we ask mothers and children if we can make tape recordings of the therapy sessions. Also, to understand exactly how your child reacts to stress, and your own response to this, on two occasions we will ask if we can make a short video-tape and record your own and your child's heart rate whilst we do this. Specific permission will be sought to make these recordings. The audio and video tapes will be heard and seen only by members of the research team; and they will be destroyed at the end of the research study.

Medication

One of the requirements of this trial is that participants (mothers and children) must either not be prescribed medication aimed at changing their mood or behaviour (e.g. anti-depressant medication or Ritalin) or this must have been prescribed at a stable

dose for at least one month prior to joining the trial, with agreement to maintain that dose throughout the study. If medication does need to be changed whilst you are taking part, you would have to withdraw from the study (however we would not withdraw treatment). If you have any concerns regarding this requirement please do not hesitate to discuss this with us and/or your general practitioner.

To summarise, if you and your child decide to take part in this study, you will be given help with your own difficulties, your child will then receive the usual treatment for his/her anxiety, and finally there will be extra sessions during which you and your child will be seen together. We will ask you and your child standard questions to find out how you both are before treatment begins and on four subsequent occasions. All information collected in this study is treated as confidential and nothing will be divulged to any other party (the exception being, if we learn that you or your child is at risk of harm). Our intention is to publish the results of this study in a medical journal. When we do this, no personal information will be given and the findings will be reported as anonymous summary statistics. If we quote anything that has been said by participants in the study, these will be anonymous and will not be traceable to a particular individual. If you would like a report of the findings of our study, we will be happy to provide it.

We anticipate that the children and mothers who participate in this study will benefit considerably. However, there will be a review assessment of each mother and child at the final assessment, and if further treatment is judged to be necessary, we will ensure that this is provided.

This study was given a favourable ethical opinion for conduct by both the University of Reading Research Ethics Committee and the Berkshire Research Ethics Committee. Everyone working on this study has been through the formal Criminal Records Bureau Disclosure process and has been approved by the School of Psychology of the University of Reading to work with children.

If you have any questions or concerns about this study, now or at any time in the future, please do ask one of us.

Yours sincerely,

Dr Lucy Willetts	Dr Rachel Gitau	Professor Peter Cooper
Clinical Director	Trials Manager	Research Director

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50
Version 1.3 (24.11.07)

Berkshire Healthcare NHS
NHS Foundation Trust

Study Centre Address:
School of Psychology, University of Reading , Whiteknights, PO Box 238 , Reading RG6 6AL

Clinical Research Team:

Clinical Director: Dr Lucy Willetts (Tel: [redacted]); l.e.willetts@reading.ac.uk
Trials Manager: Dr Rachel Gitau (Tel: [redacted]; r.gitau@reading.ac.uk
Study Assessors: Sarah Cook; s.e.cook@reading.ac.uk. Amy Corcoran; a.corcoran@reading.ac.uk. Jenny Crosby; j.crosby@reading.ac.uk. Ray Percy; r.s.percy@reading.ac.uk. Rebecca O'Grady; r.r.ogrady@reading.ac.uk .
Trials Secretary: Brendan Lawrence; b.lawrence@reading.ac.uk
Research Director: Professor Peter Cooper (Tel: [redacted]); p.j.cooper@reading.ac.uk

INFORMATION SHEET FOR CHILDREN

Overcoming your Child's Fears and Worries

You have come to our clinic for help with some problems you have been having. At this clinic we help children with these problems and we are going to do everything we can to help you.

As well as giving you some help, we are inviting you and your mum or dad to take part in a study we are doing. This study is to help us find better ways of helping children. In the study we will do two things. First, we will be working with your mum or dad to help them to help you with your anxiety problems. We will either do this now or there will be a short wait before this starts.

Second, we will ask the children and their mums or dads lots of questions about how they are feeling. We ask these questions before treatment begins, and then again every few months. We also would like to tape record the treatment sessions (so that we can check that all the children are receiving the same sort of help) and make some video-tapes of you and your mum or dad doing some different activities together. If you don't mind we will also use a small machine which can tell us how much your heart is beating when you do these tasks.

We would like you to help us by taking part in our study. You do not have to do this. If you and your mum or dad don't want to take part, you will still receive the usual help that we give children. Also, if you do take part and then change your mind, this won't matter at all. You won't have to give us a reason, and we will still help you with your problems.

Everything you tell us in the clinic and anything you tell us as part of our study is treated as a secret; nobody other than us will ever know what you have told us. If we use anything you have said when we are telling people about our study, we will make sure nobody can tell who has said it. (The only time we would not be able to keep a secret is if you told us that you or someone else was at risk of real danger. In this situation we would have to speak to another adult - like your mum or your family doctor).

Berkshire Child Anxiety Clinic
University of Reading

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50
Version 1.3 (24.11.07)

Before any research is allowed to happen, it has to be checked by a group of people called an Ethics Committee. They make sure that the research is OK to do. This study has been checked by the Reading University Committee and the Berkshire NHS Committee, and they were happy for it to go ahead.

If you have any questions about our study, either now or later, please do ask us. You have a right to know everything and we will be happy to tell you everything.

Yours sincerely,

Dr Lucy Willetts Clinical Director	Dr Sue Cruddace Trial Manager	Professor Peter Cooper Research Director

Berkshire Child Anxiety Clinic
University of Reading

Study Centre Address:
School of Psychology, University of Reading , Whiteknights, PO Box 238, Reading RG6 6AL
Clinical Research Team:
Clinical Director: Dr Lucy Willetts (Tel: [redacted]; lucy.willetts@berkshire.nhs.uk
Clinical Research Fellow: Dr Cathy Creswell; Email: c.creswell@rdg.ac.uk
Trials Manager: Dr Rachel Gitau (Tel: [redacted]; r.gitau@rdg.ac.uk
Clinical/counselling Psychologists: (Tel: [redacted]); Dr Monika Parkinson; m.b.parkinson@reading.ac.uk. Dr Katie Adolphus; k.adolphus@reading.ac.uk. Mrs Sally Greenfield; s.a.m.greenfield@rdg.ac.uk .
Study Assessors: Sarah Cook; s.e.cook@rdg.ac.uk. Amy Corcoran; a.corcoran@rdg.ac.uk. Jenny Crosby; j.crosby@rdg.ac.uk. Ray Percy; r.s.percy@rdg.ac.uk. Sarah Shaw; sxs07ses@reading.ac.uk.
Trials Secretary: Jackie Barton; j.m.barton@rdg.ac.uk
Research Director: Professor Peter Cooper (Tel: [redacted]); p.j.cooper@rdg.ac.uk

INFORMATION SHEET FOR CHILDREN

You have come to our clinic for help with some problems you have been having. At this clinic we help children with these problems and we are going to do everything we can to help you.

As well as giving you some help, we are inviting you and your mum to take part in a study we are doing. This study is to help us find better ways of helping children.

The study involves two things. First, it involves us giving a bit more help than we usually do. For example, as well as seeing children on their own, we will also sometimes be seeing children with their mums.

Second, it involves us asking the children and their mums lots of questions about how they are feeling. We ask these questions before treatment begins, and then again every few months. We also would like to tape record the treatment sessions (so that we can check that all the children are getting the same sort of help) and make some video-tapes of you and your mum doing some different activities together. If you don't mind we will also use a small machine which can tell us how much your heart is beating when you do these tasks.

We would like you to help us by taking part in our study. You do not have to do this. If you and your mum don't want to take part, you will still receive the usual help that we give children. Also, if you do take part and then change your mind, this won't matter at all: you won't have to give us a reason, and we will still help you with your problems.

Everything you tell us in the clinic and anything you tell us as part of our study is treated as a secret; nobody other than us will ever know what you have told us. If we use anything you have said when we are telling people about our study, we will make sure nobody can tell who has said it.

(The only time we would not be able to keep a secret is if you told us that you or someone else was at risk of real danger. In this situation we would have to speak to another adult - like your mum or your family doctor).

Before any research is allowed to happen, it has to be checked by a group of people called an Ethics Committee. They make sure that the research is OK to do. This study has been checked by the Reading University Committee and the Berkshire NHS Committee. They were both happy for it to go ahead.

If you have any questions about our study, either now or later, please do ask us.

You have a right to know everything and we will be happy to tell you everything.

Yours sincerely,

Dr Lucy Willetts	Dr Rachel Gitau	Professor Peter Cooper
Clinical Director	Trials Manager	Research Director

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University of Reading

This project is funded by aNational Institute for Health Research Professorship (project number RP-2014-04-018)

University of Reading

AnDY Research Clinic

UNDERSTANDING WHAT KEEPS SOCIAL ANXIETY GOING IN CHILDREN

PARTICIPANT INFORMATION (7-9 YEARS).

Anxiety group. Phase 1.
Version 2, 24.05.2018.

WHAT IS THIS ABOUT?

Sometimes children can get scared around other people, but it usually goes away.

We want to know what makes children keep being scared about being around other people.

Would you like to help?

This leaflet will help you choose if you want to help or not.

WHAT WILL HAPPEN ON YOUR VISIT

This study will take up to 4 hours. You will:

- Fill in questionnaires
- Do some activities on the computer:
  - Pick some short videos to watch by unlocking them.
  - Look at some pictures and tell us what you think of them.
  - Watch some short cartoons about shapes.

Each computer activity will take 20 to 30 minutes. There will be lots of breaks in between and we will have drinks and snacks for you too.

We will give you a £20 Amazon voucher to say thank you for your time.

If you want to take part:

- Fill out the form to show you are happy to take part.
- Your **parents will also need to agree that you can take part**. They have a form that they will need to fill in too.

If you don't want to take part:

- You don't have to do anything more!

The person that brings you can stay with you, or wait outside. You can pick!

QUESTIONS?

If you have any questions or worries about anything to do with this research study, **please speak to the team member who is going through this leaflet with you.**

Or you can email or telephone one of the researchers:

Brynjar Halldorsson.
Email: b.halldorsson@reading.ac.uk
Tel: [redacted]

Sam Pearcey.
Email: Samantha.pearcey@pgr.reading.ac.uk
Tel: [redacted]

Cathy Creswell.
Email: c.creswell@reading.ac.uk
Tel: [redacted]

Your parents will also be getting some information about this research, so you can talk to them too.

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University of Reading

AnDY Research Clinic

UNDERSTANDING WHAT KEEPS SOCIAL ANXIETY GOING IN CHILDREN

PARTICIPANT INFORMATION (7 - 9 YEARS).

Community group. Phase 1.
Version 4, 24.05.2018

WHAT IS THIS ABOUT?

Sometimes children can get scared around other people, but it usually goes away.

For some children it doesn't go away. We want to know what makes children keep being scared about being around other people.

To help us understand this, we need some children help in our research.

Would you like to help?

This leaflet will help you choose if you want to help or not.

WHAT WILL HAPPEN ON YOUR VISIT:

This study will take up to 3-4 hours. You will:

- Fill in questionnaires
- Do some activities on the computer
- You might also be asked to:
  - Watch a film of some children your age
  - Have a chat with a researcher while playing some games.

There will be lots of breaks in between and we will have drinks and snacks for you too.

We will give you a £20 Amazon voucher to say thank you for your time.

The person that brings you can stay with you, or wait outside. You can pick!

If you want to take part:

- You can talk to your parents to let them know you would like to take part.
- Your **parents will also need to agree that you can take part**. They have some information about this project too and about what to do next.

If you don't want to take part:

- You don't have to do anything more!

QUESTIONS?

If you have any questions or worries about anything to do with this research study, **please speak to the team member who is going through this leaflet with you.**

Or you can email or telephone one of the researchers:

Sam Pearcey.
Email: Samantha.pearcey@pgr.reading.ac.uk
Tel: [redacted]

Cathy Creswell.
Email: c.creswell@reading.ac.uk
Tel: [redacted]

Your parents will also be getting some information about this research, so you can talk to them too.

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University of Reading

AnDY Research Clinic

UNDERSTANDING WHAT KEEPS SOCIAL ANXIETY GOING IN CHILDREN

PARTICIPANT INFORMATION (10-12 YEARS)

Anxiety group, Phase 1.
Version 3, 24.05.2018.

WHAT IS THIS ABOUT?

Sometimes children can get scared around other people, but it usually goes away.

We want to know what makes children keep being scared about being around other people.

Would you like to help?

This leaflet will help you choose if you want to help or not. We will tell you about what things you would have to do.

One of our team will read this with you.

What is in this leaflet:

WHAT HAPPENS NOW?

If you want to take part:

- Fill out the form to show you are happy to take part.
- Your **parents will also need to agree that you can take part**. They have a form that they will need to fill in too.

If you don't want to take part:

- You don't have to do anything more!
- You will **still get help from the NHS** if you need it.

Thank you for reading about this study.

QUESTIONS?

If you have any questions or worries about anything to do with this research study, **please speak to the team member who is going through this leaflet with you.**
Or you can email or telephone one of the researchers:

Brynjar Halldorsson.
Email: b.halldorsson@reading.ac.uk
Tel: [redacted]

Sam Pearcey.
Email: Samantha.pearcey@pgr.reading.ac.uk
Tel: [redacted]

Cathy Creswell.
Email: c.creswell@reading.ac.uk
Tel: [redacted]

Your parents will also be getting some information about this research, so you can talk to them too.

THE BAD THINGS ABOUT TAKING PART

- Sometimes, we might ask you about things that are hard for you to talk about.

But…

- You can always choose not to talk about those things.
- You have control over what you talk about.

- This study will take up to 4 hours of your time
  - We have tried to make sure we are not taking up more of your time than we need to.

We have been talking to other children to make sure these risks are as small as possible.

If you have any worries about any part of the study, you should ask to speak to Professor Cathy Creswell, the principal investigator of the project. If you are still unhappy and want to complain formally, you can contact our Head of School, Professor Laurie Butler, who will arrange a meeting with you to discuss any concerns you may have.

A LITTLE LOOK

- Some children can feel scared when they are with other people.
- We are trying to find out what things make these children keep feeling scared.
- We are asking if you would like to help because:
  - You are between 7 and 12 years old.
  - You or your parent thinks you might need help to stop you feeling scared about things.
- We will ask you to do some different things:
  - Some activities on the computer.
  - Fill in questionnaires
- These will all happen at the University of Reading.

SOME IMPORTANT THINGS TO KNOW

You **do not have to do it!**

- You do not have to carry on if you change your mind at any time.
- **If you start the study and then decide you want to stop – you will still get the same help from your usual doctors**
- Some of the things you do will be recorded so that we can remember what you said.
- Everything you tell us will be kept **safe**.
  - Page 4 will tell you how we keep the things you tell us safe.

THE GOOD THINGS ABOUT TAKING PART

- After the study, we might be able to give you some help with your fears and worries.
- Some of the things you tell us could help us know how to help you.
- You will be helping us to understand more about what keeps children feeling scared around other people.
  - This will help us find better ways to help other children like you.
- We will give you a £20 Amazon voucher to say thank you for your time.

WHAT WILL HAPPEN ON YOUR VISIT

When you visit us, we will ask you to fill in some questionnaires about things like:

- How you feel about certain things.
- How you feel around other people.
- What you think others think of you.

This will take about 45 minutes.

The person that brings you can stay with you, or wait outside. You can pick!

You will do some activities on the computer like:

- Picking some short videos to watch by unlocking them.
- Looking at some pictures and telling us what you think of them.
- Watching some short cartoons about shapes.

Each activity will take 20 to 30 minutes. There will be lots of breaks in between and we will have drinks and snacks for you too.

HOW WE WILL KEEP EVERYTHING YOU SAY TO US SAFE?

- Your name won't be kept with any of the things you tell us.
  - We will store all information with a number so that we don't know who's told it to us.
- We keep everything on the computer.
  - Two passwords are needed to get to it.
  - Nothing will be taken out of the offices where we work.
  - We won't put it on our own computers.
  - Only the people in our team will be able to see any of the things you have told us.
- We have to keep what you tell us for 5 years after we have finished the study. Then we will delete it.

A CLOSER LOOK AT THE STUDY

You can feel scared about lots of things.

Some children feel scared about other people.

Sometimes this is normal. But sometimes you might need some help to stop feeling scared.

We think we can help more of these children if we know what makes them carry on being scared.

WHAT WE WILL BE ASKING YOU TO DO

First of all, we will have a chat with you and your parent to see if you can take part or not.

If you can we will then invite you to help in our study.

We will ask you some questions about things like:

- How you feel about certain things.
- How you feel around other people.
- What you think others think of you.

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AnDY Research Clinic

UNDERSTANDING WHAT KEEPS SOCIAL ANXIETY GOING IN CHILDREN

PARTICIPANT INFORMATION.

FOR CHILDREN WITH NO WORRIES ABOUT ANXIETY.

Community group.
Version 4, 24.05.2018.

WHAT IS THIS ABOUT?

Sometimes children can get scared around other people, but it usually goes away.

For some children it doesn't go away. We want to know what things keep those children feeling scared.

To help us understand this, we need some children to help in our research.

Would you like to help?

This leaflet will help you choose if you want to help or not. We will tell you about what things you would have to do.

One of our team will read this with you.

QUESTIONS?

If you have any questions or worries about anything to do with this research study, please speak to the team member who is going through this leaflet with you.

Or you can email or telephone one of the researchers:

Sam Pearcey.
Email: Samantha.pearcey@pgr.reading.ac.uk
Tel: [redacted]

Cathy Creswell.
Email: c.creswell@reading.ac.uk
Tel: [redacted]

Your parents will also be getting some information about this research, so you can talk to them too.

If you have any worries about any part of the study, you should ask to speak to Professor Cathy Creswell, the principal investigator of the project. If you are still unhappy and want to complain formally, you can contact our Head of School, Professor Laurie Butler, who will arrange a meeting with you to discuss any concerns you may have.

WHAT HAPPENS NOW?

If you want to take part:

- You can talk to your parents to let them know you would like to take part.
- Your **parents will also need to agree that you can take part**. They have some information about this project too and about what to do next.

If you don't want to take part:

- You don't have to do anything more!

Thank you for reading about this study.

What is in this leaflet:

A LITTLE LOOK

- Some children can feel scared when they are with other people.
- We want to know what things happen to keep these children feeling scared.
- We are asking if you would like to help because:
  - You are between 7 and 12 years old.
  - You or your parent thought you might want to help.
  - You might be someone who feels scared a lot, or you might be someone who has no problems with fears or worries.
- You will be asked to do these things:
  - Fill in questionnaires
  - Do some different activities on the computer.
- You might also be asked to do these things:
  - Watch a film of some children your age
  - Have a chat with a researcher while playing some games
  - You will need to come to the University of Reading to do these things.

THE GOOD AND BAD THINGS ABOUT TAKING PART

THE GOOD THING

- You will be helping us to understand more about what keeps children feeling scared around other people.
  - This will help us find better ways to help other children.
- We will give you a £20 Amazon voucher to say thank you for your time.

THE BAD THINGS.

- Sometimes, we might ask you some questions that are hard to answer. But…
  - There are no right or wrong answers – it's just what you think.
  - You don't have to answer anything you don't want to.
- This study will take up about 3 hours of your time.
  - We have tried to make sure we are not taking up more of your time than we need to.

We have been talking to other children to make sure these risks are as small as possible.

WHAT WE WILL BE ASKING YOU TO DO

First of all, your parent will answer some questions to see if you can take part or not.

If you can, we will invite you to help in our study.

When you visit us, we will ask you some questions about things like:

- How you feel about certain things.
- How you feel around other people.
- What you think others think of you.

This will take about 30-60 minutes.

The person that brings you can stay with you, or wait outside. You can pick!

You will do 4 activities on the computer like:

- Pick some short videos to watch by unlocking them.
- Look at some pictures and tell us what you think of them.
- Watch some short cartoons about shapes.

These activities will take about an hour in total. There will be lots of breaks in between and we will have drinks and snacks for you too.

You might also be asked to watch a film of children your age and have a chat with a researcher while playing some games. This would take another 30 minutes.

SOME IMPORTANT THINGS TO KNOW

! You **do not have to do it!** !

- You do not have to carry on helping if you change your mind at any time.
- Some of the things you do will be recorded so that we can remember what you said.
- Everything you tell us will be kept **safe**.
  - Page 4 will tell you how we keep the things you tell us safe.

HOW WE WILL KEEP EVERYTHING YOU SAY TO US SAFE?

- Your name won't be kept with any of the things you tell us.
  - We will store all information with a number so that we don't know who has told it to us.

- We keep everything on the computer.
  - Two passwords are needed to get to it.
  - Nothing will be taken out of the offices where we work.
  - We won't put it on our own computers.
  - Only the people in our team will be able to see any of the things you have told us.
- We have to keep what you tell us for 5 years after we have finished the study. Then we will delete it.

A CLOSER LOOK AT THE STUDY

Children can feel scared about lots of things.

Some children feel scared about other people.

Sometimes this is normal. But some children need help to stop feeling scared.

We think we can help more of these children if we know what makes them carry on being scared.

To understand this, we need to see how children who **do** and children who **do not** have these worries are different from each other.

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11.

University of Reading

AnDY Research Clinic

UNDERSTANDING WHAT KEEPS SOCIAL ANXIETY GOING IN CHILDREN

PARENT/GUARDIAN INFORMATION.

Anxiety group, Phase 1,
Version 3, 24.05.2018

WHAT THIS IS ALL ABOUT

There are times when all children can feel anxious in social situations. For most children this is often temporary, but for some it can keep going.
We are carrying out some research to find out what keeps social anxiety going in children.

We would like to invite you and your child to take part.

In this leaflet, there is some information that we hope will help you to decide whether you and your child would like to take part.

One of our team will go through this information with you.

What you can find in this leaflet:

WHAT HAPPENS NOW?

If you are happy for your son/daughter to take part:

- Fill out the form to show you are happy to take part
- We will also ask your **child to agree to take part** and fill out a form for themselves.

If you don't want to take part:

- You don't have to do anything more.
- Nothing will change in terms of the treatment available to you through the NHS

Thank you for considering this study.

If you have any other questions or concerns...

If you have any questions or concerns about any aspect of this treatment of research, please ask the clinician who is with you, or contact the research team.

Brynjar Halldorsson.
Email: b.halldorsson@reading.ac.uk
Tel: [redacted]

Sam Pearcey
Email: Samantha.pearcey@pgr.reading.ac.uk
Tel: [redacted]

Cathy Creswell.
Email: c.creswell@reading.ac.uk
Tel: [redacted]

HOW WE WILL KEEP YOUR INFORMATION SAFE

The information you give us for research purposes will not be identifiable by name. Each participant in the study is allocated an anonymous participant number.

We will store the information you give (including video or audio recordings) on a secure University system.

None of this information will be taken out of the offices where we do the research and it will not be stored on personal computers.

Both the files and the drive on which we store these files are password controlled and only members of the research team have access to these passwords.

We have to keep this information for 5 years after the end of the research for legal purposes, but then it will be destroyed.

A BRIEF OVERVIEW

- We are inviting children and their parents to take part in this study so that we can see what keeps social anxiety going in children.
- You are receiving this leaflet because your child:
  - Is between the age of 7 and 12 years old.
  - Has been referred for help with problems relating to anxiety.
- There will be a number of things that we will ask you and your child to do.
  - You and your child will be asked to fill in questionnaires
  - Your chill will complete some computer based activities.
- You will need to come into the University of Reading to meet with the researchers for up to 4 hours.

THE ADVANTAGES OF TAKING PART

- By taking part, you and your child will be helping us to understand what factors may influence the course of social anxiety disorder in children.
- By taking part, you and your child will be helping us to find the best ways of treating social anxiety disorder to help others like them.
- By helping us with our research we might be able to support you and your child with their social anxiety whilst they wait to be seen for treatment within the NHS.
- Taking part in this research may directly inform the treatment we could give your child to help them overcome their social anxiety.
- Your child will receive a £20 amazon voucher as reimbursement for their time.

WHAT WILL HAPPEN AT THE VISIT?

- We will ask your child to carry out four tasks. These are all computer based tasks and will require your child to do things such as:
  - Look at some simple "movies" and animations, and tell us what is happening in some of them,
  - Look at some different pictures and tell us what they think of them.
- During one of these tasks, we will be measuring your child's eye movements with a camera on our computer. This is so that we can check where they are looking.
- This will take place in one session that will last approximately 3-4 hours (including the questionnaires).
- Regular breaks will be available and refreshments will be provided.
- You and your child may choose for you to remain in the room whilst they do the tasks, or go to the waiting room just outside.

WHAT WE WILL BE ASKING YOU AND YOUR CHILD TO DO

- You and your child will be interviewed about your child's difficulties. This will indicate whether your child might have an anxiety disorder and will suggest which problem is affecting them the most.
- **If your child is eligible**, they will be invited to take part the study.
- This will involve one visit to the University of Reading for up to 4 hours.
- Unfortunately, your child will not be able to take part if they have a developmental or learning difficulty. They also won't be able to take part if their main diagnosis is not an anxiety disorder.
- During the research visit, we will be asking you and your child to fill out questionnaires that ask about their anxiety/mood, social behaviours and thoughts. These will take up to 45 minutes.

THE DISADVANTAGES OF TAKING PART

- Some of the questions will involve discussing thoughts and feelings that may be upsetting.
  - However, the questions are similar to the ones that are used in usual clinical practice and we have been working with other families to make sure that all of the questions we ask are **as acceptable as possible.**
- Taking part in this study will take up to 4 hours of your time.
  - We have done our best to make sure this is no longer than is absolutely necessary for the purposes of the study.

We don't foresee any harm coming to you or your child as a result of taking part in this study. All investigators on this project have had criminal records checks and have been approved by the School of Psychology and Clinical Language Sciences to work with children.

The study has been reviewed and given favourable opinion for conduct by the Oxford B NHS and University of Reading Research Ethics Committee.

If you have any concerns about any aspect of the study, you should ask to speak to Professor Cathy Creswell, the principal investigator of the project.
If you remain unhappy and wish to complain formally, you can contact our Head of School, Professor Laurie Butler, who will arrange a meeting with you to discuss any concerns you may have.

SOME IMPORTANT POINTS

- You **do not have to take part** and deciding not to take part **will not affect the treatment your child gets through the NHS** in any way!
  - You and your child have **the right to withdraw** from the study at any time, even during the sessions. You can also **choose to withdraw some or all of your information** from the study, but if you wish to do this you must tell us by 31/12/17.
  - Withdrawing from the study will not affect your child's access to or ongoing treatment within the NHS in any way.
- This research is being conducted outside the NHS.
  - During and after the study, your care within the NHS will not be affected whether you take part in this research or not.
  - We may be able to offer you further treatment in addition to what can be offered by NHS services.
- We would like to video/audio record some of the sessions.
  - This is just to aid the collection of research data.
- All information and research data will be kept **secure and confidential**.
  - Please see page 9 for more details about how we keep your information safe.

THE PROJECT IN A LITTLE MORE DETAIL

WHY WE ARE DOING THIS.

- Social anxiety disorder (SAD) is one of the most common mental health concerns in children and often continues into adulthood.
- Although psychological treatments for children with SAD work well in improving symptoms and quality of life for children and their families, for many children these treatments do not work as well.
- This may be because, we don't know a lot about what factors maintain social anxiety in children (i.e. keep the problem going).
- The aim of this study is to get a better idea of what these factors are.
- We hope that this will help us improve future treatments to give socially anxious children the best possible chance of recovery.

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University of Reading

AnDY Research Clinic

UNDERSTANDING WHAT KEEPS SOCIAL ANXIETY GOING IN CHILDREN

PARENT/GUARDIAN INFORMATION.

Community group, Version 4, 24.05.18

1.

If you have any other questions or concerns...

If you have any questions or concerns about any aspect of this treatment of research, please ask the clinician who is with you, or contact the research team.

Researcher.

Sam Pearcey
Email: Samantha.pearcey@pgr.reading.ac.uk
Telephone: [redacted]

Principal Investigator.

Cathy Creswell.
Email: c.creswell@reading.ac.uk
Telephone: [redacted]

10.

WHAT HAPPENS NOW?

If you are happy for your son/daughter to take part:

- Please contact a member of the research team using the contact details on the next page.
- They will ask you some questions and let you know what will be happening next.

If you don't want to take part:

- You don't have to do anything more.

Thank you for considering this study.

WHAT THIS IS ALL ABOUT

There are times when all children can feel anxious in social situations. For most children this is often temporary, but for some it can keep going.
We are carrying out some research to find out what keeps social anxiety going in those children.

We would like to invite you and your child to take part.

In this leaflet, there is some information that we hope will help you to decide whether you and your child would like to take part.

One of our team will go through this information with you.

What you can find in this leaflet:

A BRIEF OVERVIEW

- We are inviting some children who have problems with anxiety and some children who don't to take part in this study.
  - This is so that we can compare children with and without anxiety to get a better idea about what keeps social anxiety going in some of them.
- You are receiving this leaflet because your child:
  - Is between the age of 7 and 12 years old.
- There will be a number of things that we will ask you and your child to do.
  - You will both fill out some questionnaires.
  - Your child will complete some activities on the computer.
  - We might also ask you child to watch a film of some children their age and have a chat with a researcher while playing some games
- You will need to come into the University of Reading to complete the research session, which will take about 3-4 hours.
  - This can be split over 2 sessions depending on your preference.

3.

HOW WE WILL KEEP YOUR INFORMATION SAFE

The information you give us for research purposes will not be identifiable by name. Each participant in the study is allocated an anonymous participant number.

We will store the information you give (including video or audio recordings) on a secure University system.

None of this information will be taken out of the offices where we do the research and it will not be stored on personal computers.

Both the files and the drive on which we store these files are password controlled and only members of the research team have access to these passwords.

We have to keep this information for 5 years after the end of the research for legal purposes, but then it will be destroyed.

8.

WHAT WE WILL BE ASKING YOU AND YOUR CHILD TO DO.

- You will need to fill in a questionnaire about your child's mood and feelings.
    - If this suggests that your child is struggling with anxiety we will invite you to complete a clinical assessment. This will take up to 2 hours and show whether your child is eligible to take part.
    - If your child is not struggling with anxiety, they will be invited to take part in the research
- Unfortunately, your child will not be eligible to take part if they have a developmental or learning difficulty.

During the research visit

- We will ask you and your child to fill out few more **questionnaires** that ask about their anxiety/mood, social behaviours and thoughts.
- We will ask your child to carry out **five tasks** on the computer.
- We might also ask you child to watch a film of some children their age and have a chat with a researcher while playing some games
- This may take approximately 3-4 hours (including the questionnaires), but you are welcome to split the session into more than one visit.
- Regular breaks will be available and refreshments will be provided.
- You and your child may choose for you to remain in the room whilst they do the tasks, or go to the waiting room just outside.

THE ADVANTAGES AND DISADVANTAGES OF TAKING PART

ADVANTAGES

- By taking part, you and your child will be helping us to understand what factors may influence the course of social anxiety disorder in children.
- By taking part, you and your child will be helping us to find the best ways of treating social anxiety disorder in childhood.
    - This will be a great help to other children who have difficulties with social anxiety in the future.
- If we find that your child is struggling with anxiety and that this is significantly impacting their life, we may be able to offer some help.
- We provide a £20 amazon voucher to your child as reimbursement for their time.

DISADVANTAGES

- Some of the questions will involve discussing thoughts and feelings that may be upsetting.
    - However, the questions are commonly asked to children the same age as your child and we have been working with other families to make sure that all of the questions we ask are **as acceptable as possible.**
- Taking part in this study will take up to 3-4 hours of your time.
    - We have done our best to make sure this is no longer than is absolutely necessary for the purposes of the study.

We don't foresee any harm coming to you or your child as a result of taking part in this study. All investigators on this project have had criminal records checks and have been approved by the School to work with children.
The study has been reviewed and given favourable opinion for conduct by the Oxford B NRES and University of Reading Research Ethics Committee.

SOME IMPORTANT POINTS.

- You **do not have to take part!**
  - You and your child have **the right to withdraw** from the study at any time, even during the sessions. You can also **choose to withdraw some or all of your information** from the study, but if you wish to do this you must tell us by 31/12/18.
- We would like to video/audio record some of the sessions.
  - This is just to aid the collection of research data.
- All information and research data will be kept **secure and confidential**.
  - Please see page 9 for more details about how we keep your information safe.

5.

THE PROJECT IN A LITTLE MORE DETAIL.

WHY WE ARE DOING THIS.

- Social anxiety disorder (SAD) is one of the most common mental health concerns in children and often continues into adulthood.
- Although psychological treatments for children with SAD work well in improving symptoms and quality of life for children and their families, for many children these treatments do not work as well.
- This may be because, we don't know a lot about what factors maintain social anxiety in children (i.e. keep the problem going).
- The aim of this study is to get a better idea of what these factors are.
- We hope that this will help us improve future treatments to give socially anxious children the best possible chance of recovery.

6.

Appendix 3: Consent and assent forms for parents and children.

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50
Version 1.6 (12.08.08)

Berkshire Healthcare NHS
NHS Foundation Trust

Study Centre Address:
School of Psychology, University of Reading , Whiteknights, PO Box 238 , Reading RG6 6AL

Clinical Research Team:

Clinical Director: Dr Lucy Willetts (Tel: [redacted]); l.e.willetts@reading.ac.uk
Trials Manager: Dr Rachel Gitau (Tel: [redacted]); r.gitau@reading.ac.uk
Study Assessors: Sarah Cook; s.e.cook@reading.ac.uk, Amy Corcoran; a.corcoran@reading.ac.uk, Jenny Crosby; j.crosby@reading.ac.uk, Ray Percy; r.s.percy@reading.ac.uk, Sarah Shaw; sxs07see@reading.ac.uk
Trials Secretary: Brendan Lawrence; b.lawrence@reading.ac.uk
Research Director: Professor Peter Cooper (Tel: [redacted]); p.j.cooper@reading.ac.uk

Patient identification number for this trial:

PARENT CONSENT FORM

Overcoming your Child's Fears and Worries

	Please initial box to show agreement.
1. I confirm that I have read and understand the information sheet dated 6.2.08 (version 1.5) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
2. I understand that my and my child's participation is voluntary and that we are free to withdraw at any time, without giving a reason, without my medical care or legal rights being affected.	
3. I understand that any relevant section of our medical notes and data collected during the study, may be looked at by responsible individuals from The University of Reading or the NHS Trust, where it is relevant to our taking part in this research. I give permission for these individuals to have access to my records.	
4. I agree to our GP(s) being informed of this study	
5. I agree to my child's teacher being informed of their participation in this treatment study, and being contacted to provide information.	
6. I agree to audio and video-recordings being made during the course of the study. I understand that the audio and video tapes will be heard and seen only by members of the research team; and they will be destroyed at the end of the research study.	
7. I agree to anonymised quotations being used in research reports.	
8. I agree to take part in this study.	

Berkshire Child Anxiety Clinic
University of Reading

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50
Version 1.6 (12.08.08)

Name of child: _____

Name of parent/guardian: _____

Parent/guardian signature: _____

Date: _____

Name of person taking consent: _____

Date: _____

Signature: _____

When completed, 1 for parent; 1 for researcher site file; 1 (original) in medical notes

Berkshire Child Anxiety Clinic
University of Reading

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50
Version 1.6 (12.08.08)

Berkshire Healthcare NHS
NHS Foundation Trust

Study Centre Address:
School of Psychology, University of Reading , Whiteknights, PO Box 238 , Reading RG6 6AL

Clinical Research Team:

Clinical Director: Dr Lucy Willetts (Tel: [redacted]; l.e.willetts@reading.ac.uk
Trials Manager: Dr Rachel Gitau (Tel: [redacted]; r.gitau@reading.ac.uk
Study Assessors: Sarah Cook; s.e.cook@reading.ac.uk, Amy Corcoran, a.corcoran@reading.ac.uk Jenny Crosby; j.crosby@reading.ac.uk, Ray Percy; r.s.percy@reading.ac.uk, Sarah Shaw; sxs07ses@reading.ac.uk
Trials Secretary: Jackie Barton; j.m.barton@reading.ac.uk
Research Director: Professor Peter Cooper (Tel: [redacted]; p.j.cooper@reading.ac.uk

Patient identification number for this trial:

PARENT CONSENT FORM

Overcoming your Child's Fears and Worries

	Please initial box to show agreement.
1. I confirm that I have read and understand the information sheet dated 6.2.08 (version 1.5) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
2. I understand that my and my child's participation is voluntary and that we are free to withdraw at any time, without giving a reason, without my medical care or legal rights being affected.	
3. I understand that any relevant section of our medical notes and data collected during the study, may be looked at by responsible individuals from The University of Reading or the NHS Trust, where it is relevant to our taking part in this research. I give permission for these individuals to have access to my records.	
4. I agree to our GP(s) being informed of this study	
5. I agree to my child's teacher being informed of their participation in this treatment study, and being contacted to provide information.	
6. I agree to audio and video-recordings being made during the course of the study. I understand that the audio and video tapes will be heard and seen only by members of the research team; and they will be destroyed at the end of the research study.	
7. I agree to anonymised quotations being used in research reports.	
8. I agree to take part in this study.	

Berkshire Child Anxiety Clinic
University of Reading

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50
Version 1.6 (12.08.08)

Name of child: _____

Name of parent/guardian: _____

Parent/guardian signature: _____

Date: _____

Name of person taking consent: _____

Date: _____

Signature: _____

When completed, 1 for parent; 1 for researcher site file; 1 (original) in medical notes

Berkshire Child Anxiety Clinic
University of Reading

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50
Version 1.3 (24.11.07)

Berkshire Healthcare NHS
NHS Foundation Trust

School of Psychology
University of Reading
Whiteknights
PO Box 238
Reading RG6 6AL
UK

CONSENT FORM FOR CHILDREN

(To be completed by the child and his/her guardian)

Overcoming your Child's Fears and Worries

Please circle all you agree with:

Have you read (or had read to you) the information about this project?	YES/ NO
Has somebody else explained this project to you?	YES/ NO
Do you understand what this project is about?	YES/ NO
Have you asked all the questions you want?	YES/ NO
Have you had your questions answered in a way you understand?	YES/ NO
Do you understand it's OK to stop taking part at any time?	YES/ NO
Are you happy to take part?	YES/ NO

If any answers are 'no' or you **don't** want to take part, **don't** sign your name!

If you **do** want to take part, please write your name and today's date
Your name _____
Date _____

Your parent or guardian must write his/her name here too if s/he is happy for you to do the project
Print name _____
Sign _____
Date _____

The person who explained this project to you needs to sign too:
Print name _____
Sign _____
Date _____

Berkshire Child Anxiety Clinic
University of Reading

Berkshire Research Ethics reference number: 07/H0505/156- 157-176
University of Reading Ethics reference number: 07/48-49-50
Version 1.3 (24.11.07)

Berkshire Healthcare NHS
NHS Foundation Trust

School of Psychology
University of Reading
Whiteknights
PO Box 238
Reading RG6 6AL
UK

CONSENT FORM FOR CHILDREN

(To be completed by the child and his/her guardian)

Overcoming your Child's Fears and Worries

Please circle all you agree with:

Have you read (or had read to you) the information about this project?	YES/ NO
Has somebody else explained this project to you?	YES/ NO
Do you understand what this project is about?	YES/ NO
Have you asked all the questions you want?	YES/ NO
Have you had your questions answered in a way you understand?	YES/ NO
Do you understand it's OK to stop taking part at any time?	YES/ NO
Are you happy to take part?	YES/ NO

If any answers are 'no' or you **don't** want to take part, **don't** sign your name!

If you **do** want to take part, please write your name and today's date
Your name _____
Date _____

Your parent or guardian must write his/her name here too if s/he is happy for you to do the project
Print name _____
Sign _____
Date _____

The person who explained this project to you needs to sign too:
Print name _____
Sign _____
Date _____

Berkshire Child Anxiety Clinic
University of Reading

AnDY Research Clinic

University of Reading

ASSENT FORM

FOR CHILDREN AGED 7-12 YEARS

To be completed by the child/adolescent and his/her guardian

Anxiety Group - Version 2 23.09.2016

IRAS 209508

(1 copy to participant; 1 copy to researcher site file.)

Title of Study: Understanding what keeps social anxiety going in children

Principal Investigator: Prof. Cathy Creswell

Please circle "YES" to all you agree with:

Have you read (or had read to you) the information about this project?	YES / NO
Has somebody explained this project to you?	YES / NO
Do you understand what this project is about?	YES / NO
Have you asked all the questions you want?	YES / NO
Have you had your questions answered in a way you understand?	YES / NO / no questions
Do you understand that you don't have to take part and that it's OK to stop taking part at any time?	YES / NO
Do you agree to sessions being videotaped and/or audiotaped?	YES / NO
Do you agree to quotes being used, without your real name, for reports that the researchers might publish?	YES / NO
Are you happy to take part?	YES / NO

If any answers are 'no' or you **don't** want to take part, **don't** sign your name!

If you **do** want to take part, please write your name and today's date:

Your name _____ Date _____

Signature _____

Your parent or guardian must write his/her name here too if s/he is happy for you to do the project:

Print name _____ Date _____

Signature _____

The person who explained this project to you needs to sign too:

Print name _____ Date _____

Signature _____

University of Reading

ASSENT FORM

FOR CHILDREN AGED 7-12 YEARS

To be completed by the child/adolescent and his/her guardian

Community group - Version 1 08.08.2016

IRAS 209508

(1 copy to participant; 1 copy to researcher site file.)

Title of Study: Understanding what keeps social anxiety going in children

Principal Investigator: Prof. Cathy Creswell

Please circle "YES" to all you agree with:

Have you read (or had read to you) the information about this project?	YES / NO
Has somebody explained this project to you?	YES / NO
Do you understand what this project is about?	YES / NO
Have you asked all the questions you want?	YES / NO
Have you had your questions answered in a way you understand?	YES / NO / no questions
Do you agree to some activities being audiotaped and/or videotaped?	YES / NO
Do you understand that you don't have to take part and that it's OK to stop taking part at any time?	YES / NO
Are you happy to take part?	YES / NO

If any answers are 'no' or you **don't** want to take part, **don't** sign your name!

If you **do** want to take part, please write your name and today's date:

Your name _____ Date _____

Signature _____

Your parent or guardian must write his/her name here too if s/he is happy for you to do the project:

Print name _____ Date _____

Signature _____

The person who explained this project to you needs to sign too:

Print name _____ Date _____

Signature _____

University of Reading

CONSENT FORM

FOR PARENTS/GUARDIANS

To be completed by the child's parent of guardian

Anxiety Group - Version 3 24.05.2018

IRAS 209508

(1 copy to participant; 1 copy to researcher site file.)

Title of Study: Understanding what keeps social anxiety going in children

Principal Investigator: Prof. Cathy Creswell

Please initial each box

I confirm that I have read and understand the Information **Sheet dated 24.05.2018 (Version 3)** for the above study. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily.	☐
I understand that my child's participation is voluntary and that we are free to withdraw at any time, without giving any reason, without our medical care or legal rights being affected.	☐
I give my permission for the information that my child and I provided during our first visit to the AnDY Research Clinic to be used for the purposes of this study, as detailed in the information sheet dated 23.09.2016 (Version 2).	☐
I understand that relevant sections of the data collected during the study may be looked at by individuals from the University of Reading. I give permission for these individuals to have access to my child's records.	☐
I understand that some sessions will be audio- and/or videotaped to aid data collection. I give my permission for this to happen.	☐
I agree that the researchers can use anonymous and unidentifiable direct quotes from information I give them during the study in any resulting publications and research reports.	☐
I agree for my child to take part in the above study	☐

The study was reviewed and given a favourable ethical opinion for conduct by the National Research Ethics Service (NRES) Committee South Central (B Committee) and the University of Reading Ethics committee

I have spoken to: _____ (name of researcher)

Your child's name: _____

Your name: _____ Date: _____

Your signature: _____

Name of researcher: _____ Date: _____

Researcher's signature: _____

University of Reading

CONSENT FORM

FOR PARENTS/GUARDIANS

To be completed by the child's parent or guardian

Community Group - Version 3. 24.05.2018

IRAS 209508

(1 copy to participant; 1 copy to researcher site file.)

Title of Study: Understanding what keeps social anxiety going in children

Principal Investigator: Prof. Cathy Creswell

Please initial each box.

I confirm that I have read and understand the Information **Sheet dated 24.05.2018 (Version 4)** for the above study. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily.	☐
I understand that my child's participation is voluntary and that we are free to withdraw at any time, without giving any reason, without our medical care or legal rights being affected.	☐
I understand that relevant sections of the data collected during the study may be looked at by individuals from the University of Reading. I give permission for these individuals to have access to my child's records.	☐
I understand that some tasks will be audio- and/or videotaped to aid data collection. I give my permission for this to happen.	☐
I agree for my child to take part in the above study	☐

The study was reviewed and given a favourable ethical opinion for conduct by the National Research Ethics Service (NRES) Committee South Central (B Committee) and the University of Reading Ethics committee

I have spoken to: _____ (name of researcher)

Your child's name: _____

Your name: _____ Date: _____

Your signature: _____

Name of researcher: _____ Date: _____

Researcher's signature: _____

Appendix 4: Study materials (questionnaires and task instructions)

PARENT REPORT QUESTIONNAIRES

To be administered during first visit.

Version 2, 04/10/2016

Participant number _____

Today's date ____/____/____

Child's age _____
Child's date of birth _____
Child's gender Male (boy) / Female (girl) (please circle)

Please indicate bellow that participants have completed each questionnaire.
Please include any comments about why participants were unable to complete any of the questions/measures in the section provided, if applicable.

Participant will be attending: as part of:	**This booklet has been completed**
☐ Phase 1 only.	❑ Phase 1.
☐ Phase 2 only.	❑ Phase 2.
☐ Both phases.	

☐ **Revised child anxiety and depression scale (RCADS) parent report.**

☐ **Social Communication Questionnaire (SCQ)**

Comments.

INFORMATION ABOUT YOUR CHILD

Ethnicity (please circle below)

White	**Code**	**Black or Black British**	**Code**
British	A	African	M
Irish	B	Caribbean	N
Any other White Background	C	Any other Black background	P
Mixed		**Other Ethnic groups**	
White and Black Caribbean	D	Chinese	R
White and Black African	E	Any other Ethnic group	S
White and Asian	F	**Not Stated**	
Any other mixed background	G	I do not wish to state their ethnicity	Z
Asian or Asian British			
Indian	H		
Pakistani	J		
Bangladeshi	K		
Any other Asian background	L		

Has your son/daughter been prescribed medication for anxiety or other psychologi difficulties?
Yes / No (please circle)

Medication	Dosage	Approximate how long for?

INFORMATION ABOUT YOU

Your relationship to participant (e.g. mother/father/guardian) _____

Your age _____

Please tick the box that best describes your relationship status

Single, never married	
Married (first time)	
Remarried	
Divorced/separated	
Living with partner	
Widowed	

Education (please tick where appropriate)

	Self	**Partner (if appropriate)**
School completion		
Further education (e.g. college, vocational courses)		
Higher education (undergraduate degree)		
Postgraduate qualification		

Employment **(please tick where appropriate)**

	Self	**Partner (if appropriate)**
Unemployed		
Part-time work		
Full-time work		
Retired		

If employed, please state current occupation:

Self	
Partner (if appropriate)	

CHILD SELF REPORT QUESTIONNAIRES

To be administered during first visit.

Version 2, 13/10/2016

Participant number _____

Today's date ____/____/____

Child's age _____
Child's date of birth _____
Child's gender Male (boy) / Female (girl) (please circle)

Please indicate bellow that participants have completed each questionnaire.
Please include any comments about why participants were unable to complete any of the questions/measures in the section provided, if applicable.

Participant will be attending: as part of:	**This booklet has been completed**
☐ Phase 1 only.	❑ Phase 1.
☐ Phase 2 only.	❑ Phase 2.
☐ Both phases.	

☐ **Revised child anxiety and depression scale (RCADS) child report.**

☐ **Liebowitz Social Anxiety Scale for Children and Adolescents (LSAS) child report**

<u>Comments</u>.

Over the page, we'd like to ask you lots of questions about what you think and what you do. Please do not spend too much time on each question – there are no right or wrong answers.

Reading the Mind in the Eyes.

Instructions to children.

"I've got lots of pictures of people's eyes. Each picture has four words around it. I want you to look carefully at the picture and then choose the word that best describes what the person is thinking or feeling. The first one is a practice one so that you can see what I mean."

"Have a look and decide which word best describes what this person is thinking or feeling. I will read them for you unless you want to read them yourself. Once you've decided, you can click on the word that you've chosen."

"OK, let's have a go at the rest of them. You might find some of them quite easy and some of them quite hard, so don't worry if it's not always easy to choose the best word. If you really can't choose the best word, you can have a guess."

Presentation of the task.

The task will be presented on the computer through Collector (an online experiment and survey builder; figure 1). Pictures of eyes will be presented in the middle of the screen and the four words around the outside. Participants will click on the word of their choice to make their response and this will cause the next stimuli to be presented with a new set of words.

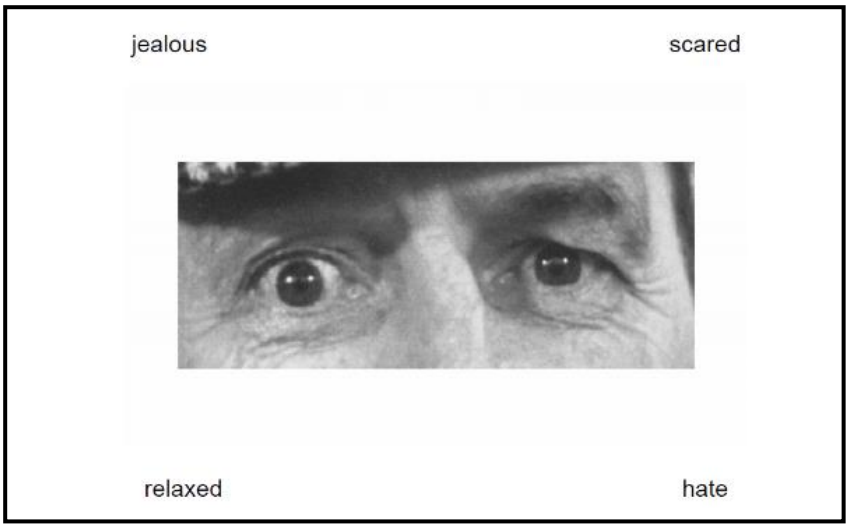


Figure 1. An example of the presentation of stimuli on the computer screen for the Eye's test.

The Triangles Task

Instructions for children.

"You are about to see some cartoons of some triangles. After each one, we would like you to tell us what you think was happening. There are no right or wrong answers, we just want to know what you think."

"Before we start, there are a few cartoons for you to practice on, just so that you can see what you will need to do for the task. On the next screen, there will be a cartoon. Watch carefully so that you can tell me what you think is happening."

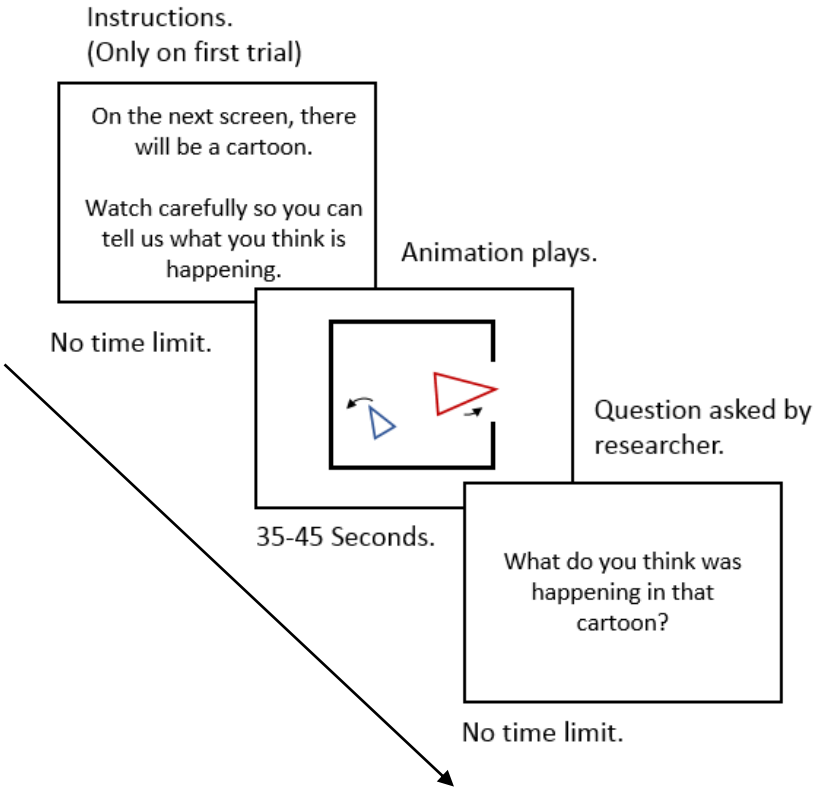
Task Presentation.

The task will be presented on the computer in E-Prime. Each animation features two triangles moving around. There is always a small blue triangle and a larger red triangle. There are three different types of animation:

I. *Random movement* (control), in which triangles drift around the space and bounce off of the walls,

II. *Goal-directed movement*, in which triangles interact with each other but there is no implication of mental state attributions between shapes (e.g. dancing together or chasing one another),

III. *ToM movement*, in which one triangle reacts to the other triangles mental state (e.g. persuading, mocking, or bluffing).


Instructions.
(Only on first trial)
On the next screen, there will be a cartoon.
Watch carefully so you can tell us what you think is happening.
No time limit.
Animation plays.
35-45 Seconds.
Question asked by researcher.
What do you think was happening in that cartoon?
No time limit.