



# Cognitive bias modification of interpretation in children with social anxiety disorder



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## ARTICLE INFO

### Article history:

Received 24 October 2015

Received in revised form 17 August 2016

Accepted 28 October 2016

Available online 6 November 2016

### Keywords:

Social anxiety disorder

Interpretation

Cognitive bias modification

Child

## ABSTRACT

Negative (or a lack of positive) interpretation of ambiguous social situations has been hypothesised to maintain social anxiety disorder in children, yet there is currently limited evidence to support this. Cognitive Bias Modification of Interpretation (CBM-I) provides a means to explore the causal influence of interpretation bias on social anxiety disorder, and has been associated with a reduction in social anxiety symptoms in adults. Seven to twelve year old children with a diagnosis of social anxiety disorder completed CBM-I training, adapted from materials designed for socially anxious children in the community, or no training. Effects on interpretation bias and social anxiety were assessed. The adapted CBM-I training was not associated with significant changes in benign or negative interpretation. Unsurprisingly given the lack of successful interpretation training, there were no significant changes in child or parent reported social anxiety symptoms, clinician-rated severity or diagnoses and change in interpretation was not significantly associated with change in social anxiety. These findings contrast with some studies with community populations although it is possible that more intensive CBM-I training is required to fully test this hypothesis among clinical groups.

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## 1. Introduction

Social anxiety disorder is common in children (Beesdo et al., 2007), causes significant functional impairment (Erath, Flanagan, & Bierman, 2007; Van Ameringen, Mancini, & Farvolden, 2003) and is associated with long term risk of adult social anxiety as well as other mental health difficulties (Pine, Cohen, Gurley, Brook, & Ma, 1998; Zimmermann et al., 2003). Social information is often ambiguous, yet adults without social anxiety disorder often interpret this information in a positive manner. This helpful positive bias is lacking in adults with social anxiety disorder (Hirsch & Mathews, 2000; Stopa & Clark, 2000) and it is hypothesised that a lack of positive interpretation bias may play a fundamental role in the maintenance of social anxiety disorder (Hirsch & Clark, 2004).

Psychological treatments for social anxiety disorder among children typically include methods which aim to change interpretation bias (e.g. NICE, 2013). However it is far from clear that interpretation biases have a maintaining role in childhood social anxiety disorder as studies to date have typically examined cross-

sectional associations, and where these have been conducted they have not provided consistent evidence for specific associations between social interpretation biases and social anxiety disorder (e.g. Muris, Kindt et al., 2000). For example, Creswell, Murray & Cooper (2013) failed to find differences in either the frequency of threat interpretation in responses to ambiguous social scenarios, or in expectations of how a social challenge would turn out in children (7–12 years) with social anxiety disorder, other anxiety disorders and non-anxious children. However, although social anxiety disorder in adults is characterised by a lack of positive bias (e.g. Hirsch & Mathews, 2000; Garner, Mogg & Bradley, 2006), studies with children have typically failed to distinguish between increased positive and reduced negative interpretations, instead tending to treat these as on a continuum (e.g. Creswell et al., 2013). Furthermore, there has been limited examination of the prospective relationship between cognitions and social anxiety in children (Muris, Huijding, Mayer, Remmerswaal, & Vreden, 2009).

One method that has the potential to determine causal influences of interpretation on social anxiety symptoms is Cognitive Bias Modification of Interpretation (CBM-I) which involves training participants to interpret ambiguous social stimuli in a more positive and/or less negative fashion. CBM-I has been associated with reduced social anxiety symptoms in both community and clinical

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adult populations (e.g. Murphy, Hirsch, Mathews, Smith, & Clark, 2007; Beard & Amir, 2008), and there is evidence that change in benign interpretation mediates the effect of training on social anxiety (Beard & Amir, 2008).

Recent applications of CBM-I with children have led to mixed results. On the basis of a meta-analysis of CBM (of attention and interpretation) interventions for mental health problems in children, Cristea, Mogoase, David and Cuijpers (2015) concluded that while CBM appeared to bring about significant changes in interpretation biases, these shifts did not translate to changes in child symptoms of anxiety, depression or general mental health (consistent with recent studies of Attention Bias Modification in the context of social anxiety; Carleton et al., 2015; Heeren, Mogoase, McNally, Schmitz & Philippot, 2015; Yao, Yu, Qian & Li, 2015). However, interpretation measures were collapsed to include both controlled in-lab experiments and real-life, ecologically valid measures, leaving the extent to which interpretation bias changed somewhat unclear. Where studies have focused on CBM-I and social anxiety specifically, findings have been mixed. One study reported a reduction in trait social anxiety among twenty two 10–11 year old children from a community population who scored highly on trait social anxiety, after 3 sessions of CBM-I with 45 trials (Vassilopoulos, Banerjee & Prantzalou, 2009). Yet, another study found no training effects on trait social anxiety among 77 10–13 year old children, despite using similar methods (Vassilopoulos, Moberly, & Zisimatou, 2013). In both studies, interpretation bias training was associated with reduced negative interpretation (Vassilopoulos et al., 2009, 2013) and in Vassilopoulos et al. (2013) training was also associated with more benign interpretation of ambiguous social scenarios. One possible reason why CBM-I may have failed to translate to a change in social anxiety symptoms in Vassilopoulos et al. (2013) is that participants were an unselected sample who did not have elevated levels of social anxiety at the outset. Indeed, other studies with unselected populations have managed to successfully train interpretation biases but have failed to find an effect on general anxiety symptoms in children (Lester, Field, & Muris, 2011; Salemink & Wiers, 2011; though see Hirsch, Mathews & Clark, 2007, for contrasting evidence in adults); and it has been suggested that symptoms may be more likely to change following CBM-I for highly anxious child populations (e.g. Cristea et al., 2015; Muris, Huijding, Mayer, & Hameetman). No studies to date have applied CBM-I with children who meet diagnostic criteria for social anxiety disorder, however, if successful in reducing social anxiety symptoms, this provides both valuable insights in to the relationship between interpretation and social anxiety and may lead to low-intensity treatment options (e.g. Beard, Weisberg, & Amir, 2011).

We aimed to address whether CBM-I is associated with more benign interpretation and less negative interpretation of ambiguous social scenarios, a reduction in social anxiety symptoms and severity, and whether change in social anxiety was mediated by changes in interpretation. Some particular methodological features of the current study should be noted. We aimed to use an established method of CBM-I for social anxiety which had previously been used with high socially anxious children recruited from the community (Vassilopoulos et al., 2009). However, given previous CBM-I training programmes for social anxiety in children have relied heavily on children's reading abilities and have not used highly systematised procedures (instead presenting training materials on cards which are read, circled and then turned over by participants to reveal 'correct' interpretations and therefore varying in timing of presentation, manner in which materials are read etc, e.g. Vassilopoulos et al., 2009, 2013) we adapted these previously used training materials for administration using experimental software with accompanying audio-materials. Furthermore, we asked participants to imagine themselves in the

described scenarios since this has been shown to augment CBM-I in adults with depression (Holmes, Lang, & Shah, 2009).

The study hypotheses were as follows:

1. Children who receive the CBM-I training will have more benign interpretation and less negative interpretation post-training compared to children who do not receive CBM-I training.
2. Children who receive the CBM-I training will have lower scores on child, parent and clinician ratings of social anxiety post-training, compared to children who do not receive CBM-I training.
3. The association between group ('training', 'no training') and change in social anxiety will be mediated by the change in benign and negative interpretation biases, i.e., confirming a causal relationship between interpretation biases and anxiety.

## 2. Materials and methods

On the basis of the large effect found in Vassilopoulos et al. (2009), 30 participants were required to conduct repeated measures analyses of variance investigating within-between interactions (effect size  $F = 0.35$ ; power 95%; correlation among repeated measures, 0.48, as reported below). However, as an effect size has yet to be obtained with a clinical group, we powered this study for a medium effect size ( $F = 0.25$ ), and so recruited  $n = 56$  participants in order to provide at least 90% power to detect this more conservative effect.

### 2.1. Participants

All participating children had been referred to the Berkshire Child Anxiety Clinic at the University of Reading by health or education professionals for assessment and treatment of an anxiety disorder. Children were invited to take part if they met the following inclusion criteria: (i) a primary anxiety disorder and a diagnosis of social anxiety disorder, (ii) aged 7–12 years, (iii) fluent English speakers, (iv) absence of learning difficulties (including autistic spectrum disorder), (v) absence of severe condition or risk that requires immediate treatment. A flow diagram showing recruitment and retention is shown in Fig. 1. Fifty six clinically anxious children and their primary caregivers (all mothers) gave informed consent and took part in all stages of the study. Participants were randomized, using a random number generator, to either receive training (CBM) or not to receive training (NO CBM). The groups were well balanced on child age, gender, ethnicity, socioeconomic status, and symptoms of anxiety and low mood (see Table 1). No significant difference was found between groups for child anxiety disorder by comparing primary diagnosis ( $\chi^2(6) = 4.68, p = 0.59$ ) and frequency of social anxiety as the primary disorder ( $\chi^2(1) = 0.25, p = 0.62$ ). Groups did not differ on the presence of externalizing disorders ( $\chi^2(1) = 2.70, p = 0.10$ ) or mood disorders ( $\chi^2(1) = 1.46, p = 0.23$ ). (See Table 2 for frequencies of primary anxiety diagnoses and overall diagnoses). There was also no difference between the CBM group ( $M = 5.48, SD = 0.63$ ) and the NO CBM group ( $M = 5.37, SD = 0.74$ ) on ADIS-C/P clinical severity ratings of the primary diagnosis ( $t[54] = -0.61, p = 0.54$ ).

### 2.2. Measures

#### 2.2.1. Anxiety disorders interview schedule for DSM IV for children–child and parent versions (ADIS-C/P; Silverman & Albano, 1996)

Children were assigned diagnoses on the basis of the ADIS-C/P, a structured diagnostic interview with well-established psychometric properties (Silverman, Saavedra, & Pina, 2001). The interview

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