



Attentional bias towards angry faces in childhood anxiety disorders

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ABSTRACT

Objective: To examine attentional bias towards angry and happy faces in 8–12 year old children with anxiety disorders ($n = 29$) and non-anxious controls ($n = 24$).

Method: Children completed a visual-probe task in which pairs of angry/neutral and happy/neutral faces were displayed for 500 ms and were replaced by a visual probe in the spatial location of one of the faces.

Results: Children with more severe anxiety showed an attentional bias towards angry relative to neutral faces, compared with anxious children who had milder anxiety and non-anxious control children, both of whom did not show an attentional bias for angry faces. Unexpectedly, all groups showed an attentional bias towards happy faces relative to neutral ones.

Conclusions: Anxiety symptom severity increases attention to threat stimuli in anxious children. This association may be due to differing threat appraisal processes or emotion regulation strategies.

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1. Introduction

Childhood anxiety disorders are recognised as significant forms of psychopathology affecting between 10 and 20% of youths (e.g., Cartwright-Hatton, McNichol, & Doubleday, 2006) they are associated with poor psychosocial functioning, predict later psychopathology (e.g., Bittner et al., 2007) and are a significant burden on health care systems (Waghorn, Chant, White, & Whiteford, 2004). Expanding our understanding of the causes and determinants of childhood anxiety disorders is important for offsetting their high prevalence and debilitating outcomes.

Cognitive models of anxiety predict that threat-based attention and interpretation biases play causal and/or maintaining roles in anxiety (e.g., Mogg & Bradley, 1998; Williams, Watts, Macleod, & Mathews, 1997). In support, an extensive literature has demonstrated that in comparison with non-anxious controls, anxious adults preferentially allocate attention to threat relative to neutral stimuli and do not show a bias for other emotional stimuli (see Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007, for a review). By contrast, a smaller literature on children has produced inconsistent findings with regard to preferential processing of threat and other emotional stimuli, such as happy faces.

The most common paradigms for assessing attentional bias in childhood anxiety disorders are the emotional Stroop task and the

visual-probe task (see Vasey & MacLeod, 2001). However, the emotional Stroop task has been criticised as a measure of attentional bias because the interference in colour-naming performance caused by the emotional meaning of threat words may reflect not only enhanced processing of emotional information, relative to neutral information, but also effortful attempts to suppress such processing (de Ruiter & Brosschot, 1994).

The visual-probe task, on the other hand, engages selective attention processes by assessing the spatial distribution of attention to threat versus other stimuli (MacLeod, Mathews, & Tata, 1986). Specifically, the visual-probe task contains trials in which stimulus pairs (e.g., threat and neutral words; or angry and neutral faces) are simultaneously presented, followed by a visual probe (e.g., a small dot) appearing immediately after stimulus offset. On some trials, the probe replaces the threat stimulus (e.g., angry face) and on other trials the neutral stimulus (e.g., neutral face). Differences in response latency for probes replacing threat versus neutral stimuli index attention bias for threat.

Initial studies with children using the visual-probe task with word stimuli reported findings similar to those from adult studies in that an attentional bias towards threat stimuli was found in anxious but not healthy children (e.g., Hunt, Keogh, & French, 2007; Taghavi, Dalgleish, Moradi, Neshat-Doost, & Yule, 2003; Taghavi, Neshat-Doost, Moradi, Yule, & Dalgleish, 1999; Vasey, Daleiden, Williams, & Brown, 1995). However, other studies employing threat, neutral and pleasant pictures, such as those from the International Affective Picture System (IAPS), found inconsistent evidence as to whether the threat bias was specific to anxious

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children or common amongst all children (Waters, Lipp, & Spence, 2004; Waters, Wharton, Zimmer-Gembeck, & Craske, 2008). This suggested that emotional pictures may evoke a general threat bias in children due to the stronger arousal properties of pictures compared with words.

More recent childhood studies have focused on attentional biases for emotional face stimuli given their greater ecological validity compared with words and potentially more universal interpretations than complex affective pictures. However, in contrast to adult work which has consistently found evidence of attentional biases towards angry faces, relative to neutral faces, in anxious adults (e.g., Bar-Haim et al., 2007; Bradley, Mogg, White, Groom, & de Bono, 1999; Mogg, Philippot, & Bradley, 2004), findings from childhood studies have varied in terms of whether the bias in anxious children has been towards or away from angry faces. For example, Roy et al. (2008) found that an attentional bias towards angry faces relative to neutral ones shown for 500 ms was characteristic of anxious youths with either social phobia, generalised anxiety disorder (GAD) or separation anxiety disorder ($n = 101$) but not of controls. Notably, the attentional bias towards angry faces was unrelated to the type of diagnosis or severity of anxiety, though all anxious subjects in this study suffered from relatively severe anxiety. Similarly, Waters, Mogg, Bradley, and Pine (2008) found that when children diagnosed with GAD were divided into those with more versus less severe anxiety symptoms, an attentional bias towards angry faces shown for 500 ms emerged only in the high but not the low severity group or in non-anxious controls. The latter two groups showed no attentional bias either towards or away from angry faces. Shafiee, Goodarzi, and Taghavi (2009) also recently reported that children with high trait anxiety showed a significant vigilance towards angry compared with neutral faces, while children with low anxiety traits showed an attentional bias away from these faces. Similarly, an association between high trait anxiety and attentional bias towards threatening (relative to friendly) schematic faces shown for 1000 ms was found in school-age children by Heim-Dreger, Kohlmann, Eschenbeck, and Burkhardt (2006). Moreover, Waters, Kokkoris, Mogg, Bradley, and Pine (in press) recently revealed that an attentional bias towards angry faces persisted across 500 and 1250 ms exposure durations in high compared with low trait anxious children.

However, at least three other studies have found attentional avoidance of angry relative to neutral faces in anxious children. Pine et al. (2005) found attentional avoidance of angry faces presented for 500 ms in maltreated children, some of whom had post-traumatic stress disorder (PTSD). An attentional bias away from angry faces shown for 500 ms was also observed in paediatric GAD by Monk et al. (2006). Finally, a study of non-clinical school-age children found a positive association between attentional bias away from negative faces and social anxiety symptoms (i.e., Stirling, Eley, & Clark, 2006).

Thus, the evidence for attentional biases towards and away from angry faces in childhood anxiety disorders is inconsistent and this may in part be due to variations in methodology, sample characteristics (e.g., severity of anxiety), and testing environments across studies (Roy et al., 2008). For example, avoidance of angry faces by maltreated children (i.e., Pine et al., 2005) may reflect on an adaptive response for avoiding further harm in hostile environments. Attention away from angry faces in the GAD group in Monk et al.'s (2006) study may have been influenced by heightened state anxiety associated with the stressful context of completing the task in an fMRI scanner. Finally, Stirling et al. (2006) utilised a 1000 ms exposure duration and a combination of angry, sad, fearful and disgust expressions to represent negative faces. They also utilised a probe-classification format ("what is the probe"), which is in contrast to many other childhood studies published to date which

have commonly used either a probe-position ("where is the probe?") or probe-detection ("is there a probe?") format (see Mogg & Bradley, 1999, for discussion of different formats).

Such variability currently limits the conclusions that can be made about the role of threat attentional bias in childhood anxiety disorders. Moreover, only four of these prior studies examined children with clinically significant anxiety disorders, with two finding an attentional bias towards angry faces (i.e., Roy et al., 2008; Waters, Mogg et al., 2008) and two finding attentional avoidance of these stimuli (i.e., Monk et al., 2006; Pine et al., 2005). Thus, additional studies are required using carefully controlled methodology with clinical samples of anxious children and non-anxious controls. The present study sought to add to this literature, by utilising in such children the same visual-probe task with emotional face stimuli shown for 500 ms, as used by Monk et al. (2006), Pine et al. (2005), Roy et al. (2008), Waters, Mogg et al. (2008), and Waters et al. (in press). Moreover, as an attentional bias towards biologically relevant threat cues, such as angry faces, is thought to reflect a basic process underlying vulnerability to a spectrum of anxiety disorders, including GAD, social phobia and separation anxiety disorder (Craske, 2003; Mogg & Bradley, 1998) and has been found to be unrelated to diagnosis type in a large-scale paediatric study (i.e., Roy et al., 2008), we opted to study all children with an anxiety disorder as their principal diagnosis. Given the high comorbidity of anxiety disorders, we did not predict content-specificity in attentional bias; i.e., we did not expect the bias for angry faces to significantly differ among children who had GAD, social phobia or separation anxiety disorder as a principal or secondary diagnosis. Finally, given our prior finding that anxiety severity influences attentional bias towards angry faces in paediatric GAD (i.e., Waters, Mogg et al., 2008), we also examined whether the bias was strongest as a function of anxiety severity.

The specific hypotheses were based on cognitive models of anxiety (e.g., Mogg & Bradley, 1998; Williams et al., 1997), and in particular the findings of Roy et al. (2008) and Waters, Mogg et al. (2008). It was hypothesised that an attentional bias towards angry faces would be enhanced in clinically anxious children compared with non-anxious controls (e.g., Roy et al., 2008), and that this bias would be the most pronounced in severely anxious children relative to less severe anxious children and non-anxious controls (Waters, Mogg et al., 2008).

The study also examined attentional bias for happy faces. However, the specific predictions were less clear given that some paediatric and adult studies have found an anxiety-related bias for happy (and angry) faces (e.g., Bradley et al., 1999; Martin, Williams, & Clark, 1991; Waters, Mogg et al., 2008), whereas others have not (Monk et al., 2006; Pine et al., 2005; Roy et al., 2008). However, based on cognitive models of anxiety (e.g., Mogg & Bradley, 1998), an anxiety-related attentional bias was not expected for happy faces because they are not generally regarded as being threat-related.

2. Method

2.1. Participants

Participants were 53 children aged 8 years, 0 months to 12 years, 6 months (26 males; 27 females): 29 anxious children (13 males; 16 females) and 24 non-anxious controls (13 males; 11 females). Anxious children (with one exception) were referred to the Griffith University Child Anxiety Disorders Research Program by parents, guidance counsellors at local schools, community mental health agencies and paediatricians for treatment of their anxiety symptoms. Non-anxious control children were recruited as research volunteers from a local primary school. Ninety percent of children

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