Cognitive theories suggest that the development and maintenance of anxiety are associated with enhanced processing of threat-related information (Williams, Watts, MacLeod, & Mathews, 1997). Supporting this notion is a growing body of research indicating that high anxious individuals display attentional biases favouring threatening interpretations of stimuli, such as pictures of angry faces (see Bar-Haim et al., 2007 for a meta-analysis).

The most frequently applied methodology in this area is the visual probe (VP) task (MacLeod, Mathews, & Tata, 1986), which provides measures of spatial attention. Previous VP studies have found that anxious individuals are faster to respond to a probe that replaces angry rather than neutral faces, thus reflecting an attentional bias towards threat (e.g., Ioannou, Mogg, & Bradley, 2004; Koster, Verschueren, Crombez, & Van Damme, 2005). However, the majority of this research has focused on adults and findings from child populations are inconsistent (e.g. Stirling, Riley, & Clark, 2006; Tely, et al., 2008). As such, there is a need to further investigate the effects of anxiety upon spatial attentional biases in children. Furthermore, no previous child VP studies have examined covert spatial attention (i.e., initial shifts of attention in the absence of eye movement). Covert attention can be investigated using stimulus exposure durations of 200ms or less (Stevens, Rist, & Gerlach, 2011). Adult research investigating covert attention have found that high anxious individuals display initial biases of attention towards threat (e.g., Mogg, Bradley, DeBono, & Painter, 1997).

Consequently, the aim here was to investigate the effects of high and low levels of anxiety upon biases of covert spatial attention in a child population. This was achieved using a VP task with a stimulus exposure duration of 200ms.

Participants and Measures

1. 124 local primary school children (65 male; 59 female), aged 8 to 11 years (M=9.17; SD=+.88), took part in a pre-selection process:
   - Tract subscale of the State-Trait Anxiety Inventory for Children (STAIC, Spielberger, 1973) administered Children’s Depression Inventory Short Form (CDI-S; Kovacs, 1992) administered Participants assigned to groups of high and low levels of trait anxiety using a tertile split Participants with high levels of Dysphoria excluded.
   - Together with selection criteria, this resulted in a participant sample of 52 children (26 male; 26 female) aged 8 to 11 years (M=9.17; SD=.92).
   - The State subscale of the STAIC was administered to these participants during the experiment.

Stimuli

- Stimuli were 24 faces selected from the NimStim face set (Tottenham et al., 2009).
- These included angry (threat), happy (positive) and neutral facial expressions (see Figure 1) from 8 actors varying race.
- Stimuli were modified so that a) they appeared monochrome; b) luminance levels were normalised; and c) extraneous features were removed.
- Stimulus presentation was controlled using Inquisit software (www.millisecond.com).

Visual Probe Task Procedure

- The sequence of trial events is displayed in Figure 2.
- Face pairs were threat / neutral (threat trials) and positive / neutral (positive trials).
- These were replaced by a probe randomly appearing in one of the locations previously occupied by a face.
- Trials in which the probe appeared in place of the emotional face were classed as ‘congruent’; trials in which the probe appeared in place of the neutral face were classed as ‘incongruent’ (see Figure 2 for an example).
- Participants were required to select the location of the probe (i.e., left / right) using a response pad.
- The inter-trial interval varied randomly between 750ms and 1250ms.
- Response accuracy and latency were recorded automatically throughout.

Results

Initial Analysis

Attentional bias scores were calculated by subtracting mean reaction times (RTs) on congruent trials from mean RTs on incongruent trials. Thus, positive scores inferred an attention bias towards emotional stimuli, whereas negative scores inferred an attention bias away from emotional faces.

The mean RTs when probes replaced threat faces and positive faces were 484.64ms (SD = 110.53ms) and 489.50ms (SD = 116.18ms), respectively. The mean bias scores for threat faces and positive faces were -.95 (SD = 34.81) and -7.19 (SD = 39.84), respectively.

Trait Anxiety Analysis

To investigate trait anxiety, a mixed ANOVA was carried out with Face Type as the within-groups IV, Trait Anxiety (high [n = 26] vs. low [n = 26]) as the between-groups IV, and bias scores as the DV. There was no main effect of face type, however, there was a significant main effect of trait anxiety on bias scores [F(1, 49) = 4.71, p = .035]. Estimates revealed that high trait anxious participants displayed a negative bias overall (M = -13.32, SD = 51.30), whereas low trait anxious participants displayed a positive bias overall (M = 2.71, SD = 40.14) (see Figure 1). No interaction effect was found.

State Anxiety Analysis

A similar analysis was conducted with State Anxiety (high [n = 27] vs. low [n = 26]) as the between-groups IV. No main effects nor an interaction effect were found.

Discussion

Findings demonstrated that there were no differences in how participants initially attended to threat and positive faces in general. However, it was found that high trait anxious children displayed an initial attentional bias away from emotional faces, whereas low trait anxious children displayed an initial attentional bias towards emotional faces. This is in contrast with previous adult studies (e.g., Mogg, Bradley, de Bono, & Painter, 1999). One explanation for the present findings is that high, relative to low, trait anxious children appraised both angry and happy faces as threatening (Bradley et al., 1999). To our knowledge, this is the first VP study to demonstrate that trait anxiety mediates covert attention to emotional stimuli in a child population.

References