Attentional bias for emotional faces in anxiety and defensiveness: Evidence from eye-movements during visual search

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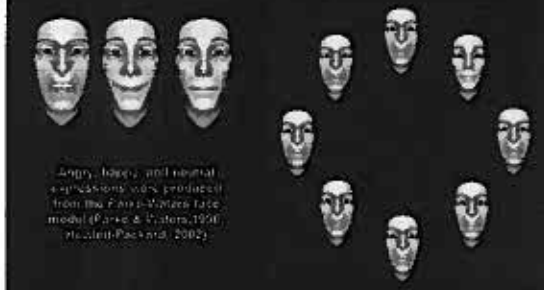
1. Abstract and summary of findings

High anxiety is associated with an attentional bias towards threatening stimuli (e.g., Mogg & Bradley, 1998; Koster et al., 2004) and with a failure to disengage from the processing of this material (e.g., Fox et al., 2001; Fox et al., 2002). This analysis of attentional bias is, however, mostly limited to the analysis of reaction times. Repressive-defensiveness, on the other hand, is associated with the effective avoidance of threat-related material (e.g., Kline et al., 1998; Caldwell & Newman, 2005), and a bias towards the perception of positive stimuli (e.g., Kline et al., 2002). The current investigation recorded participants' eye-movements as a second measure of attentional bias. Participants were presented with a circle of faces, and asked to identify the 'odd one out'. The emotional expressions assigned to the 'target' and 'crowd' faces were manipulated. Results indicated that an angry crowd slowed down detection of target in high-anxious individuals. Eye-movement analysis found that high-anxious individuals made more non-target fixations in a crowd of angry faces that contained a happy target. These findings extend the 'delayed disengagement hypothesis' in anxiety, through the measurement of eye-movements during a visual search task. No significant effects of repressive-defensiveness were observed in relation to emotional expression manipulation of 'target' or 'crowd'. However there was a trend for high defensive individuals to be faster in finding a happy target in a crowd of angry faces. In a similar manner, a non-significant trend showed that high defensiveness was associated with slower detection of angry target in a crowd of happy faces.

2. Overview of Method and Design - *Visual search task*



Angry, happy, and neutral expressions were produced from the Ekman-Matsumoto face model (Ekman & Matsumoto,1994; Hasselt-Packard, 2002).

Eye-tracking device

The LC technologies 'Eye-gaze' system was used to track eye-movements (LC Technologies, 2003). The system uses the Pupil-Centre Corneal Reflection method (PCCR; Merchant & Morrissette, 1973). The screen position of the gaze-point is estimated at 60Hz, with a typical root mean square error of less than 0.35mm. The Eye-gaze system estimates participant fixations by spatial averaging over groups of gaze-points. A minimum duration of an individual fixation is defined as 100ms and the maximum fixation radius is defined as 0.35mm). The presentation of stimuli and responses were controlled using the DMDX software.

Predictions

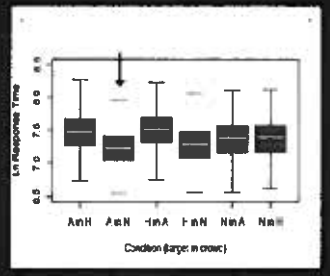
We were especially interested in the effects of crowd on finding of target. We predicted that high anxiety will be associated with a slower detection of target in a crowd of angry faces. On the other hand, repressive-defensiveness would be associated with faster detection of target in an angry crowd. There would be an advantage for finding angry targets in neutral crowd and this effect would be enhanced by anxiety levels.

Participants

Participants were defined by their levels of trait anxiety and defensiveness. These two measures were treated as continuous variables in the analysis (the correlation between the two was very low, $r = .2$).

3. Results

1. Reaction time (RT)



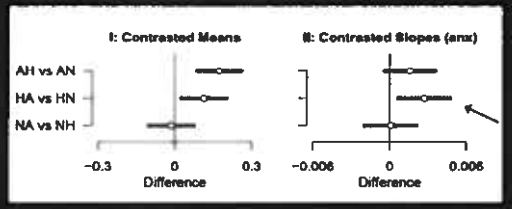
Note: A = angry, H = happy, N = neutral

Fig. 1 shows that participants are faster to detect the angry target in the neutral crowd (AngT/NeutC).

Significant (anxiety X condition) interaction! Explored below...

We conducted planned contrasts to examine effect of 'crowd' on 'target' (Fig. 2 below).

We took the difference between estimated coefficients of two conditions and computed the confidence interval. Each condition contained a slope estimated as a function of anxiety (AT).



AH vs AN = Effect of happy vs neutral crowd on finding of angry target
HA vs HN = Effect of angry vs neutral crowd on finding of happy target
NA vs NH = Effect of angry vs happy crowd on finding of neutral target

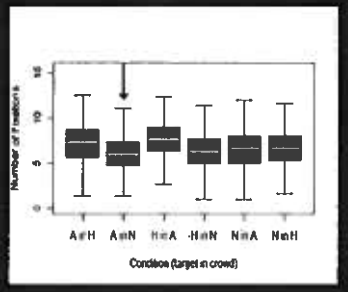
Fig. 2 (C) [illegible]

Fig. 2 (A2) shows that in high-anxious individuals an angry crowd relative to a neutral crowd, slows down detection of happy target.

3. Results

2. Eye-movements

Analysis showed a strong linear relationship between RT and number of fixations, $r = .79$.



Note: A = angry, H = happy, N = neutral

Fig. 3 shows that participants make more fixations on non-target faces when crowd contains neutral faces and target is an angry face (AngT/NeutC).

Significant (anxiety X condition) interaction! Explored below...

We conducted planned contrasts to examine the effect of 'crowd' on 'target' (Fig. 4 below), as we did with RT data (above).

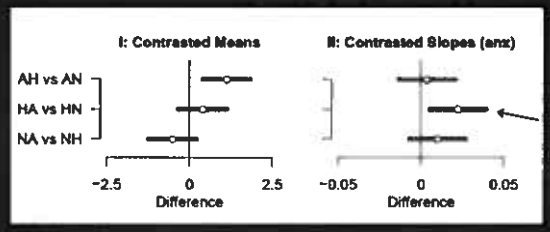


Fig. 4 (B2) shows that high-anxious individuals make more fixations in an angry crowd when finding target. This effect was significant, when target was a happy face.

Taken together, these findings replicate and extend the delayed disengagement hypothesis in anxiety.

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