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The time-course of attention to emotional faces in social phobia

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ABSTRACT

This study investigated the time-course of attentional bias in socially phobic (SP) and non-phobic (NP) adults. Participants viewed angry and happy faces paired with neutral faces (i.e., face-face pairs) and angry, happy and neutral faces paired with household objects (i.e., face-object pairs) for 5000 ms. Eye movement (EM) was measured throughout to assess biases in early and sustained attention. Attentional bias occurred only for face-face pairs. SP adults were vigilant for angry faces relative to neutral faces in the first 500 ms of the 5000 ms exposure, relative to NP adults. SP adults were also vigilant for happy faces over 500 ms, although there were no group-based differences in attention to happy-neutral face pairs. There were no group differences in attention to faces throughout the remainder of the exposure. Results suggest that social phobia is characterised by early vigilance for social cues with no bias in subsequent processing.

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1. The time-course of attention to emotional faces in social phobia

Research has increasingly emphasized the role of emotion in regulating attention to fear-relevant stimuli (Öhman, Flykt, & Lundqvist, 2000). In the context of social anxiety, it is generally assumed that socially anxious individuals are biased toward selective processing of social threat cues, known as *attentional bias* (Bögels & Mansell, 2004). However studies have also shown that socially anxious individuals may *avoid* processing social threat (Chen, Ehlers, Clark, & Mansell, 2002; Mansell, Clark, Ehlers, & Chen, 1999; Rinck & Becker, 2005). Findings of both *vigilance* and *avoidance* are prominent in social anxiety (for review see Heinrichs & Hofmann, 2001) and have prompted researchers to develop more sophisticated models of attentional bias that allow for variations in the direction of attentional allocation. Several authors have proposed that anxiety is characterised by a *vigilant-avoidant* pattern of attentional allocation, in which anxious individuals initially orientate toward threat but then shift attention away in order to alleviate anxious mood (Mogg, Bradley, de Bono, & Painter, 1997; Mogg, Mathews, & Weinman, 1987). This two-stage model assumes that the direction of attentional bias might vary throughout the information processing stream, and as a result, has prompted research into the time-course of attentional bias. The

main goal of this research has been to determine whether attentional bias occurs in both the early and late stages of attentional processing, and whether the direction of attention bias varies throughout these stages. To date, however little is known about the time-course of attentional bias in social phobia.

Traditional models of social phobia propose that attentional bias is important in maintaining the disorder, however they make competing predictions about the time-course of attentional bias. For example, Rapee and Heimberg's (1997) model of social phobia proposes that socially phobic individuals detect social threat cues rapidly and have difficulty disengaging attention from them. Once external threat is detected, the individual also begins monitoring an internal representation of themselves as they appear to others. Overall, the model predicts early and sustained vigilance for threat; however it remains possible that splitting attention toward internal cues may cause the outward-directed attentional bias to diminish over time. In contrast, Clark and Wells' (1995) model of social phobia proposes that socially phobic individuals avoid social threat, however it is unclear how threat is first detected. If avoidance follows initial overt orientation toward threat, the model would predict a vigilant-avoidant pattern of attention.

Few studies have examined the time-course of attentional bias in social anxiety, in part due to limitations in existing technologies. Attentional bias is generally measured using dot probe tasks in which pairs of social threat and non-threat stimuli are presented for 500 ms and replaced by a probe. Vigilance for threat is indicated by faster detection of probes replacing threat stimuli compared with neutral stimuli. This task provides only a static snap-shot of attention and is ill equipped to study the time-course of attentional

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bias. One approach to assessing the time-course of attentional bias has been to study the eye movements (EMs) of anxious individuals while viewing threatening pictures. EM provides a dynamic, 'on-line' registration of attention, enabling researchers to examine the time-course of selective attention over much longer stimulus durations. However, EM studies with socially anxious individuals have also produced equivocal results.

Horley, Williams, Gonsalvez, and Gordon (2003) monitored the EMs of socially phobic and non-phobic individuals to single photographs of sad, happy and neutral faces for 10 s. Social phobics spent less time viewing informative facial regions, particularly the eyes, but showed extensive scanning of non-feature areas of the face. Horley et al. replicated these results with the addition of angry faces (Horley Williams, Gonsalvez, & Gordon, 2004) and found that hyperscanning with eye avoidance was particularly pronounced in angry faces, suggesting elements of both vigilance and avoidance of social threat. However, it is difficult to extrapolate these results to draw conclusions about the time-course of attentional bias as EM data were averaged across the entire 10 s viewing exposure. Consequently, although socially phobic individuals avoided viewing facial features overall, it is possible that they initially looked toward facial features but then averted their gaze to non-feature regions of the face. In addition, given that individuals viewed only one facial expression at a time, results do not reflect selective processing of affective vs. neutral social cues.

More recently, Garner, Mogg, and Bradley (2006) assessed the first EM of high and low socially anxious individuals to face pairs. When participants were threatened with having to give a speech, high socially anxious individuals were faster to initiate a first EM to emotional (happy and angry) faces relative to neutral faces. However, this fixation was brief, with socially anxious individuals tending to fixate on emotional faces for less time than low anxious individuals. The authors concluded that under conditions of social-threat, high socially anxious adults rapidly orientate toward emotional faces, but then quickly disengage their attention. The authors further suggested that a *threat-specific* bias might be more apparent in those with clinical levels of social anxiety. To that end, it is important to replicate this work in those diagnosed with social phobia.

The current study aimed to extend previous research in several ways. We examined the time-course of attentional bias in individuals diagnosed with social phobia and healthy controls using EM as a continuous index of selective attention. Previous dot probe and EM studies have produced reliable evidence for a bias in early attentional processing (Heinrichs & Hofmann, 2001) therefore we predicted that socially phobic adults would show an attentional bias during the first 500 ms of stimulus viewing. Studies have also shown, however, that the precise direction of early attentional bias might vary depending upon the context in which social threat occurs. Clark and McManus (2002) argued that if socially anxious individuals have the opportunity to avoid social cues (e.g., faces), they will do so and will preferentially attend instead to external non-social cues, such as objects (e.g., Chen et al., 2002; Mansell et al., 1999). However, if presented with two faces, socially anxious individuals will preferentially attend to the more negative face (e.g., Mogg & Bradley, 2002). To control for this, EM was monitored to stimuli pairs containing: (a) happy and angry faces matched with neutral faces (i.e., face-face pairs); and (b) happy, angry and neutral faces matched with household objects (i.e., face-object pairs). Following Clark and McManus's theory, we predicted that socially anxious adults would show an early bias toward negative faces on face-face trials and would avoid faces in favour of objects on face-object trials.

This is the first study to examine EMs to face pairs in socially phobic adults over several seconds. Studies to date have produced

mixed support for the existence of a bias in sustained processing. Studies examining scanning patterns over long periods (Horley et al., 2003, 2004) have used singular faces (not stimulus pairs) and have found elements of both vigilance and avoidance. Two studies using face pairs (Garner et al., 2006; Mogg, Philippot, & Bradley, 2004) failed to demonstrate attentional bias in sustained processing, however they used much shorter time frames. Based on the two dominant models of social phobia we predicted that social phobia might be characterised by either sustained vigilance for social cues (Rapee & Heimberg, 1997) or late-stage avoidance (Clark & Wells, 1995).

2. Method

2.1. Participants

Two groups of participants were recruited for this study, a clinical sample and non-clinical controls. All participants were assessed by graduate students in clinical psychology using the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; DiNardo, Brown, & Barlow, 1994). Data from our laboratory (overlapping with this sample) indicate a moderate to strong interrater reliability for diagnoses of anxiety and mood disorders, including a very high reliability for a diagnosis of social phobia ($K = 0.89$). Avoidant personality disorder was diagnosed using the ICD-10 International Personality Disorder Examination (Loranger, Janca, & Sartorius, 1997). Interrater reliability for avoidant personality diagnoses for our clinic also showed good agreement ($K = 0.65$).

The clinical group consisted of 30 males and 29 females who met diagnostic criteria for social phobia (generalized subtype) (DSM-IV; American Psychiatric Association, 1994). Clinical participants were seeking treatment from the Centre for Emotional Health at Macquarie University. Ages ranged from 18 to 60 years ($M = 33.15$ yrs; $SD = 9.93$). All clinical individuals met criteria for a comorbid diagnosis including, 66.66% generalized anxiety disorder, 26.6% other anxiety disorders, 20% major depression, and 26.6% dysthymia. More than half (62.71%) met criteria for avoidant personality disorder.

The control group consisted of 28 individuals, including 16 males and 12 females. Ages ranged from 18 to 60 years ($M = 36.36$ years; $SD = 13.83$). No control participants met criteria for a mental disorder according to the ADIS-IV (DiNardo et al., 1994). Twelve control participants were 1st year psychology students who received course credit for their participation. The remainder were community volunteers recruited from advertisements seeking "confident, worry-free individuals who have never seen a mental health professional". Volunteers were paid a small sum as reimbursement for their time and effort.

2.2. Materials

Two stimulus sets were used in this experiment. In one stimulus set, two faces were paired together. There were 32 face pairs consisting of 16 angry and 16 happy faces matched with a neutral face of the same person. This set also contained 4 practice pairs containing 1 exemplar of each pair-type (i.e., 1 angry-neutral male, 1 angry-neutral female, 1 happy-neutral male, and 1 happy-neutral female). In the other set faces were paired with objects. There were 36 face-object pairs, consisting of 12 angry, 12 happy and 12 neutral faces matched with a household object (clock, sofa, vacuum cleaner, phone, lamp or table). There were 6 practice pairs containing 1 exemplar of each pair-type (i.e., 1 angry male-object, 1 happy male-object, 1 neutral male-object, 1 angry female-object, 1 happy female-object, 1 neutral female-object). Each stimulus set included equal numbers of males and females. The location of each

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