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The misclassification of facial expressions in generalised social phobia

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ABSTRACT

The aim of this study was to investigate facial expression recognition (FER) accuracy in social phobia and in particular to explore how facial expressions of emotion were misclassified. We hypothesised that compared with healthy controls, subjects with social phobia would be no less accurate in their identification of facial emotions (as reported in previous studies) but that they would misclassify facial expressions as expressing threatening emotions (anger, fear or disgust). Thirty individuals with social phobia and twenty-seven healthy controls completed a FER task which featured six basic emotions morphed using computer techniques between 0 percent (neutral) and 100 percent intensity (full emotion). Supporting our hypotheses we found no differences between the groups on measures of the accuracy of emotion recognition but that compared with healthy controls the social phobia group were more likely both to misclassify facial expressions as angry and to interpret neutral facial expressions as angry. The healthy control group were more likely to misclassify neutral expressions as sad. The importance of the role of these biases in social phobia needs further replication but may help in understanding the disorder and provide an interesting area for future research and therapy.

The ability to identify and interpret facial expressions of emotion is crucial to normal interpersonal relationships. Not only do facial expressions signal the emotional states of others, but they also influence the production and regulation of affective states and behaviour in response to these signals (Phillips, Drevets, Rauch, & Lane, 2003). The investigation of facial expression recognition (FER) in social phobia may be particularly pertinent in view of clinical reports from people with this condition that looking at faces and making eye contact with others are often difficult (Hermans & Van Honk, 2006). This may be because other peoples' faces are seen as threatening because they convey nonverbal signs of evaluation which is a basic fear in social phobia.

In addition to its clinical face validity the investigation of responses to facial expressions of emotion in social phobia can test for cognitive biases that may be involved in this disorder. Theoretical models of social phobia suggest that biased information processing contributes both to the aetiology and maintenance of the disorder (Clark & Wells, 1995; Rapee & Heimberg, 1997). Evidence supporting these models has included findings of biased attention to social threat (Gilboa-Schechtman, Foa, & Amir, 1999; Mogg & Bradley, 2002; Mogg, Philippot, & Bradley, 2004), excessive attention to internal cues (Bogels & Mansell, 2004; Mansell, Clark, & Ehlers, 2003) and the negative interpretation of ambiguous social events (Amin, Foa, & Coles, 1998).

Studies of FER in social phobia have typically examined responses to viewing different facial emotions, e.g. anger, sadness, disgust, fear, happiness, surprise and neutral. These have generally suggested that there are no significant differences in FER accuracy between subjects with social phobia compared with healthy controls (Melfsen & Florin, 2002; Philippot & Douilliez, 2005; Stevens, Gerlach, & Rist, 2008). As elaborated by previous authors socially anxious individuals know as well as non-anxious individuals that an angry face means anger and a sad face means sadness (Philippot & Douilliez, 2005). The overall accuracy rates from previous studies of FER are low, often less than 50 percent (Harmer, Hill, Taylor, Cowen, & Goodwin, 2003) which would suggest that it may be important to examine how the facial emotions are misclassified. The misclassification results have not, however routinely been reported in studies.

Studies have also examined the interpretation of neutral or ambiguous facial emotions in social anxiety and these have reported some interesting findings. Some studies have reported that socially anxious individuals interpreted neutral faces as threatening whereas less socially anxious subjects interpreted them as neutral (Mohlman, Carmin, & Price, 2007; Yoon & Zinbarg, 2007). Other studies have however, reported no differences in the interpretation of neutral facial expressions of emotion in groups of people with social phobia and healthy controls (Philippot & Douilliez, 2005). A recent study using images of facial expressions of the emotions of anger, sadness and happiness which were presented at increasing degrees of emotional intensity (from neutral

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to full) reported that social phobia participants needed less intensity to correctly identify anger than the depressed or control groups (Joormann & Gotlib, 2007). The investigation of the response to neutral or ambiguous facial expressions of emotion may be important because these images may be more sensitive to changes in bias or perception than overall accuracy rates. This may also be of clinical relevance because of the inherent ambiguity of many social interactions.

The aim of this study was to further investigate FER accuracy in social phobia and in particular to explore how facial expressions of emotion were misclassified. We hypothesised that compared with healthy controls, subjects with social phobia would be no less accurate in their identification of facial expressions of emotions (as reported in previous studies above) but that they would be more prone to misclassify facial expressions as expressing threatening emotions (i.e. anger, fear or disgust).

1. Method

1.1. Subjects

Thirty individuals with generalised social phobia (19 males, mean age 37 years) were recruited through an article in the local newspaper describing the symptoms of social phobia, and through referrals to the Anxiety Disorders Unit (a publicly funded, outpatient, specialist anxiety service in Christchurch, New Zealand). They were diagnosed with a primary diagnosis of social phobia according to the DSM-IV criteria using the Structured Clinical Interview for DSM IV Axis I Disorders Schedule (SCID-I) (First et al., 1998), which was conducted by clinicians (CB, HC, FC) who had had training in the use of the SCID and had extensive experience in administering structured clinical interviews. This group had no other current Axis I conditions, no neurological disorder and no history of head injury or any serious physical illness that would interfere with their ability to perform the FER task. Of the thirty subjects, twenty were medication free, seven were receiving a selective serotonin reuptake inhibitor (SSRI), one a tricyclic antidepressant, and two benzodiazepines.

Twenty-seven healthy controls (16 males: mean age 39 years) were recruited through advertisements. They were assessed using the Mini International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998). Subjects were excluded if they met criteria for any current or past psychiatric condition, had a history of head injury, neurological disorder, or any serious physical illness, or if they had a first degree relative with a history of any Axis I disorder. Healthy controls were matched as closely as possible to the social phobia group on measures of age, sex, ethnicity, and the National Adult Reading Test (NART) as a measure of estimated IQ.

The study was approved by the Upper South B Regional Ethics Committee (CTR/03/10/176) and written informed consent was given by all patients and volunteers before participation in the study.

1.2. Facial expression recognition task

The FER task featured six basic emotions – happiness, sadness, surprise, fear, anger and disgust taken from the Ekman and Friesin (1976) "pictures of affect" series. These had been morphed between each prototype and neutral using techniques described by Young et al. (1997). Briefly, this procedure involved taking a variable percentage of the shape and texture differences between two standard images 0 percent (neutral) and 100 percent (full emotion) in 10 percent steps. Four examples of each emotion (portrayed by two male and two female actors) at each level of intensity were given between 10 percent and 100 percent (four examples × ten [intensity 10 – 100 percent] × six different emotions – a total of 240 images). Each face was also presented in a neutral expression (24 faces) giving a total of 264 stimulus presentations. Each face was presented in a random order on the computer screen for 500 ms and was immediately replaced with a blank screen. Subjects made their responses by pressing one of 7 labelled keys (the 6 emotions and neutral) on a response box in front of them and were asked to respond as quickly and as accurately as possible. The task was broken down into three blocks with an untimed rest period between each block to prevent fatigue. This task and the morphing techniques (described above) has been used widely previously by other research groups (Harmer, Shelley, Cowen, & Goodwin, 2004).

The outcome measures included accuracy, reaction times and misclassifications. The accuracy was measured as a percentage of the responses. The reaction time was defined as each participant's time to respond to each facial expression (whether or not this was accurate). Misclassifications were examined in two ways; (i) by investigating to which emotion category facial expressions of an emotion were misclassified and (ii) by investigating what percentage of neutral expressions were misclassified to which emotion.

1.3. Procedure

The study took place at the Clinical Research Unit at the Department of Psychological Medicine in Christchurch. Subjects attended the Unit at midday and over a light lunch were asked to complete the self-report measures. These included the Liebowitz Social Anxiety Scale (LSAS) (Liebowitz, 1987); the Spielberger State Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1970); and the Beck Depression Inventory (BDI-II) (Beck, Steer, & Brown, 1996).

The research assistant explained to the participants that their task was to judge the facial expressions of emotion on the screen and to respond using one of the seven possible labeled keys. They were told that the facial expressions of emotion were of differing intensity and included some neutral expressions. They were then familiarized with the FER task by completing a practice block of 14 faces (2 of each emotion at two different levels of intensity, plus 2 neutral). The task was then run in three blocks of approximately 5 min each (to allow for inter-individual variations in task duration).

1.4. Statistics

Demographic and clinical variables were analysed using one-way analyses of variance (ANOVA) for continuous variables and chi-square analysis for categorical variables. FER data (accuracy and reaction times) were analysed using ANOVA with emotion portrayed by the stimulus (anger, disgust, fear, happiness, sadness, surprise) and intensity of the emotion portrayed (neutral or 0 percent, 10 percent, 20 percent, 30 percent, 40 percent, 50 percent, 60 percent, 70 percent, 80 percent, 100 percent) as within subject factors, and experimental group (social phobia or healthy control), gender and medication status as the between subject factors. Further post hoc *t*-tests between groups were then completed for each emotion. Analysis of the misclassification of facial expressions to different emotions was similarly analysed. The misclassification of neutral expressions compared the percentage of neutral expressions misclassified to each emotion using independent *t*-tests between the two groups.

2. Results

2.1. Demographics

The two groups were matched for gender ($\chi^2 = 0.79$), age ($t = 0.59$, d.f. = 55, $p = 0.56$), handedness ($\chi^2 = 0.48$) and scores from