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Sensitivity to posed and genuine facial expressions of emotion in severe depression

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ABSTRACT

The aim of the current study was to investigate whether the ability to distinguish genuine from non-genuine (neutral or posed) facial expressions of emotion (happiness, sadness, fear and disgust) is impaired in depression, and whether improvement in this ability occurs with treatment response. Sixty-eight depressed inpatients and 50 matched healthy controls performed the Emotion Categorisation Task three times over 6 weeks. All participants showed some sensitivity to the meaningful differences between genuine and non-genuine expressions of emotion, with an increasing percentage of faces labelled as genuinely feeling the emotion from neutral to posed to genuine presentations. Depressed patients showed significantly less sensitivity in differentiating non-genuine from genuine expressions of sadness, compared with healthy controls. Performance on the Emotion Categorisation Task did not change over time in treatment responders compared with treatment non-responders. These findings have implications for understanding why depressed individuals may have difficulties in social interactions.

1. Introduction

The ability to recognise the facial expressions of others is vital in interpersonal relationships, as facial expressions are signals of emotional states (Phillips et al., 2003). Interpersonal factors and deficits in social skills play a substantial role in the development and maintenance of major depression (Joormann and Gotlib, 2006). This may be due, in part, to deficits in processing facial expressions.

Several studies have examined aspects of facial emotion processing in major depression. Evidence is relatively consistent that depressed individuals show negative bias when processing faces. Neutral or ambiguous facial expressions are more likely to be interpreted as sad (Bouhuys et al., 1999; Leppanen et al., 2004), and less likely to be interpreted as happy (Surguladze et al., 2004), by individuals with depression, compared with healthy controls. These findings are consistent with psychological theories suggesting that individuals with major depression view their surroundings negatively (Beck, 1967).

What remains to be clarified is whether depressed individuals display deficits in recognising specific emotions. Some studies have found reduced accuracy in recognising happy and/or sad facial expressions in depression (Mandal and Palchoudhury, 1985; Mikhailova et al., 1996), whilst others have found global deficits in facial emotion recognition (Persad and Polivy, 1993; Asthana et al., 1998), or comparable recognition accuracy for sadness and happiness between depressed and control participants (Archer et al., 1992; Kan et al., 2004; Leppanen et al., 2004). This inconsistency may be due to variable methodologies, including differences in the stimuli and the way they are presented, sample characteristics and statistical analyses (Bourke et al., 2010).

A further area of interest is whether changes in facial emotion processing relate to improved clinical state in depression. Impaired recognition of happy faces in depressed individuals taking placebo has been found to reverse 3 h after antidepressant (reboxetine) administration (Harmer et al., 2009), indicating that antidepressants have immediate effects on the brain that can be measured with facial emotion processing tasks. Such tasks may therefore be useful objective markers of treatment response in depression. Although cross-sectional studies have tended to find evidence of persisting abnormalities in facial emotion processing after recovery from depression (Levkovitz et al., 2003; Bhagwagar et al., 2004), longitudinal studies over a major depressive episode have reported more inconsistent findings. Recognition accuracy of schematic happy, sad and neutral faces has been found to improve with successful treatment in depressed male inpatients (Mikhailova et al., 1996), although no comparison group meant that practice effects could not be eliminated. Some studies have found persisting negative interpretive biases over time in depressed samples, regardless of treatment response (Bouhuys et al., 1999; Leppanen et al., 2004). However, in one study the negative bias was accentuated when acutely depressed (Bouhuys et al., 1999) and in the other, analysis of error bias revealed that although depressed patients had a persisting tendency to interpret neutral faces as sad over treatment, remitters became more likely to interpret neutral faces as happy (Leppanen et al., 2004). Inconsistency among studies is not surprising given the wide variety of tasks and emotional functions tested, and the small sample sizes.

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In our recent study (Douglas et al., 2011), minimal evidence was found of facial expression recognition improvement with treatment response amongst those with severe depression. An explanation of this finding may be that in our facial expression recognition task, targets were posing (*showing*) an emotion, but these emotions were not necessarily what targets were actually *feeling*. Recognition of felt rather than posed facial expressions may be an important alternative measure of facial emotion processing. Spontaneous (genuine) expressions occur as part of an emotional experience. Deliberate (posed) expressions are not coupled with the corresponding emotion and occur as a means to fake, mask or suppress emotional experience (Ekman and Friesen, 1982; Ekman et al., 1997). Thus, posed expressions provide limited information about the actual affective state of a person.

Both spontaneously expressed and deliberately posed facial expressions are routinely used for a variety of reasons. Individuals may smile as a part of cursory social etiquette, in order to disguise other feelings, or because they are truly feeling happy (Ekman and Friesen, 1982). It is important to identify an individual's mood state and not just their facial expressions, as the interaction possibilities afforded by individuals in varying mood states differ (Miles and Johnston, 2007; Johnston et al., 2010). Determining whether facial information specifies emotion or not is crucial to effective social functioning. Mistaking posed displays for genuine displays can result in negative outcomes for the social perceiver (Miles, 2009). A lessened ability to distinguish posed from genuine expressions of emotion might partially explain why depressed individuals have difficulty taking part in social interactions.

In the current study we used a task – the Emotion Categorisation Task – developed to measure sensitivity to posed versus genuine facial expressions of emotion (Walton, 2004). Participants determine whether target individuals in photographs displaying facial expressions of emotions are feeling these emotions or not. Using sensitivity analysis, healthy controls have shown the ability to distinguish between genuine (i.e., feeling) and posed (i.e., not feeling) facial expressions of sadness, happiness and fear (McLellan et al., 2010). Examining the performance of depressed individuals on the Emotion Categorisation Task may offer insight into the difficulties that depressed individuals experience when processing facial information. As facial emotion processing has been reported to change soon after antidepressant administration in depressed patients (Harmer et al., 2009), we sought to determine whether initial subtle changes in response to treatment (from baseline to 10–14 days) could be detected by examining performance on this Emotion Categorisation Task.

We report performance on the Emotion Categorisation Task of depressed inpatients and healthy controls, as well as change in performance over the course of six weeks of treatment for depression. Based on the particular difficulty that severely depressed patients have with social interactions, we hypothesised that our sample of severely depressed patients would have lower sensitivity scores than controls.

2. Method

2.1. Participants

Consecutive inpatients admitted to Hillmorton Hospital (Christchurch, New Zealand) experiencing a major depressive episode according to DSM-IV criteria (American Psychiatric Association, 1994), were approached to take part in the study over a two-year period. Exclusion criteria included current significant alcohol or substance abuse or dependence, endocrinological, neurological or chronic medical conditions, pregnancy, previous serious head injury or electroconvulsive therapy in the 12 months prior to admission. Sixty-eight depressed inpatients (major depressive disorder: $n=60$, bipolar depression, $n=8$), between the ages of 18 and 60 years, were recruited.

Fifty healthy controls were recruited from the general population in Christchurch with the same exclusion criteria and, in addition, for a personal or immediate family history of major mental illness. Controls and depressed patients were group-matched for age, sex and predicted verbal IQ (NART, Nelson, 1982).

All participants completed further neuropsychological assessment, including the Facial Expression Recognition Task (Harmer et al., 2003), a task involving recognition of posed facial expressions (Douglas and Porter, 2010; Douglas et al., 2011).

2.2. Study design

The Emotion Categorisation Task and a control task – a Sex Discrimination Task – were administered to participants three times over 6 weeks, always between 11:00n and 15:00n: baseline (for patients, within 5 days of admission to hospital), 10 to 14 days after baseline and 6 weeks after baseline. The Montgomery–Åsberg Depression Rating Scale (Montgomery and Åsberg, 1979) was administered at each assessment by the primary investigator (KD), who was trained by a consultant psychiatrist (RP). At 6 weeks, the MADRS was used to classify depressed patients as treatment responders (>50% reduction in MADRS score from baseline to 6 weeks) or non-responders (≤50% reduction in MADRS score from baseline to 6 weeks). The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I, First et al., 1998) assessed psychiatric comorbidity within the depressed sample. The study was approved by the National Health and Disability Ethics Committee and all participants gave informed written consent.

2.3. Measures

2.3.1. Emotion Categorisation Task

In the Emotion Categorisation Task (Walton, 2004), participants were presented with photographs of targets one after another on a computer screen. For the first block of trials, participants judged whether each of the 12 targets presented was *feeling* or *not feeling* happy (4 neutral expressions, 4 posed happy expressions and 4 genuinely happy expressions; displays were presented in a unique random order for each participant) by pressing appropriate keys on the computer keyboard (see Fig. 1 for examples of neutral, posed and genuine expressions). This process was repeated three times for blocks of sad, fearful and disgusted expressions. In each block of trials, there were four different targets, with each target having a neutral, posed and genuine expression of emotion. All targets were female. Responses were recorded by computer software (Walton, 2004). For a detailed description of how posed and genuine facial expressions were generated for the Emotion Categorisation Task; see McLellan et al. (2010). Whilst McLellan et al. (2010) did not include expressions of disgust in their study, expressions of disgust were developed by McLellan (2008) using the same standardised procedures.

2.3.2. Sex Discrimination Task

Participants also performed a Sex Discrimination Task (Walton, 2004) to ensure that any deficit found in the Emotion Categorisation Task was not due to a general impairment in processing faces. Participants were presented with photographs of targets, one after another, on the computer screen and were asked to identify whether the individual was *male* or *female*. Fifty photographs were presented and responses were recorded by the computer software.

2.4. Statistical analysis

Statistical analyses were conducted using SPSS for Windows, version 13.0 (SPSS, 2004). Demographic and baseline neuropsychological data were assessed using chi-squared tests or analysis of variance (ANOVA), with group as the between-participants factor. Baseline accuracy on the four emotion blocks of the Emotion Categorisation Task was analysed using repeated measures ANOVA, with emotion (happy, sad, fearful, disgusted) and expression (neutral, posed, genuine) as within-participants factors and group (depressed, control) as a between-participants factor. Preliminary analyses included smoking status and sex as between-participants factors (see below for rationale). Smoking status did not influence the results, and thus, analyses were re-run without the smoking status factor. Preliminary analyses revealed significant effects of sex for performance on the Sex Discrimination Task, and in those analyses only sex was included as a between-participants factor. Changes in performance on this task over time were examined using repeated measures ANOVA, with an additional within-participants factor of time (baseline, 10–14 days, 6 weeks) and with the between-participants factor of group including control, responders and non-responders. Post-hoc analyses were conducted when differences amongst groups were observed. The Fisher Least Significant Difference (LSD) test for pair-wise comparisons, or separate one-way ANOVAs, were used to examine such differences.

3. Results

3.1. Demographic and clinical characteristics

Depressed and control groups did not differ in any demographic characteristics (see Table 1). No participants reported consumption of alcohol or marijuana in the 24 h prior to assessment. The depressed group had a significantly greater proportion of smokers than the control group ($P=0.006$), but the number of cigarettes they smoked prior to baseline assessment was not significantly different (responders = 3.8 cigarettes (S.D. = 1.8), non-responders = 5.7 cigarettes (S.D. = 2.6) and control = 3.2 cigarettes (S.D. = 2.2); $F_{2,20}=2.5$, $P=0.1$). The most prevalent comorbid psychiatric disorders in the depressed sample were post-traumatic stress disorder (16.1%), panic disorder with agoraphobia (13.2%) and alcohol abuse (8.8%).