



Perception bias of disgust in ambiguous facial expressions in obsessive–compulsive disorder

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ABSTRACT

Impaired recognition of facial expressions of disgust has been suggested for patients with obsessive–compulsive disorder (OCD). This study aimed to compare the perception of negative emotions by OCD patients and controls using both non-ambiguous and ambiguous facial expressions. Forty-one OCD patients and thirty-seven controls performed the computerised emotion perception task. There were no differences between OCD patients and controls in the frequency of correct identification of non-ambiguous facial expressions. However, OCD patients were more likely to perceive disgust and less likely to perceive anger in response to ambiguous facial expressions when controlling for covariates. In OCD patients, a higher cleaning dimension was associated with a lower perception of anger and a higher perception of disgust when presented with ambiguous facial expressions. The domains of core disgust and contamination-based disgust domains of disgust sensitivity were positively correlated with the perception of ambiguous facial expressions as disgust, as well as cleaning symptom dimension scores. Our findings suggest that OCD patients, particularly those with higher washing/contamination symptoms, are more likely to perceive disgust in ambiguous facial expressions.

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1. Introduction

Disgust is thought to underlie various psychiatric illnesses. Initially defined as a revulsion response to distasteful foods (Darwin and Ekman, 1998), the current concept of disgust now also includes responses to a wide range of stimuli, such as poor hygiene, potential for disease and violations of the normal body envelope (Rozin and Fallon, 1987).

At its core, disgust functions to prevent contamination and disease (Darwin and Ekman, 1998) by the characteristic behavioural dimension of avoidance (Rozin and Fallon, 1987). Disgust also has specific physiological manifestations, such as nausea and a distinct facial expression of narrowed nostrils, wrinkling of the brow and raising of the upper lip (Phillips et al., 1998; Rozin et al., 1994). From a developmental perspective, perception of disgust is thought to be absent at birth and to develop during childhood (Rozin and Fallon, 1987). The learning process is thought to occur through experience with other peoples' disgust, and to involve the identification of disgust-eliciting stimuli, the recognition of other peoples' facial expressions of disgust, and the correlation between the two (Sprengelmeyer et al., 1996). If there is a dysfunction in this appraisal process, the stimuli that elicit disgust in those with a dysfunction may

be dissimilar from the stimuli that elicit disgust in others (Sprengelmeyer et al., 1996).

Impairment in this disgust appraisal process has been suggested to be closely related to obsessive–compulsive disorder (OCD). OCD is a relatively common disorder, characterised by persistent and unwanted thoughts and ritualistic behaviour. Among the heterogeneous symptoms of OCD, concerns with contamination are commonly involved. OCD patients often exhibit heightened appraisals of vulnerability to infection and spread of contamination in response to offensive objects, which elicit washing compulsions (Olatunji and McKay, 2007). Because the situations in which OCD patients experience disgust are different from those in which normal individuals experience disgust, it has been hypothesised that the learned association between the emotion of disgust and the facial expressions of disgust may have failed to develop (Sprengelmeyer et al., 1997).

Experimental support for this theory of disgust perception in OCD, however, has been mixed. Sprengelmeyer et al. (1997) reported that all OCD patients examined showed a distinct and significant impairment in recognising facial expressions of disgust. However, subsequent studies have not revealed a clear association between OCD and the failure to recognise facial expressions of disgust. Parker et al. (2004) and Buhlmann et al. (2004) both reported no significant differences between OCD patients and normal controls with respect to facial expression recognition. In a more recent study, the results of Sprengelmeyer et al. (1997) were replicated, but the magnitude of the

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effect was much smaller – only about a third of OCD subjects showed the impairment (Corcoran et al., 2008). These previous studies used non-ambiguous facial expressions to assess the responses of OCD patients, which could result in other important aspects of disgust perception being missed.

Ambiguous facial expressions may further our understanding of emotion perception (Kee et al., 2006; Pollak and Kistler, 2002). Whereas non-ambiguous facial expressions are helpful in assessing facial emotion recognition, ambiguous facial expressions reveal whether individuals have a perception bias towards a certain emotion.

Furthermore, due to the heterogeneity of OCD, some researchers have hypothesised that only a subset of OCD patients may have altered disgust perception, particularly those with contamination/washing symptoms (Power and Dalgleish, 2008). Several studies have reported an association between contamination fear and disgust sensitivity (Mancini et al., 2001; Olatunji et al., 2004; Woody and Tolin, 2002), but the association between contamination fear and disgust perception has not been previously investigated.

In the present study, we recruited OCD patients and healthy controls for the following purposes: (1) to compare their emotion recognition of non-ambiguous facial expressions, (2) to test if there are any perception biases in the classification of ambiguous facial expressions, especially the emotion of disgust, (3) to determine if the particular OCD symptom dimension of cleaning is associated with disgust perception and (4) to evaluate the domains of disgust sensitivity associated with disgust perception and the cleaning dimension of OCD.

2. Materials and methods

2.1. Participants

Forty-one primary OCD patients were recruited from the psychiatric outpatient clinic of Severance Hospital, Yonsei University Medical Center. Patients were interviewed and diagnosed by experienced psychiatrists on the basis of the structured clinical interview for Diagnostic and Statistical Manual of Mental Disorders, fourth edition Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) (SCID-CV) (First et al., 1997). Those with co-morbid diagnoses were included under the condition that OCD was the main reason for their visit. Exclusion criteria were substance abuse, psychosis or any neurological or medical condition that could affect the subject's performance. Thirty-seven normal controls were selected to match the OCD group for sex, age, and education level. SCID-CV was used to ensure that the normal controls had no history or current symptoms of neurological or psychiatric disorders and were not on any medication.

2.2. Measures

For the OCD subjects, the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS) and Y-BOCS Symptom Checklist (Goodman et al., 1989) was used to assess the severity and types of OC symptoms. A score of 0, 1 or 2 was assigned to each of the symptom categories of the Y-BOCS Symptom Checklist as follows: 0 if the patient did not have any of the symptoms under the category; 1 if the patient had at least one symptom, but not the principal symptom, under the category; or 2 if the principal symptom was under the symptom category. Using the four dimensional factors (symmetry, forbidden thoughts, cleaning and hoarding) identified by Bloch et al. (2008) in their meta-analysis, the sum of the scores for the symptom categories under each

dimensional factor was the score for that dimension. Psychiatrists administered the Y-BOCS on the day the emotion perception task was performed. In both OCD and control groups, the severity of depressive symptoms was measured using the Montgomery-Asberg Depression Rating Scale (MADRS) (Davidson et al., 1986). To measure disgust sensitivity, all participants completed the Disgust Scale (Haidt et al., 1994), which includes seven domains of disgust elicitors i.e., food, animals, body products, body envelope violations, death, sex and hygiene) and sympathetic magic. In this study, a recently proposed model (Olatunji et al., 2007) consisting of the following three factors was used: contamination-based disgust (the disgust reaction based on the threat of transmission of contagion), core disgust (based on a sense of offensiveness and the threat of disease) and animal reminder disgust (stimuli that serve as reminder of animal origins of humans). All tests were in Korean, and the validity and reliability of these tests have been confirmed (Ahn et al., 2005; Chung et al., 2000; Kang et al., 2008).

2.3. Stimuli and procedure

2.3.1. Stimuli

Pictures from the Facial Expressions of Emotion: Stimuli and Tests (FEEST) (Young et al., 2002) were used. Each picture is a morphed image of one prototypical facial expression with another from the Ekman and Friesen (1976) series. Morphed continua of only the negative emotions (anger, disgust, fear and sadness) were selected in 20% steps (e.g., 10% anger–90% fear, 30% anger–70% fear, 50% anger–50% fear, 70% anger–30% fear and 90% anger–10% fear) (Figs. 1 and 2). Given that happiness and surprise are rarely confused with disgust (Corcoran et al., 2008), they were not selected to increase the difficulty of the task. Two models, one male and one female, were used, resulting in a total of 60 facial expressions (6 continua $\times$ 5 steps $\times$ 2 models). Although presented together, facial expressions with more than 70% morphed emotion were categorised as non-ambiguous, whereas 50% morphed facial expressions were considered to be ambiguous, and the two kinds of stimuli were analysed separately.

2.3.2. Procedure

All participants completed a computerised emotion perception task. Participants were asked to choose which emotion the facial expressions most resembled among the four negative emotions. With 60 facial expressions repeated for six blocks, a total of 360 stimuli were shown (288 non-ambiguous and 72 ambiguous), in random order. For non-ambiguous stimuli, there were 72 stimuli for each emotion. For ambiguous stimuli, there were no correct answers because no dominant emotion is present in 50% morphed emotions. Emotion word choices were counterbalanced across trials and presented below the pictures on the screen. Only when a response was made, the next picture appeared. All participants were asked the meaning of the emotion words before performing the task to test for comprehension. The entire task took approximately 30 minutes.

2.4. Statistical analyses

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 12.0 for Windows (SPSS Inc., Chicago, IL, USA). Demographics and clinical variables for OCD patients and controls were compared using *t*-tests or the chi-square test. Multivariate analysis of covariance (MANCOVA) was used to compare the perception of each of the four emotions for non-ambiguous and ambiguous facial expressions between OCD patients and controls. All MANOVAs were performed both with and without controlling for age, sex and depression severity. The influence of the four symptom dimensions on the perception of facial expressions was tested using a multiple regression model (stepwise method). In addition, an enter method, in which the test is repeated by entering the covariates of age, sex and depression severity in the model first, was used. Pearson correlation analyses were conducted to explore the relationship between disgust sensitivity, the perception of facial expressions, and the cleaning dimension.

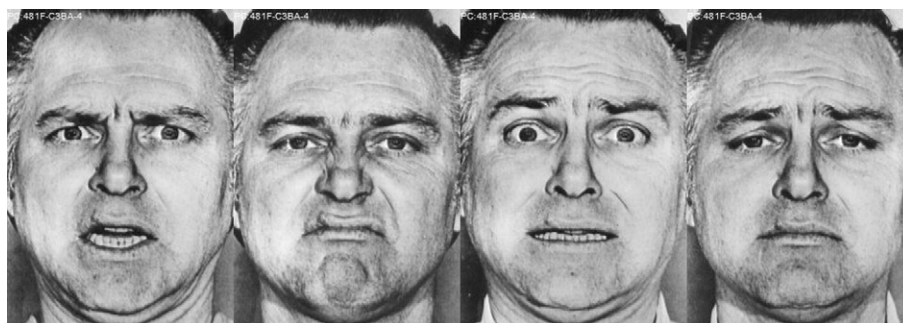


Fig. 1. Non-ambiguous facial expressions of anger, disgust, fear and sadness (more than 70% morphed).

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