(a) Title: Facial Emotion Recognition and Alexithymia in Adults with Somatoform Disorders.

(b) Running head: Somatoform disorders, alexithymia and emotion recognition

(c) and (d) names of authors:

Francisco Pedrosa Gil [a], MD, Nathan Ridout [b], PhD, Henrik Kessler [c], MD, Michaela Neuffer [d], PhD, Claudia Schoechlin [e], PhD, Harald C. Traue [c], PhD, Marius Nickel [f], MD

[a] Psychosomatic Out-patient Clinic, Department of Medicine Innenstadt, Ludwig-Maximilians-University, Pettenkoferstr. 10, 80036 Munich, Germany.

[b] Clinical and Cognitive Neurosciences, School of Life and Health Sciences, Aston University, Aston Triangle, Birmingham, B4 7ET, UK; United Kingdom.

[c] Clinic of Psychosomatic Medicine and Psychotherapy, Medical Psychology, University of Ulm, Am Hochstraess 8, 89081 Ulm, Germany.

[d] Institute of Medical Psychology, Ludwig-Maximilians-University, Goethestrasse 31, 80336 Munich, Germany.

[e] Department of Clinical Psychology and Psychophysiology, Psychiatric and Psychotherapeutic Hospital, Ludwig-Maximilians-University, Nußbaumstrasse 7, 80336 Munich, Germany.

[f] University Clinic for Psychosomatic and Psychotherapy, Medical University Graz, 8990 Bad Aussee, Austria and University Clinic for Psychiatry 1, PMU, Salzburg, Austria.

(e) Corresponding author:

Francisco Pedrosa Gil, MD, Psychosomatic Out-Patient Clinic, Department of Medicine Innenstadt,Ludwig-Maximilians-University,Pettenkoferstrasse10,D-80336 Munich,Telephone: ++49 89 5160 3572,Fax:++49 89 5160 4751,E-Mail:Francisco.Pedrosa.Gil@med.uni-muenchen.de

ABSTRACT

The primary aim of the present study was to investigate Facial Emotion Recognition (FER) in patients with Somatoform Disorders (SFD). Also of interest was the extent to which concurrent alexithymia contributed to any changes in emotion recognition accuracy. Twenty patients with SFD and twenty healthy, age, sex and education matched, controls were assessed with the FEEL Test of facial emotion recognition and the 26-item Toronto Alexithymia Scale (TAS-26). Patients with SFD exhibited elevated alexithymia symptoms relative to healthy controls. Patients with SFD also recognized significantly fewer emotional expressions than did the healthy controls. However, the group difference in emotion recognition accuracy became non-significant once the influence of alexithymia was controlled for statistically. This suggests that the deficit in facial emotion recognition observed in the patients with SFD was most likely a consequence of concurrent alexithymia. It should be noted that neither depression nor anxiety were significantly related to emotion recognition accuracy, suggesting that these variables did not contribute the emotion recognition deficit. Impaired facial emotion recognition observed in the patients with SFD could plausibly have a negative influence on these individuals' social functioning.

(f) Key words: Alexithymia - Emotion Recognition - Somatoform Disorders

Abbreviations: FEEL=Facially Expressed Emotion Labelling Test; **FER**=Facial Emotion Recognition; **SFD=**Somatoform Disorders; **TAS-26=** Toronto Alexithymia Scale-26 Items

INTRODUCTION

Somatoform disorders (SFD) refer to a group of psychiatric conditions that are characterized by, often multiple and variable, somatic symptoms (e.g. limb pain, stomach disturbance) that are commonly seen in general medical practice and primary care but that defy medical explanation [Ustun and Sartorius, 1995]. It has been reported recently that patients with a subtype of SFD, namely body dysmorphic disorder (BDD), exhibit impaired ability to correctly identify facially expressed emotion. Buhlmann *et al*. [2004] reported that a group of 20 patients with BDD exhibited a general impairment, relative to matched healthy controls, in their recognition of the primary emotions from facial stimuli. This finding was replicated by the same research group in a subsequent study [Buhlmann *et al*., 2006]. To date, no studies have addressed if other forms of SFD are associated with a similar deficit in facial emotion recognition. This is an important avenue of research as such a deficit could contribute to the interpersonal problems that have been reported in patients with SFD [Waller *et al.,* 2004].

A concept that might contribute to our understanding of facial emotion recognition in patients with SFD is alexithymia. This concept was developed by Sifneos [1973] and is characterized by an inability to describe and identify one's own feelings, the absence of fantasies, and the utilization of an externally oriented analytical cognitive style. Notably, alexithymia has also been implicated in problems in the recognition of facially expressed emotion. For example, a number of studies [e.g. Jessimer *et al*., 1997; Lane *et al*., 2000; Parker *et al*., 1993] have reported that individuals meeting (TAS-20) criteria for alexithymia exhibited significantly impaired emotion recognition from facial stimuli relative to non-alexithymic participants. With these findings in mind, it has been suggested [Lane *et al*., 2000] that the commonly reported problems in putting emotion into words in alexithymia might represent a more general impairment in emotional information processing.

It is notable that elevated levels of alexithymia have been reported in a number of clinical disorders; including depression [Honkalampi *et al*., 2000], eating disorders

[Bydlowski, 2005], and obsessive-compulsive disorder [De Berardis *et al*., 2005] that have also been shown to exhibit deficits in emotion recognition from faces [Aigner *et al*., 2006; Dannlowski *et al*. 2006; Gaebel *et al*., 1992; Gaebel *et al*., 2004; Leppänen *et al*., 2004; Weniger *et al*., 2004]. It is plausible that the presence of alexithymia in these clinical groups might have contributed to their problems in recognizing emotion from faces. Importantly for the present study, a high prevalence of alexithymia has also been shown in patients with SFD [Bach and Bach, 1995; Bankier *et al*., 2001].

The main aim of the present study was to investigate if patients with SFD exhibit impaired recognition of facially expressed emotion. Also of interest was the extent to which concurrent alexithymia contributed to any observed deficits in emotion recognition. With this in mind, a carefully selected sample of patients with SFD and a group of healthy controls were assessed on a widely used test of facial emotion recognition [FEEL Test; Kessler *et al*., 2002]. The presence and severity of alexithymia was established using a robust measure of alexithymia [TAS-26; Kupfer *et al*., 2000; 2001]. It was expected that patients with SFD would correctly recognize fewer emotional facial expressions than would the controls. However, it was also expected that this effect would be mediated by the presence of concurrent alexithymia.

METHODS

PARTICIPANTS

Twenty psychiatric outpatients (16 females, 4 males) meeting ICD-10 diagnostic criteria for SFD and twenty healthy, age and sex matched, controls (15 females, 5 males) took part in the present study. These sample sizes were considered large enough to enable changes in emotion recognition accuracy in patients with SFD to be detected; as they are directly comparable with the sample sizes used in the only other studies that have reported impaired facial emotion recognition in patients with sub-types of SFD [Buhlmann *et al*., 2004; 2006]. Nine of the 20 patients with SFD were diagnosed with persistent somatoform pain

disorder (F45.4), seven with somatization disorder (F45.0) and four with somatoform autonomic dysfunction (F45.3). The patients with SFD were recruited from an outpatient clinic of the Department of Medicine (Munich University) and the psychotherapy ward of "Psychosomatic Hospital" in Simbach, where they had been referred for diagnostic interview and counselling. The diagnosis of SFD was established during a standardized clinical interview based on the diagnostic criteria outlined in the ICD-10 [Hiller *et al*., 1996] and on the participant's score on the Screening for Somatoform Symptoms (SOMS) questionnaire [Rief *et al*., 1997]. Diagnosis was based on medical and psychiatric assessment performed by a trained psychiatrist (P.G.F.). Inclusion criteria for the patient group were the presence of a SFD, diagnosed according to ICD-10 criteria. Physical conditions (e.g. angina) that may have explained the patient's symptoms had been excluded prior to referral following extensive inpatient or outpatient investigation at the Department of Medicine or in general practice. It should be noted that 80% (n = 16) of the SFD patients also exhibited symptoms of co-morbid psychiatric conditions. The most common conditions were (F34.1) dysthymia (n = 7) and (F43.2) brief depressive reaction (n = 4), further co-morbid diagnoses were three cases of anxiety disorder (F41.1), one case of hypochondriasis (F45.2) and one case exhibited the symptom profile of mixed anxiety and depressive disorder (F41.2). Exclusion criteria for the patient group were presence of medical disorders (e.g. autoimmune-, neoplasms, cardiac-, pulmonary-, or endocrine diseases), severe mental illnesses, such as schizophrenia, schizoaffective disorder, bipolar disorder, substance abuse disorders, major depression (unipolar with depressive episodes), medication with benzodiazepines or other psychotropic drugs during the past four weeks. The latter criteria were to ensure that the patients were entirely drug free at the time of testing in order to eliminate any possible pharmacological influences upon facial emotion recognition.

The participants in the control group were recruited from the local community and from the student population in the medical and nursing schools at the University of Ulm. Prior to taking part in the present study the participants making up the control group reported that they were not currently suffering from any serious medical or psychiatric conditions and that

were not currently taking any psychotropic medication. It should be noted that no thorough clinical examination was conducted on these individuals to confirm their self-reported medical and psychological status. Controls were matched with the SFD patients in terms of age and sex, and educational background. Additionally in the control group only the FEEL-test and the TAS-26 were measured, no more psychological measures were accomplished.

The study protocol was approved by the Ethics Committee of the University of Ulm and Munich and full written informed consent was obtained from each participant before they took part in the study.

MEASURES AND ASSESSMENTS

The original version of TAS (Toronto Alexithymia Scale) was developed by Taylor et *al*. [1992] as a standardized self-assessment questionnaire to measure alexithymia. A German version of this measure (TAS-26) has subsequently been developed by Kupfer *et al*. [2000; 2001], which consists of 26 items that are rated on a 5-point Likert scale. The TAS-26 was utilized in the present study to assess the presence and severity of alexithymia in the participants. A three-factor structure has been replicated in clinical and non-clinical groups: This measure includes 26 items that generate scores on three dimensions: “difficulty identifying feelings”; “difficulty describing feelings” and “externally orientated thinking”. The German version was validated with a representative population sample (n=2084) and shows adequate internal consistencies ranging between r=.67 and r=.84.

The Screening for Somatoform Symptoms [SOMS; Rief *et al*., 1997] is a self-rated questionnaire that was used in the present study to establish the presence of 53 physical symptoms. The symptoms incorporated in the questionnaire include all 33 physical complaints outlined in the DSM-IV criteria for somatoform disorders and the somatic symptoms listed in the ICD-10. The "somatization index" is computed by summing the number of reported symptoms (scores range from 0 to 33 points). The number of self-

reported somatization symptoms correlated (r = 0.75) with the number identified during the clinical interview, confirming the high validity of the SOMS.

The 90-item version of the Symptom Checklist-90 Revised [SCL-90-R*;* Derogatis, 1994] is a widely used self-report questionnaire that assesses the presence and severity (using 5-point Likert scales) of symptoms of a number of somatic and psychiatric conditions. The 21-item Hamilton Rating Scale for Depression*;* [HAMD; Hamilton, 1960] was utilized in the present study to provide an observer-rated measure of depression severity. This assessment was conducted by a fully trained psychiatrist (P.G.F).

ASSESSMENT OF EMOTION RECOGNITION ACCURACY

The Facially Expressed Emotion Labelling (FEEL) Test [Kessler *et al*., 2002] was utilized in the present study to assess participants' ability to recognize the basic emotions from facial stimuli. The FEEL Test is a computer-based program that involves presenting participants with color photographs of faces expressing different emotions and asking them to identify the emotion expressed. The faces included in the FEEL Test were taken from the JACFEE series (Japanese and Caucasian Facial Expressions of Emotion) developed by Matsumoto *et al*. [1988] and feature the six basic emotions: anger, sadness, disgust, fear, happiness and surprise. In total, there are 42 pictures making up the FEEL Test (the six basic emotions are each represented by seven different faces). Although half of the emotional expressions were portrayed by Japanese individuals and half by Caucasian, unpublished data from our own research group, based on a sample of healthy participants (n=400), revealed no differences between posers in terms of FEEL score [Traue, Keller, Hoffmann, Kessler, in preparation]. The FEEL Test was considered to be the most suitable task to assess emotion recognition ability in the present study, as it has already been used with several hundred participants [Traue, Keller, Hoffmann, Kessler, in preparation] and has been shown to have a Cronbach´s alpha coefficient of up to r= 0.77 [Kessler *et al*., 2002].

PROCEDURE

The participants completed the interview and questionnaires, followed by the FEEL Test on the same day. After a practice phase to get accustomed with the testing procedure, the 42 pictures making up the main set of stimuli in the FEEL Test were presented to the participants, one at a time in a random order, according to the following protocol. First, a neutral face was shown on the computer screen for 1500 milliseconds (ms) and this was accompanied by a short beep to attract the attention of the participant. After a break of 1000ms an expressive stimulus (same face, this time showing one of the six basic emotions) was presented for exactly 300ms. The use of both the neutral and the emotional facial expression was considered necessary because some of the stimuli (neutral face per se) might have provoked emotional interpretations due to their physiognomy. Furthermore, the presentation of a neutral face followed by an emotional expression imitates natural conditions where the emotion often evolves from the neutral face. Once the emotional face had disappeared from the screen there was an interval of 500ms after which time, six emotion words (one for each basic emotion) were displayed on the screen. The participant indicated, by clicking on the appropriate word label, which emotion they considered had been portrayed by the previously presented face (forced-choice response format). It is important to note that the emotional picture and the labels were not visible on the screen at the same time. The maximum time allowed for the participant to make their response was 10 seconds. Prior to the presentation of the next pair of faces (neutral and then emotional) there was a variable pause of between 4000 to 6000 milliseconds, during which time the screen was grey. Once the participants had viewed and rated all of the faces they were thanked for their participation and fully de-briefed concerning the aims and objectives of the present study.

SCORING AND DATA ANALYSIS

Prior to statistical analysis all data were examined to ensure they met parametric assumptions. Shapiro-Wilk tests were utilized to establish if the data was normally distributed

and Levene Tests were conducted to check for the homogeneity of variance. All data met parametric test assumptions unless otherwise stated.

The age of the participants in the two groups was analyzed using an independent t-test. The ratio of male and females making up each sample and the number of participants from each group achieving the highest level of education were analyzed using chi-square tests. The participants' alexithymia (TAS-26) scores were analyzed using independent t-tests with the alpha level adjusted ($p=0.0125$) for multiple comparisons using Bonferroni correction. Prior to statistical analysis, the total number of each type of facial expression that was correctly recognized by each participant was calculated to provide a FEEL score for each emotion (ranging from 0 to 7) and these scores were summed to give the participants' total FEEL score (ranging from 0 to 42). The participants' FEEL scores were analyzed using a 2 x 6 mixed ANOVA with group (patients with SFD *vs.* controls) as the between subjects factor and the type of emotional expression (happiness *vs.* sadness *vs.* surprise *vs.* anger *vs*. fear *vs.* disgust) as the within subjects factor. As the Shapiro-Wilk tests revealed that the FEEL data was not normally distributed these data were subjected to an arcsine transformation prior to statistical analysis [according to the procedure outlined in Keppel and Wickens, 2004]. Although this transformation failed to fully correct the distribution of all of the data, analysis was still conducted using the planned ANOVA, as it has been reported consistently that the F-test is robust even if the normality assumption is violated [Keppel and Wickens, 2004]. It is important to note that the data did not violate the homogeneity of variance assumption. For ease of understanding, the untransformed data are presented in table 2. In order to control for the influence of alexithymia on emotion recognition accuracy the analysis was re-conducted with the participants' TAS-26 scores entered as a covariate. The resultant adjusted mean FEEL scores are presented in table 3. Pearson correlation coefficients were calculated to analyze the significance of the relationships between participants' SOMS and SCL-90-R (somatization subscale) scores and self-rated alexithymia (indexed by TAS-26 scores). Similarly, Pearson tests were used to assess the significance of the relationships between participants' HAM-D, SOMS, SCL-90-R (GSI, Depression, Anxiety

and Somatization scales) scores and emotion recognition accuracy. All analysis was conducted using SPSS for Windows© 12.0.

RESULTS

PARTICIPANT CHARACTERISTICS AND PSYCHOPATHOLOGY

Analysis of the participant characteristics revealed that the two groups did not differ significantly in terms of their age (SFD patients Mean=47.7 years, Standard Deviation=8.5; healthy controls (HC) M=46.4 years, SD=9.4); $t(38)=0.5$, $p>0.05$. Furthermore, the two groups did not differ significantly in terms of the ratio of males and females making up each group, $\chi^2(1)=0.14$, $p>0.05$. Likewise, the two groups did not differ in terms of their educational background, with eight patients with SFD and 6 healthy controls having completed higher level study; $\chi^2(1)=0.4$, $p>0.05$. Inspection of the SOMS scores of the SFD patients (M=18.7, SD=10.5) revealed moderate to severe levels of somatization. Examination of the HAMD scores (M=11.7, SD=4.3) revealed that the patients with SFD were also experiencing a mild degree of depression severity. Subjective general psychiatric symptoms as indicated by the Global Severity Index-score (SCL-90-R) were elevated (M=63.6, SD=12.9) in patients with SFD relative to the normative sample mean of 50 (SD=10).

ASSESSMENT OF ALEXITHYMIA

Analysis of the participants' total alexithymia (TAS-26) scores (presented in table 1) revealed that patients with SFD rated themselves as significantly more alexithymic (M=52.7, SD=9.9) than did healthy controls (M=42.9, SD=10.5); $t(38)=3.0$, $p<0.01$. Furthermore, analysis of the participants' scores on the three factors of the TAS-26 revealed that patients with SFD scored significantly higher on the factor 1 "Difficulty identifying feelings"(M=56.0, SD=10.1) than did the controls (M=44.6, SD=8.2); $t(38)=3.9$, $p<0.001$. However, the scores of the patients did not differ from those of the controls on either the factor 2 "Difficulty describing feelings" (SFD M=49.7, SD=13.4; controls M=44.5, SD=11.5) or factor 3

“Externally oriented thinking“ subscales (SFD M=48.6, SD=9.3; controls M=45.6, SD=10.4); t(38)=1.3, p>0.05 and t(38)=1.0, p>0.05 respectively. As the significant difference between the groups in alexithymia could confound the interpretation of the participants’ emotion recognition performance the alexithymia scores were entered into the analysis of the emotion recognition accuracy as a covariate (see data analysis section above). Correlational analyses revealed no significant relationships between self-rated somatization (indexed by participants’ scores on the SOMS and the somatization subscale of the SCL-90-R) and the degree of alexithymia (indexed by TAS-26 scores), all tests p>0.05.

ASSESSMENT OF EMOTION RECOGNITION ACCURACY

Analysis of the participants’ emotion recognition accuracy (FEEL scores; presented in table 2) revealed a significant effect of participant group, such that patients with SFD correctly recognized fewer emotional expressions (Mean=31.7, Standard deviation=4.6) than did the healthy controls (M=34.5, SD=3.0); F(1, 38)= 5.3, p<0.05. The analysis also revealed a significant main effect of type of emotion on the participants’ FEEL scores; F(5,190)=23.9, p<0.001. However, no significant Group x Type of Emotion interaction was observed; F(5, 190)=1.2, p>0.05. Further investigation of the main effect of type of emotion, using Bonferroni adjusted t-tests, revealed that the participants exhibited more accurate recognition of anger than fear, sadness or disgust; p<0.05, p<0.001 and p<0.01 respectively. Similarly, happiness was recognized more accurately than fear, sadness or disgust; all tests p<0.001. Furthermore, happiness was recognized more accurately than was surprise; p<0.05. The accuracy of participants’ recognition of happiness and anger did not differ significantly; p>0.05. Likewise, participants did not differ in their recognition of sadness, disgust, fear or surprise; all tests p>0.05. Correlational analysis revealed that emotion recognition accuracy was negatively related to self-rated alexithymia; r(40)=-0.32, p<0.05. However, emotion recognition accuracy was not significantly related to self rated somatization; either SOMS score, r(20)=-0.3, p>0.05 or score on the somatization subscale of the SCL-90, r(20)=-0.2,

p>0.05. Importantly, emotion recognition accuracy was not significantly related to patients' depression-scores (HAMD), SCL-90-R scores (GSI and depression scale); r(20)=-0.2, p>0.05; r(20)=-0.1, p>0.05 and r(20)=-0.2, p>0.05 respectively. Similarly, emotion recognition accuracy was not significantly related to the severity of the patients' anxiety (indexed by SCL-90-R anxiety subscale); r(20)=-0.2, p>0.05. The re-analysis of the participants' emotion recognition accuracy (FEEL scores) using an ANCOVA to control for the influence of alexithymia revealed that there was still a significant main effect of type of emotion; F(5, 185)=2.5, p>0.05. However, the main effect of group was no longer significant; F(1, 38)=2.0, p>0.05. The ANCOVA also revealed no significant effect of alexithymia, no significant group x emotion interaction and no significant alexithymia x emotion interaction; F(1, 37)=2.6, p>0.05; F(5, 185)=0.7, p>0.05 and F(5, 185)=0.8, p>0.05 respectively. The adjusted mean FEEL scores on which these analyses were conducted are presented in table 3.

DISCUSSION

The primary aim of the present study was to examine if patients with SFD exhibited impaired facial emotion recognition. Also of interest was the extent to which the presence of concurrent alexithymia contributed to any observed changes in emotion recognition accuracy.

In line with our predictions, patients with SFD correctly recognized fewer emotional expressions than did the healthy controls. This finding is consistent with the findings of Buhlmann *et al*. [2004; 2006], who reported that patients with body dysmorphic disorder (a subtype of SFD) exhibited a similar general deficit in the recognition of facial emotion. This suggests that impaired facial emotion recognition might be a general feature of SFD.

As expected, patients with SFD rated themselves as significantly more alexithymic (on the TAS-26) than did the controls. This finding is consistent with previous studies that have reported elevated alexithymia scores in patients with SFD [Bach and Bach, 1995; Bankier *et al*., 2001]. However, it is important to note that, although the two groups of

participants differed in terms of their global TAS-26 scores, this finding is probably a consequence of the underlying deficit indexed by the factor 1 of TAS-26 ("Difficulty identifying feelings"); as, importantly, the two groups did not differ significantly on the other two factors of the TAS-26 ("Difficulty describing feelings" and "Externally oriented thinking").

The results of the ANCOVA revealed that once the influence of alexithymia was controlled for the observed difference between the two groups in terms of facial emotion recognition was no longer significant. This suggests that the observed impairment in emotion recognition exhibited by the patients with SFD was most likely a consequence of concurrent alexithymia. This finding is consistent with previous studies that have reported impaired emotion recognition in participants with elevated levels of alexithymia [e.g. Jessimer *et al*., 1997; Lane *et al*., 2000; Parker *et al*., 1993]. Similarly, the observed negative correlation between participants alexithymia (TAS-26) scores and their performance on the FEEL task is also consistent with previous studies [Lane *et al.,* 2000]. The present findings have implications for the ongoing study of alexithymia, as they support the notion that alexithymia might represent a general impairment in emotional processing. Furthermore, these results suggest that the presence of co-morbid alexithymia might contribute to emotion recognition deficits that have been reported in certain clinical disorders, most notably depression, eating disorders and obsessive-compulsive disorder [Aigner *et al*., 2006, Dannlowski *et al*., 2006, Gaebel *et al*., 1992; Gaebel *et al*., 2004; Leppänen *et al*., 2004; Weniger *et al*., 2004].

As previous studies [e.g. Amin *et al*., 2004; Mueser *et al*., 2004] have reported that, in certain psychiatric groups, impaired processing of emotional facial expressions is related to deficits in social functioning, it is plausible that the reported impairment of facial emotion recognition exhibited in the patients with SFD could also have implications for their social functioning. This is important as poor social support has been identified as a significant factor in the maintenance of ongoing psychological distress and in the development of mental illness [Hipkins *et al*., 2004; Klineberg *et al*., 2006]. This proposal could be examined in future research using recognized measures of social functioning, such as the social

functioning scale [Birchwood *et al*., 1999] or social problem solving task [Goddard *et al*., 1996,1997].

Analysis of the participants' FEEL scores revealed some general differences in the accuracy with which the participants could recognize the different emotional expressions. Notably, happiness and anger were recognized more accurately than all other emotional expressions (surprise, fear, disgust and sadness). An explanation for this recognition advantage for happy and angry expression may be found by referring to approach/withdrawal theories of emotion. For example, Davidson and Irwin [1999] postulated that there are basically two opposing systems relating to emotion: approach and withdrawal. It is generally suggested that happiness and anger are part of the approach system. It is therefore interesting that our participants exhibited enhanced recognition of the 'approach' emotions. In large samples of healthy subjects [N=400, *Traue, Keller, Hoffmann, Kessler*, in preparation], happiness and anger were consistently the two emotions that were recognized best. Moreover, the findings of the present study are consistent with evolutionary theories of emotion; as these theories would predict a recognition advantage for expressions that have the greatest fitness benefits for the individual. The smile is used by both sexes in social interactions to indicate approval and to signal potential interest in terms of mating, thus missing or misinterpreting this signal could have negative consequences for the individuals' genetic fitness. Anger, on the other hand, is used to signal displeasure and to moderate the behaviour of others around us, thus insensitivity to this expression could result in physical danger for the individual, again negatively impacting upon genetic fitness [Davidson and Irwin, 1999]. However, it is also possible that happy and angry expressions involve more pronounced changes in facial muscle configurations that may have facilitated their recognition. Nevertheless, previous studies using other emotional stimuli [e.g. emotional tone of voice; Hornack *et al.,* 2003] have also reported enhanced recognition of anger and happiness, suggesting that differences in facial configuration is not a complete explanation.

There are a number of limitations to the present study that need to be considered. The first concerns the relatively low number of males in both participant samples (patients

and controls), which could have influenced the results of our study. For example, studies based on samples from the general population have tended to reported higher levels of alexithymia in males relative to females [Parker *et al*., 2003]. However, it should be noted that, other studies have reported no association between alexithymia and gender [Loas *et al*., 2001]. Furthermore, in the present study, there was no significant difference between the two participant groups in terms of the ratio of males and females, thus the emotion recognition deficit observed in the patients with SFD is unlikely to be a consequence of gender differences. As the primary aim of the present study was to investigate facial emotion recognition in patients with SFD, it was not considered of primary importance to ensure that equal numbers of males and females were recruited, only that the balance of gender in the two groups was equivalent. However, given that previous studies [e.g. Thayer *et al*., 2000] have suggested that males and females process emotional stimuli differently (e.g. female participants report that they experience more intense emotional reactions than do males when making affective judgements of Ekman faces), future studies should also consider analysing gender differences.

Another limitation of the present study concerns the high comorbidity between SFD and other psychiatric conditions; notably depressive disorders. This comorbidity has implications for the interpretation of the present findings in terms of the “pure” effects of somatization and alexithymia, as many studies have reported emotion recognition deficits in patients experiencing significant depression [e.g. Mikhailova, 1996; Weniger *et al*., 2004]. The high comorbidity between SFD and depressive symptoms has been well-reported in the literature [Rief *et al*., 1998; Maier and Falkai, 1999], thus it is plausible that the emotion recognition deficit observed in the patients with SFD could relate to comorbid depression. However, contrary to this notion, emotion recognition accuracy was not significantly correlated with clinician-rated depression severity or depression scales of the SCL-90. In order to delineate the effects of depression, alexithymia and somatoform symptoms on facial emotion recognition, future studies should compare alexithymic and non-alexithymic patients

with SFD, alexithymic and non-alexithymic patients with depression (but without symptoms of SFD) and healthy controls.

Another limitation concerning the present sample is the fact that the participants in the control group were not assessed as thoroughly as the SFD patients with regards to the presence of medical and psychiatric conditions. However, the presence of undetected psychiatric conditions in the controls would have influenced the results in the opposite direction to our hypotheses (i.e. decreased the emotion recognition accuracy of the controls where we hypothesised that they would have a recognition advantage relative to the patients with SFD). A strength of the present study was that none of the patients or healthy controls were receiving medication at the time of testing, thus avoiding potential emotion recognition deficits due to pharmacological influences on the participants' cognitive function.

Another important point is the nosology of SFD. There are difficult conditions to conceptualize and classify the SFD [Sharpe and Carson, 2001]; in psychiatry, they are classified as somatoform disorders (DSM-IV/ICD-10) while in medicine as functional somatic syndromes. A common ground in these classifications appears to be the lack of a conventionally defined explanation for somatic presentations. A further problem is how to deal with the overlapping of psychosomatic issues with other psychiatric conditions, e.g. depressive disorders [Mayou *et al.*, 2005]. The DSM-IV/ICD-10 Somatoform category is simply a grouping of favorites not a conceptual framework [Janca, 2005; Sykes, 2006]. A multi-factorial etiology with interacting psychological, social, and biological factors [Mayou *et al.*, 1995] would be preferable.

In summary, we reported that a selected sample of patients with SFD exhibited significantly impaired facial emotion recognition (indexed by scores on a reliable and valid measure of emotion recognition accuracy; the FEEL Test) relative to a group of healthy controls. To our knowledge this is the first study to report deficits in facial emotion recognition in patients with SFD (other than Body Dysmorphic Disorder). However, importantly, when concurrent alexithymia was controlled for this group difference became non-significant, which

suggests that the observed impairment of emotion recognition in the patients with SFD was a consequence of concurrent alexithymia. Finally, it is plausible that the deficit in the recognition of facially expressed emotion exhibited by the patients with SFD could lead to impaired social functioning in these patients.

REFERENCES

Aigner M, Sachs G, Bruckmuller E, Winklbaur B, Zitterl W, Kryspin-Exner I, Gur R, Katschnig H. 2007. Cognitive and emotion recognition deficits in obsessive-compulsive disorder. Psychiatry Res 149(1-3):121-8.

Amin Z, Constable RT, Canli T. 2004. Attentional bias for valenced stimuli as a function of personality in the dot-probe task. Journal of Research in Personality 38:15 - 23.

Bach M, Bach D. 1995. Predictive value of alexithymia: a prospective study in somatizing patients. Psychother Psychosom 64(1):43-8.

Bankier B, Aigner M, Bach M. 2001. Alexithymia in DSM-IV disorder: comparative evaluation of somatoform disorder, panic disorder, obsessive-compulsive disorder, and depression. Psychosomatics 42(3):235-40.

Birchwood M, Smith J, Cochrane R, Wetton S Copestake S.1990. The social functioning scale: The development and validation of a new scale of social adjustment for use in family interventions programmes with schizophrenics. Brit J Psychiatry 157:853-859.

Buhlmann U, Etcoff NL, Wilhelm S. 2006. Emotion recognition bias for contempt and anger in body dysmorphic disorder. J Psychiatr Res 40(2):105-11.

Buhlmann U, McNally RJ, Etcoff NL, Tuschen-Caffier B, Wilhelm S. 2004. Emotion recognition deficits in body dysmorphic disorder. J Psychiatr Res 38(2):201-6.

Bydlowski S, Corcos M, Jeammet P, Paterniti S, Berthoz S, Laurier C, Chambry J, Consoli SM. 2005. Emotion-processing deficits in eating disorders. International Journal of Eating Disorders 37(4):321 - 329.

Dannlowski U, Kersting A, Donges US, Lalee-Mentzel J, Arolt V, Suslow T. 2006. Masked facial affect priming is associated with therapy response in clinical depression. Eur Arch Psychiatry Clin Neurosci 256(4):215-221.

Davidson RJ, Irwin W. 1999. The functional neuroanatomy of emotion and affective style. Trends Cogn Sci 3(1):11-21.

De Berardis D, Campanella D, Gambi F, Sepede G, Salini G, Carano A, La Rovere R, Pelusi L, Penna L, Cicconetti A and others. 2005. Insight and alexithymia in adult outpatients with obsessive-compulsive disorder. Eur Arch Psychiatry Clin Neurosci 255(5):350-8.

Derogatis LR. 1994. SCL-90-R. Self-Report Symptom Inventory. In: Collegium Internationale Psychiatriae Scalarum (Hrsg.), Internationale Skalen für Psychiatrie. Weinhemim: Beltz-Verlag.

Eisenberg N, Fabes RA, Miller PA, Fultz J, Shell R, Mathy RM, Reno RR. 1989. Relation of sympathy and personal distress to pro-social behaviour – multimethod study. J Personal Soc Psychol 57(1):55-56.

Gaebel W, Wolwer W. 1992. Facial expression and emotional face recognition in schizophrenia and depression. Eur Arch Psychiatry Clin Neurosci 242(1):46-52.

Gaebel W, Wolwer W. 2004. Facial expressivity in the course of schizophrenia and depression. Eur Arch Psychiatry Clin Neurosci 254(5):335-42.

Goddard L, Dritschel B, Burton A. 1996. Role of autobiographical memory in social problem solving and depression. J Abnorm Psychol 105(4):609-16.

Goddard L, Dritschel B, Burton A. 1997. Social problem solving and autobiographical memory in non-clinical depression. Br J Clin Psychol 36(Pt 3):449-51.

Hamilton M. 1960. A rating scale for depression. Journal of Neurology, Neurosurgery and Psychiatry 23:56-62.

Hiller W, Zaudig M, Mombour W. 1996. International diagnostic checklists for ICD-10 and DSM-IV (Handbook). Seattle: Hogrefe-Verlag.

Hipkins J, Whitworth M, Tarrier N, Jayson G. 2004. Social support, anxiety and depression after chemotherapy for ovarian cancer: a prospective study. Br J Health Psychol 9(Pt 4):569-81.

Honkalampi K, Hintika J, Tanskanen A, Lehtonen J, Viinamaka H. 2000. Depression is strongly associated with alexithymia in the general population. J Psychosom Res 48:99-104.

Hornak J, Bramham J, Rolls ET, Morris RG, O'Doherty J, Bullock PR, Polkey CE. 2003. Changes in emotion after circumscribed surgical lesions of the orbitofrontal and cingulate cortices. Brain 126(Pt 7):1691-712.

Janca A. 2005. Rethinking somatoform disorders. Curr Opin Psychiatry 18(1):65-71.

Jessimer M, Markham R. 1997. Alexithymia: a right hemisphere dysfunction specific to recognition of certain facial expressions? Brain Cogn 34(2):246-58.

Keppel G, Wickens TD. 2004. Design and analysis: A researcher's handbook. New Jersey: Pearson Prentice Hall.

Kessler H, Bayerl P, Deighton R, Traue HC. 2002. Facially Expressed Emotion Labeling (FEEL): PC-gestützter Test zur Emotionserkennung. Verhaltenstherapie und Verhaltensmedizin 23(3):297-306.

Klineberg E, Clark C, Bhui KS, Haines MM, Viner RM, Head J, Woodley-Jones D, Stansfeld SA. 2006. Social support, ethnicity and mental health in adolescents. Soc Psychiatry Psychiatr Epidemiol 41(9):755-60.

Kupfer J, Brosig B, Brahler E. 2000. [Testing and validation of the 26-Item Toronto Alexithymia Scale in a representative population sample]. Z Psychosom Med Psychother 46(4):368-384.

Kupfer J, Brosig B, Brähler E. 2001. Toronto-Alexithymie-Skala-26, German Version, Göttingen-Seattle: Hogrefe-Verlag.

Lane RD, Sechrest L, Riedel R, Shapiro DE, Kaszniak AW. 2000. Pervasive emotion recognition deficit common to alexithymia and the repressive coping style. Psychosom Med 62(4):492-501.

Leppanen JM, Milders M, Bell JS, Terriere E, Hietanen JK. 2004. Depression biases the recognition of emotionally neutral faces. Psychiatry Res 128(2):123-33.

Loas G, Corcos M, Stephan P, Pellet J, Bizouard P, Venisse JL, Perez-Diaz F, Guelfi JD, Jeammet P. 2001. Factorial structure of the 20-item Toronto Alexithymia Scale: confirmatory factorial analyses in nonclinical and clinical samples. J Psychosom Res 50(5):255-61.

Maier W, Falkai P. 1999. The epidemiology of comorbidity between depression, anxiety disorders and somatic diseases. Int Clin Psychopharmacol 14 Suppl 2:S1-6.

Matsumoto D, Ekman P. 1988. Japanese and Caucasian Facial Expressions of Emotion (JACFEE) and Neutral Faces (JACNeuF). San Francisco: Obtainable at Dr. Paul Ekman, Department of Psychiatry, University of California, San Francisco, 401 Parnassus, San Francisco, CA 94143-0984.

Mayou R, Bass C, Sharpe M. 1995. Overview of epidemiology classification and aetiology, in Treatment of functional Somatic Symptoms. Edited by Mayou R, Bass C, Sharpe M. London, Oxford University Press, pp 42-65.

Mayou R, Kirmayer LJ, Simon G, Kroenke K, Sharpe M. 2005. Somatoform disorders: time for a new approach in DSM-V. Am J Psychiatry 162(5):847-55.

Mikhailova ES, Vladimirova TV, Iznak AF, Tsusulkovskaya EJ, Sushko NV. 1996. Abnormal recognition of facial expression of emotions in depressed patients with major depression disorder and schizotypal personality disorder. Biol Psychiatry 40(8):697-705.

Parker JD, Taylor GJ, Bagby RM. 1993. Alexithymia and the recognition of facial expressions of emotion. Psychother Psychosom 59(3-4):197-202.

Parker JD, Taylor GJ, Bagby RM. 2003. The 20-Item Toronto Alexithymia Scale. III. Reliability and factorial validity in a community population. J Psychosom Res 55(3):269-75.

Rief W, Hiller W, Heuser J. 1997. SOMS-Das Screening für Somatoforme Störungen. Manual zum Fragebogen. (SOMS-The screening for somatoform symptoms). Bern: Huber-Verlag.

Rief W, Shaw R, Fichter MM. 1998. Elevated levels of psychophysiological arousal and cortisol in patients with somatization syndrome. Psychosom Med 60(2):198-203.

Sharpe M, Carson A. 2001. "Unexplained" somatic symptoms, functional syndromes, and somatization: do we need a paradigm shift? Ann Intern Med 134(9 Pt 2):926-30.

Sifneos PE. 1973. The prevalence of 'alexithymic' characteristics in psychosomatic patients. Psychother Psychosom 22(2):255-62.

Sykes R. 2006. Somatoform disorders in DSM-IV: mental or physical disorders? J Psychosom Res 60(4):341-4.

Taylor GJ, Bagby RM, Parker JD. 1992. The Revised Toronto Alexithymia Scale: some reliability, validity, and normative data. Psychother Psychosom 57(1-2):34-41.

Thayer JF, Johnsen BH. 2000. Sex differences in judgement of facial affect: a multivariate analysis of recognition errors. Scand J Psychol 41(3):243-6.

Ustun TB, Sartorius N. 1995. Mental illness in general health care. Chichester, UK: John Wiley.

Waller E, Scheidt CE, Hartmann A. 2004. Attachment representation and illness behavior in somatoform disorders. J Nerv Ment Dis 192(3):200-9.

Weniger G, Lange C, Ruther E, Irle E. 2004. Differential impairments of facial affect recognition in schizophrenia subtypes and major depression. Psychiatry Res 128(2):135-46.

Table 1: Mean alexithymia (TAS-26) scores for patients with SFD and healthy controls (Standard deviations are presented in parentheses)

Scores on the TAS-26	**Patients with SFD (N=20)**	**Healthy Controls (N=20)**	**p-value**
	Mean (SD)	**Mean (SD)**	
Total Score	52.7 (9.9)	42.9 (10.5)	**p = 0.004***
Factor 1 ***"Difficulty identifying feelings"***	56.0 (10.1)	44.6 (8.2)	**p < 0.001***
Factor 2 ***"Difficulty describing feelings"***	49.7 (13.4)	44.5 (11.5)	p = 0.193
Factor 3 ***"Externally orientated thinking"***	48.6 (9.3)	45.6 (10.4)	p = 0.334

* Significant at the adjusted alpha level of 0.0125

Table 2: Mean emotion recognition (FEEL) scores for patients with SFD and healthy controls as a function of the type of emotional expression (Standard deviations are presented in parentheses)

Type of Emotion	Patients with SFD (N = 20)	Healthy Controls (N = 20)
	Mean (SD)	Mean (SD)
Fear	4.6 (1.6)	4.5 (1.7)
Sadness	3.9 (1.8)	5.1 (1.5)
Anger	6.1 (0.9)	6.8 (0.4)
Disgust	4.9 (2.1)	5.5 (1.3)
Happiness	6.6 (0.7)	6.8 (0.6)
Surprise	5.7 (1.4)	6.0 (1.2)
Total FEEL score	31.7 (4.6)*	34.5 (3.0)*

* Significantly different at 0.01 level

Table 3: Adjusted Mean emotion recognition (FEEL) scores for patients with SFD and healthy controls as a function of the type of emotional expression (Standard deviations are presented in parentheses)

Type of Emotion	Patients with SFD (N = 20)	Healthy Controls (N = 20)
	Mean (SD)	Mean (SD)
Fear	5.0 (1.6)	5.4 (1.7)
Sadness	4.4 (1.8)	4.6 (1.5)
Anger	6.2 (0.9)	6.7 (0.4)
Disgust	6.7 (2.1)	6.7 (1.3)
Happiness	4.0 (0.7)	4.0 (0.6)
Surprise	5.8 (1.4)	5.8 (1.2)
Total FEEL score	32.1 (4.6)	33.2 (3.0)