Social Support, Disease-related Cognitions and Coping as Predictors of Depressed Mood in Systemic Sclerosis

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Abstract Psychological mood or distress in patients with systemic sclerosis (SSc) is only weakly related to physician-assessed disease severity, self-reported symptoms and physical functioning. Psychological variables such as social support indices, disease-related cognitions and coping strategies are likely predictors of depressed mood. Until now, however, the independent association between these variables and psychological mood in patients with SSc after controlling for disease severity, symptoms and functioning has not been studied. One hundred and twenty-three patients completed questionnaires measuring symptoms, physical functioning, social support, cognitions, coping and depressed mood. Depressed mood was measured using a subscale of a self-report function scale developed for patients with rheumatic conditions. In addition, disease severity was assessed by a rheumatologist. In the final analysis, being married, higher levels of perceived potential support and higher levels of disease-related cognition acceptance each showed independent associations with lower levels of depressed mood after controlling for disease severity, self reported symptoms and function. Expression of emotion showed associations with higher levels of depressed mood. These findings suggest that psychological interventions in SSc should try to improve social support skills and acceptance of the disease by the patient.

Running head: Predictors of Depressed Mood in Systemic Sclerosis.

Keywords Systemic Sclerosis - Depressed Mood - Coping - Cognitions - Social Support

Introduction

Systemic Sclerosis or scleroderma (SSc) is a generalized progressive disorder of connective tissue that affects skin, joints, tendons and internal organs. The hallmark feature of the disease is the thickening of the skin (Varga & Korn, 2004). Although SSc runs a variable course, it has serious consequences in many patients. The fibrotic process ('thickening') may affect every internal organ and leads to morbidity and decreased life expectancy. Especially in patients diagnosed with diffuse cutaneous SSc with associated early internal organ involvement, the prognosis is poor (Medsger, 2003). In SSc, patients report a wide range of adverse symptoms, including pain and tiredness. The disease has an impact on many dimensions of life (Suarez-Almazor et al., 2007; Haythornthwaite et al., 2003; Joachim & Acorn, 2003), including physical functioning (Del Rosso et al., 2004; Merkel, 1998), body image satisfaction (van Lankveld et al., 2007; Benrud-Larson et al., 2003; Malcarne et al., 1999), sexuality (Saad & Behrend, 1996), employment levels (Mau et al., 2005) and life expectancy (Ioannidis et al., 2005). Therefore, health-related quality of life as perceived by patients with SSc is significantly impaired when compared with healthy controls (Hyphantis et al., 2007). Furthermore, patients report problems in adjusting to the disease (Malcarne et al., 2007). As yet, medical treatment has only a limited effect on disease progression and symptom manifestation. As a result, SSc is a highly distressing disease to the patient. Half of the patients show mild to severe depression (Thombs et al., 2007; Daniele et al., 2005; Angelopoulos et al., 2001; Roca et al., 1996) and the urgency of treating the symptoms of depression in SSc is increasingly recognized (Benrud-Larson et al., 2003; Matsuura et al., 2003).

Previous research has demonstrated that psychological mood in patients with SSc is only partly explained by disease status, expressed in either physician-assessed disease severity, self-reported symptoms or physical functioning (Nietert et al., 2005; Roca et al., 1996). Lazarus and Folkman (1984) defined a stress-and-coping model that has been successfully used to study the relation between stressful events and depressed mood. In this model, depressed mood is predicted by coping resources, cognitive appraisals and the use of coping strategies.

In SSc, social support has been identified as an important coping resource. For instance, perceived adequacy of social support (Roca et al., 1996) and dissatisfaction with social support (Moser et al., 1993) have been shown to be associated with psychological mood. The interaction between these coping resources and the stressful event determines the patient's appraisal of the situation: the way patients perceive and think about their disease. Usually, appraisals refer to how a person perceives the threat of the disease in relation to their coping resources. Because of the adverse symptoms and negative impact on many dimensions of life, SSc is initially perceived as a threat. However, in chronic conditions, the appraisal of the situation can change over time as patients learn to use new coping resources and new coping skills. Therefore, patients differ in the extent to which they have negative, neutral, or even positive cognitive appraisals about their condition (Evers et al., 2001). The way patients perceive and think about their disease is associated with psychological mood. For instance, helplessness, a negative appraisal of the disease, is related to higher levels of depressed mood in SSc (Matsuura et al., 2003) while the opposing control appraisals are related to lower levels of depressed mood (Malcarne & Greenbergs, 1996). The interaction between the stressful event, availability of

coping resources and the patient's evaluation of the disease determines the coping behavior. Coping is defined as the conscious effort to deal with a stressful event, for instance a chronic disease. In SSc, the way patients cope with their disease is related to depressed mood (Malcarne & Greenbergs, 1996), with active coping strategies reducing the levels of depressed mood.

These psychological variables predicting depressed mood (i.e., social support, cognitions and coping) are largely unrelated to clinical disease status in SSc (Matsuura et al., 2003; Moser et al., 1993). Furthermore, studies in rheumatoid arthritis (RA) have shown that psychological interventions can improve perceived social support, improve the use of 'adaptive' cognitions and improve coping skills, with positive effects for the patient's psychological mood (Astin et al., 2002; Riemsma et al., 2002; Savelkoul et al., 2000). Therefore, these variables are likely candidates for psychological interventions aimed at reducing distressed mood in patients with SSc as well. To date, the relative importance of these variables in determining depressed mood in SSc is unclear. Previous studies of depressed mood in SSc have not included social support, disease related cognitions and coping effort simultaneously, or have failed to control for physician-assessed disease severity, self-reported symptoms and physical functioning.

The purpose of this study is to determine the relative importance of social support, disease cognitions and coping as predictors of depressed mood in patients with SSc after controlling for physician-assessed disease severity, self-reported symptoms and physical functioning. Because the disease is extremely unpredictable and the impact of the patient's behavior or medical treatment on disease progression

and symptoms is only limited, it is expected that disease-related cognitions will be the most important variables associated with depressed mood.

Method

Subjects

All patients with a definitive diagnosis of SSc according to the American College of Rheumatology preliminary criteria for the classification of systemic sclerosis (Subcommittee ARA, 1980) who were being treated in the departments of rheumatology of the Sint Maartenskliniek and the Radboud University Medical Center were invited to participate in the study. Of the 138 patients invited, 123 agreed to participate (89%). The patients were predominantly middle-aged females (68%). Half of the patients (54%) were still active in the work force: either employed, studying or as a housewife. The majority of the patients had limited cutaneous SSc (71%), with 29% suffering from diffuse cutaneous SSc. Esophageal involvement was common in this study sample and lungs were affected in 41% of the patients. Other organ involvement was less common: heart 9%, kidneys 5%, intestines 4% and muscles 4%. In 5 patients (4.2%), no organ involvement was reported. These findings are similar to sample descriptions in other studies on SSc (Medsger, 2003). Further characteristics of the patients are given in Table I.

Procedure

All patients were sent a letter explaining the nature of the study and inviting them to participate. When patients agreed to participate they received a questionnaire at their next physical assessment by the rheumatologist. Participants were asked to complete the self-reported measures and return it by mail within two weeks in a postage-paid return envelope.

The study was approved by the local ethics commission.

Measures

Demographic variables. Patients reported their gender, age, years of education, marital status, work status and disease duration (see Table I).

Disease severity. The rheumatologist assessed three clinical variables: 1) subtype of SSc (limited versus diffuse cutaneous); 2) the extent and degree of skin involvement using the modified Rodnan Skin Score (mRSS) (Clements et al., 1993); and 3) the number of internal organs involved. The mRSS is obtained by clinical palpation of 17 body areas to assess the extent and severity of skin thickening for that particular area on a scale from 0 to 3 (0 = normal, 1 = mild, 2 = moderate, 3 = severe). The scores are summed, with a possible range of 0-51; higher scores indicate more severe disease. The number of internal organs involved is the third clinical variable and was derived from a database containing all yearly assessments of our multicenter Scleroderma Cohort. Involvement of internal organs was assessed based on clearly defined criteria (Giordano et al., 1986; Altman et al., 1991; Bulpitt et al., 1993). Assessments included detailed patient history, physical examination, pulmonary function test, HR-CT-scan, echocardiography and laboratory tests.

Physical Functioning. The validated official Dutch version of the Health Assessment Questionnaire (HAQ) was used to measure the patient's physical functioning (Broers et al., 2007). The HAQ is a frequently used function index in rheumatology research that was originally developed for patients with rheumatoid arthritis (RA) (Fries et al., 1980). More recently, the HAQ-DI has demonstrated good reliability and validity in patients with SSc as well (Smyth et al., 2003; Steen & Medsger, 1997; Pool & Steen, 1991). The Disability Index of this self-reported measure consists of 20 items

measuring 8 dimensions of functioning: dressing and grooming, arising, eating, walking, personal hygiene, reach, grip strength, and activities. The score for each dimension ranges from 0 (best function) to 3 (worst function). In addition to separate scores on the 8 dimensions, mean scores for these 8 HAQ scores are calculated and used as an indicator of overall physical functioning (HAQ-DI). The HAQ-DI showed good internal consistency is this sample (Cronbach's Alpha = .90).

Disease Symptoms. The symptoms of SSc were assessed using the SHAQ (Steen & Medsger, 1997). The SHAQ comprises the HAQ and six additional Visual Analog Scales measuring the severity of disease symptoms. The different scales measure the subjective severity of the symptoms due to internal organ involvement, Raynaud's phenomenon, gastrointestinal involvement, lung involvement, pain, and overall disease severity. In the present study, we used one additional VAS measuring tiredness. The mean scores on the 7 VAS scales were computed and used as an indicator of overall perceived symptom severity.

Psychological mood. The scale 'Depressed Mood' of the 'Impact of Rheumatic Diseases on General Health and Lifestyle' (Invloed van Reuma op Gezondheid en Leefwijze: IRGL; Huiskes et al., 1990) was used to assess depressed mood. The IRGL is frequently used in the Netherlands and has been shown to be a reliable and valid instrument for assessing physical, psychological and social functioning in patients with rheumatic diseases. The validity and reliability of the 6-item subscale 'Depressed Mood' has been previously studied in the Dutch population (Zwart & Spooren, 1982). The scale measures 6 mood states: depressed, gloomy, disheartened, low spirited, disconsolate and sad. Participants rate the extent to which they have experienced each mood state during the last week, using a 5-point Likert scale ranging from '*not at all*'

to '*a lot*'. Higher scores depict higher levels of depressed mood. The scale showed good internal consistency is this sample (Cronbach's Alpha = .93).

Social support. Social support was measured using two subscales of the IRGL: 'Potential Support' (5 items; e.g., 'When I am in pain, there is someone to support me') and 'Actual Support' (3 items; e.g., 'I speak confidentially with others'). Scores were rated on a 4-point Likert scale from '*almost never*' to '*almost always*'. The reliability of these scales in this sample was good (Cronbach's Alpha = .90 and .65, respectively).

Illness Cognitions. Cognitions were assessed using the Illness Cognitions Questionnaire (ICQ; Evers et al., 2001). The ICQ was developed in the Netherlands and measures three generic illness cognitions or different disease-related connotations: 'Helplessness', 'Acceptance' and 'Disease Benefits'. 'Helplessness' emphasizes the negative meaning of the stressor, 'Acceptance' diminishes the negative meaning, and 'Disease Benefits' gives a positive meaning to the event. The scale consists of 18 items with six items for each of the three constructs. Item examples are: 'My illness frequently makes me feel helpless' (helplessness), 'I have learned to live with my illness' (acceptance) or 'My illness has helped me realize what's important in life' (disease benefits). Participants were asked to indicate on a 4-point Likert scale the extent to which they agree with these statements, ranging from '*not at all*' to '*completely*'. The scale has excellent construct and internal validity (Evers et al., 2001). The internal consistency of these scales in this sample was good (Cronbach's Alpha = .88, .91 and .82 for Helplessness, Acceptance and Disease Benefits, respectively). Higher scores reflect higher levels of agreement with that particular disease connotation.

Coping. Coping was assessed using the Utrecht Coping Scale, which has good validity and reliability (UCL; Schreurs et al., 1993). The UCL measures 'Active coping' (7 items), 'Comforting cognitions' (5 items), 'Seeking social support' (6 items), 'Avoidance' (8 items), 'Expression of emotions' (3 items) and 'Palliative reaction' (8 items). Respondents are asked to indicate how often they use that particular coping strategy when reacting to a stressful event. Answers range from 1: seldom or never, to 4: very often. Higher scores on the coping scales depict more frequent use of the coping style. In this sample, the different scales showed sufficient internal consistency (Cronbach's Alpha between .70 and .80 for each of the scales).

Statistical analysis

Relationships between variables are expressed in Pearson correlations and partial correlations. Differences between groups were tested using Students t-test for independent samples or ANOVA. Mean scores on the different psychological measures were compared to mean scores reported for patients with rheumatoid arthritis (RA). RA is also a painful, chronic and progressive rheumatologic condition. Separate regression analyses were performed to determine the relation between social support, cognition and coping variables with depressed mood. The stress-coping model of Lazarus and Folkman determines the order in which selected variables are entered into the model predicting depressed mood. To this end, a hierarchic regression analysis was performed, with selected variables entered as blocks and depressed mood as the dependent variable. First, physician-assessed disease severity variables were forced into the equation as a block, followed by a block of self-reported functioning and symptoms. Because it is argued that demographic and social support measures are

part of the person's resources, these variables will in part determine the patient's cognitions and coping, and should thus be controlled for. Therefore, demographic and social support measures with a significant association with depressed mood were entered next. Finally, significantly related cognitions and coping variables were entered blockwise. For each block, the amount of variance explained by that block is given (R2 change). To explore the relative contribution of the potential predictors of depressed mood, standardized regression coefficients are calculated (Beta weights). These Beta weights depict the relative importance of each variable in explaining depressed mood while controlling for all the other independent variables entered in the analysis. Statistics were calculated using the SPSS, version 9.1. Significance levels were set at $p < .05$.

Results

Associations between depressed mood and demographic characteristics, disease severity, self-reported symptoms and physical functioning

The mean score for depressed mood in this SSc patient sample was 4.6 (SD = 4.5), reflecting mild symptoms of depressed mood. Similar levels of depressed mood were reported in a sample of RA outpatients (M = 4.3, SD = 4.5; mean difference = 0.3, not significant) and lower levels of depressed mood were reported in healthy adults (M = 1.47, SD = 2.57; $\underline{t}$ (1,122) = 6.62, $p < .01$) (Huiskes et al., 1990). Clinical and subclinical depression was present in 49% of the patients. Subclinical depression is defined as a score greater than 4 on the scale for depressed mood (Zwart & Spooren, 1982). These findings are in line with the levels of depression reported in other studies. A recent review of eight studies on depression in SSc concluded that 36-65%

of patients had clinically significant symptoms of depression (Thombs et al., 2007). No significant correlations were found between disease duration, years of education, work status and depressed mood. Marital status was the only demographic variable related to depressed mood. Thus, married patients reported lower levels of depressed mood compared to either unmarried, divorced or widowed patients (mean scores 3.9, 6.4, 7.8 and 6.8, respectively; ANOVA for difference between groups: $F(3,117) = 5.6$, $p < .05$). For subsequent analysis, this variable was dichotomized (married, not married).

Clinical disease severity was unrelated to depressed mood. Patients with limited SSc did not differ from patients with diffuse cutaneous SSc in depressed mood; the mean scores (with standard deviation in parenthesis) were 4.5 (4.7) and 4.8 (4.3), $t(122) = 0.3$, not significant. The correlations between modified mRSS or number of organs involved (summation of affected organs) and depressed mood were not significant ($r = .09$ and .10, respectively).

The mean scores and standard deviation (SD) of self-reported disease symptoms and physical functioning measures, as well as the Pearson correlations with depressed mood, are presented in Table II.

Self-reported symptoms are associated with depressed mood. Six of the 7 VAS were significantly correlated with depressed mood. Only the VAS measuring ulcers was unrelated to depressed mood. Tiredness showed the highest mean VAS score of all the self-reported disease symptom scales. The high correlation between tiredness and depressed mood was similar to the strength of the correlation reported between depressed mood and pain or self-reported disease severity. In a regression analysis, the group of disease symptom scales together explained an additional 32% of

the variance in depressed mood after controlling for dichotomized marital status ($F(7,109) = 7.6$, $p < .001$). Self-reported functioning was related to depressed mood in a similar way. Each HAQ subscale was significantly correlated with depressed mood. Together, the combined function scales explained 24% of the variance in depressed mood after controlling for marital status ($F(8,108) = 5.27$, $p < .001$). Both higher levels of perceived disease symptoms and impaired physical functioning are associated with higher levels of depressed mood. High correlations were observed in both the set of self-reported symptom scales and physical function scales (correlations ranging from .25 to .72). Therefore, both the mean score computed for the disease symptom scales and the mean score for the physical function scores were used in further analysis.

Associations between depressed mood and social support, cognitions and coping

The mean scores for social support, disease cognitions and coping, as well as the Pearson correlation and partial correlation of each variable with depressed mood, are shown in Table III. Partial correlations were computed while controlling for marital status, mean self-reported symptom score and mean functional limitation.

The mean scores found for social support measures and coping in this sample were similar to the mean scores reported in patients with RA (Huiskes et al., 1990). The mean scores on the disease cognitions 'helplessness' and 'disease benefits' also equaled those reported in RA (Evers et al., 2001). The mean levels of acceptance in SSc and RA (with standard deviations in parenthesis) were 15.3 (4.3) and 16.7 (4.2), respectively. Patients with SSc reported lower levels of acceptance compared to patients with RA $t(1,389) = 2.9$, $p < .05$. A significant negative correlation between Potential Support and depressed mood was found. This correlation remained

significant after controlling for marital status, disease symptom and functioning. Higher levels of Potential Support were associated with lower levels of depressed mood. Actual support was unrelated to depressed mood. Helplessness and Acceptance both showed strong correlations with depressed mood. Higher levels of 'helplessness' were associated with higher levels of depressed mood, while acceptance was associated with lower levels of depressed mood. Both associations remained statistically significant after controlling for marital status, mean disease symptoms and functioning. Within the third group of potential predicting variables, only two coping styles were significantly related to depressed mood: Active Coping was associated with lower levels of depressed mood and Expression of emotions was associated with higher levels of depressed mood. Both correlations remained significant after controlling for marital status, symptoms and functioning.

Stepwise regression analysis predicting depressed mood

Next, we selected the psychological variables that showed significant partial correlations with depressed mood for the final analysis to explore their relative contribution to the prediction of depressed mood after controlling for physician-assessed disease severity, self-reported symptoms and physical functioning. The result of the hierarchic stepwise regression analysis of depressed mood is shown in Table IV, with the variables entered in blocks. In the first block, physician-assessed disease severity variables are entered: subtype of SSc, Rodnan Skin Score and number of internal organs involved. Next, self-reported disease symptoms and physical functioning are forced into the equation as a block, followed by Marital Status (block 3) and Potential Support (block 4). Marital status and Potential Support are unrelated in this sample, i.e., married patients did not differ in potential support from patients

that were not married. Next, the disease cognitions Helplessness and Acceptance were entered as a block. In the last step, the coping styles Active Coping and Expression of Emotions were entered as a block. For each block, the increase in the percentage of variance, R2, and the standardized Beta weights are given. These Beta weights reflect the relative importance of all the variables entered in the final model, and the direction of the association with depressed mood. Because these Beta weights are standardized, the relative importance of the different variables in predicting depressed mood can be compared on the basis of these Beta weights.

The first block of physician-assessed disease severity was unrelated to depressed mood ($F(3,119) = 0.7$, not significant). The block of self-reported disease symptoms and physical functioning together explained an additional 25% of the variance in depressed mood after controlling for physician-assessed disease severity ($F(5,117) = 8.6$, $p < .01$). Marital status explained a further 8% of the variance in depressed mood ($F(6,116) = 10.5$, $p < .01$) and an additional 4% was explained by Potential Support ($F(7,115) = 10.4$, $p < .01$). The two disease cognitions entered together as a block in step four of the equation explained an additional 10% of the variance in depressed mood (F change $(9,113) = 12.0$, $p < .01$). The last block to be entered, consisting of both coping styles, explained another 6% (F change$(11,111) = 12.0$, $p < .01$). The final model explained 54% of the variance in depressed mood ($F(11,111) = 16.4$, $p < .001$). The Beta Regression weights indicated that in the final model, higher levels of disease symptoms and expression of emotions were associated with higher levels of depressed mood. Being married and higher levels of potential support and acceptance were associated with lower levels of depressed mood.

Discussion

The aim of this study was to determine the relative importance of social support, disease cognitions and coping in predicting depressed mood in patients with SSc after controlling for physician-assessed disease severity, self-reported symptoms and functioning. As expected, disease-related cognitions showed the strongest associations with depressed mood in SSc, but individual social support and coping indices were also related to depressed mood.

The levels of depressed mood in this SSc patient population were elevated compared to the general population, and equaled the levels of depressed mood previously observed in patients with RA (Huiskes et al., 1990) and SSc (Thombs et al., 2007). In agreement with previous findings, depressed mood was largely independent of clinical disease severity (Daniele et al., 2005; Nietert et al., 2005; Roca et al., 1996). However, strong associations were found between depressed mood and both self-reported disease symptoms and physical functioning.

The VAS Tiredness included in this study seems to be an important addition to the 6 symptom scales of the SHAQ (Steen & Medsger, 1997). The mean VAS score for tiredness was higher than the VAS score on any of the other symptom scales. These results confirm the recently reported importance of tiredness as a symptom in SSc (Richards et al., 2003). Tiredness was strongly associated with depressed mood in this sample. Tiredness is known to be associated with depression and with disease activity in other autoimmune and rheumatic diseases. Therefore, more research is needed to distinguish between these concepts and to determine the relative importance of disease activity and depressed mood in tiredness. Nevertheless, tiredness is an

important symptom in SSc and should be assessed in order to fully comprehend the impact of the disease.

More importantly, this study demonstrates that perceived social support, disease cognitions and coping are associated with depressed mood in patients with SSc, even after controlling for physician-assessed disease severity as well as self-reported disease symptoms and physical functioning. Potentially, each of these psychosocial variables can be targeted in psychological interventions, improving depressed mood. In line with previous research, this study confirms the importance of social support (Roca et al., 1996; Moser et al., 1993). However, the level of actual support is not correlated with depressed mood. This last finding should be interpreted with caution. The Cronbach's alpha of the actual support scale used in this study was low at 0.65. The low internal consistency of this measure may have contributed to the lack of significant association between actual support and depressed mood. A more internally consistent measure of actual support might show a different relationship with depressed mood. In this study, however, it is potential support, or the confidence that one can turn to another person for help, that is associated with lower levels of depressed mood. Potential support is a cognitive evaluation of social support resources. Interestingly, this relationship is independent of marital status. However, both marital status and potential support are associated with depressed mood. Further research is needed to clarify the interaction between marital status, social support and depressed mood in patients with SSc.

Of all the psychological variables included in the study, 'helplessness' and 'acceptance' showed the strongest correlations with depressed mood. Moreover, these disease cognitions entered as a block in a regression analysis made a significant

contribution to the prediction of depressed mood (explaining an additional 10% of the variance) after controlling for physician-assessed disease severity, self-reported disease symptoms, physical functioning, marital status and social support. Therefore, it seems that both negative (helplessness) and neutralizing (acceptance) connotations concerning the disease are related to depressed mood. However, 'helplessness' made no independent unique contribution to the prediction of depressed mood in the final analysis, over and above all other variables in the final equation. Furthermore, positive cognition (disease benefits) is unrelated to depressed mood. It is still unclear how this lack of association between disease benefits and depressed mood should be explained. Previous studies confirmed the importance of the cognitive appraisals of helplessness and control (Matsuura et al., 2003; Malcarne & Greenbergs, 1996). Neutral and/or positive cognitive re-evaluations have not previously been studied in SSc, although one study showed that a related construct, sense of coherence, was inversely related to depression (Matsuura et al., 2003). However, 'sense of coherence' refers to a personality trait and less to disease-related cognitions as conceptualized in this study. Acceptance as measured in this study refers to attaching connotations to an event that diminish the negative meaning of the stressful event (Evers et al., 2001). As such, these connotations can be modified by psychological interventions.

Only two of the coping strategies measured in this study were related to depressed mood: active coping and expression of emotions. The significant partial correlations between these two coping strategies and depressed mood indicate that these relations remained significant after controlling for marital status, self-reported disease symptoms and physical functioning. The association between active coping and depressed mood is similar to the relationship between problem-focused coping

and distress reported by Malcarne & Greenbergs (1996). Both coping scales measure a conceptually similar construct. Active coping or problem-focused coping thus seems to have some positive effect in patients with SSc. In this study, however, active coping made no independent unique contribution to the prediction of depressed mood, beyond social support and disease cognitions. The relationship between expression of emotions and higher levels of depressed mood observed in this study is remarkable. Expression of emotions is generally regarded as a positive coping style with potential positive effects for a person's psychological mood (Gohm & Clore, 2002). However, expression of emotions can also be seen as a primarily emotion-focused coping strategy. In general, emotion-focused coping strategies are associated with negative consequences for a person's well-being. Further research is needed to understand the relation between expression of emotions and depressed mood in patients with SSc. To summarize, 'potential support' and 'acceptance' are both related to lower levels of depressed mood, while 'helplessness' and 'expression of emotions' are positively associated with depressed mood.

Several limitations of this study should be mentioned. First of all, in the current study, only generic psychological measures were used, i.e., instruments measuring psychological factors that play a role in all chronic diseases. Some SSc-specific factors may contribute to perceived psychological distress as well. For instance, skin modification is a stressor that is specific for SSc. Indeed, some studies have pointed out the importance of body-image dissatisfaction in the patient's psychological well-being (Benrud-Larson et al., 2003; Ben-Tovim & Walker, 1995). The SHAQ questionnaire, measuring the perceived severity of the disease symptoms, does not contain a scale 'skin modification' or a conceptually related construct. Skin

modification may be extremely negative and psychologically distressing for the individual patient (van Lankveld et al., 2007). Psychological treatment should address these individual problems when appropriate. The correlational design of the current study is another limitation. As yet, no longitudinal studies have been conducted into the long-term effects of social support, coping and cognitions on depressed mood in SSc.

Nonetheless, these findings may have important implications for the future treatment of depressed mood in patients with SSc. Although the mean score for depressed mood in SSc is high, no studies heave been reported on the effectiveness of psychological interventions in reducing depressed mood in SSc. Recently, some interventions have been developed based on educational principles (Samuelson & Ahlmén, 2000; Genth & Baltscheit, 2003). The primary goal of these interventions is to educate the patient about the disease, and not primarily to improve the patient's depressed mood. However, given the high levels of depression in these patients, specific interventions to reduce the patient's level of depressed mood should be developed. Such specific interventions in SSc could benefit from the findings reported in this study. In RA, cognitive-behavioral interventions are effective in improving the patient's psychological well-being (Riemsma et al., 2002). This is true for interventions targeting the patients coping and those targeting cognitions (van Lankveld et al., 2004), as well as for interventions aimed at improving the patient's social support skills (Savelkoul & Witte, 2004). Similar interventions in SSc may help reduce depressed mood as a result of the disease. More research is needed to determine whether an intervention targeting the psychological associates of depressed

mood identified in this study will actually result in improved psychological well-being of patients with SSc.

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Table I: Demographic characteristics and physician-assessed disease severity of patients with SSc (N = 123).

Age in years (mean (SD))	54.3 (12.9)
Female %	68.0%
Education	
< 9 years	9.0%
9-14 years	71.0%
15-17	14.5%
> 18	4.9%
Work Status	
Student	1.6%
Employed	23.2%
Housekeeping	26.4%
Social benefit	27.2%
Retired	18.4%
Marital status	
Never married	11.4%
Married	76.0%
Divorced	4.9%
Widowed	8.1%
Duration of the disease in years (mean SD)	10.6 (9.7)

Physician-assessed disease severity	
Patients with limited SSc	71%
Mean mRSS	9.9 (7.6)
Number of organs involved	1.5 (0.7)

Table II: Mean scores on Perceived Disease Symptoms and Physical Functioning in the sample and Pearson correlations with Depressed Mood (N = 123).

	Range	Mean (SD)	Depressed Mood r
Disease symptoms (VAS)	0-10		
Pain		3.4 (2.7)	0.45**
Intestine		1.8 (2.2)	0.29**
Breath		3.2 (3.1)	0.28**
Raynaud's		4.3 (3.1)	0.32**
Digital Ulcers		2.9 (3.9)	0.16
Disease severity		4.0 (2.6)	0.51**
Tiredness		4.8 (2.7)	0.46**
Mean Symptom Score		3.4 (2.1)	0.49**
Functioning (HAQ-DI)	0-3		
Dressing and grooming		0.9 (0.8)	0.36**

Arising	0.6 (0.7)	0.32**
Eating	1.1 (0.9)	0.26**
Walking	0.8 (0.9)	0.37**
Hygiene	1.1 (1.0)	0.27**
Reach	1.0 (0.9)	0.39**
Grip strength	0.9 (0.8)	0.27**
Activities	1.4 (0.9)	0.45**
Mean Function Score	1.0 (0.7)	0.44**

* $p < .05$, ** $p < .01$

Table III: Mean scores for Social Support, Cognitions and Coping, and correlations and partial correlations with depressed mood.

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	Range	Mean (SD)	r	partial r [#]
Social support (IRGL [a])				
Potential support	5-20	15.3 (4.1)	-0.32**	-0.25*
Actual support	3-12	6.7 (1.8)	-0.06	-0.09
Cognitions (ICQ [b])				
Helplessness	4-24	13.4 (4.6)	0.54**	0.31**
Acceptance	4-24	15.3 (4.3)	-0.56**	-0.40**
Disease benefits	4-24	14.5 (4.0)	-0.18	-0.19
Coping (UCL [c])				
Active coping	7-28	17.6 (3.6)	-0.31**	-0.30**
Comforting Cognitions	5-20	13.5 (2.6)	-0.12	-0.17
Seeking Social Support	6-24	12.8 (3.3)	0.06	0.03
Avoidance	8-32	16.3 (3.1)	0.12	0.08
Expression of emotions	3-12	6.0 (1.8)	0.33**	0.32**
Palliative reaction	8-32	17.6 (3.6)	0.14	0.02

[#]Controlling for marital status, self-reported disease symptoms and physical functioning. [a] IRGL, Impact of Rheumatic Diseases on General Health and Lifestyle (Invloed van Reuma op Gezondheid en Leefwijze); [b] ICQ, Illness Cognitions Questionnaire; [c] UCL, Utrecht Coping Scale.
*$p < .05$, ** $p < .01$

Table IV: Stepwise regression analysis predicting Depressed Mood, entering disease severity variables, and selected social support, cognitions and coping variables.

Step	Variables	R^2 change	beta[a]
1	Physician-assessed disease severity	.01	
	Subtype SSc		.06
	Rodnan Skin Score		-.11
	Number of organs involved.		-.02
2	Self-reported disease variables	.26**	
	Symptoms		.24**
	Functioning		.09
3	Marital status (0 = not married, 1 = married)	.08**	-.24**
4	Potential support	.04**	-.16*
5	Disease Cognitions	.10**	
	Helplessness		.14
	Acceptance		-.18*
6	Coping	.06**	
	Active Coping		-.11
	Expression of emotions		.21**
Total R^2		.54**	

[a] Standardized regression coefficient. *$p < .05$, ** $p < .01$