Psychological characteristics of systemic sclerosis patients and their correlation with major organ involvement and disease activity

C.V. Golemati, H.M. Moutsopoulos, P.G. Vlachoyiannopoulos

Department of Pathophysiology, Medical School, National University of Athens, Athens, Greece.

Christina V. Golemati, MSc
Haralampos M. Moutsopoulos, MD, Prof.
Panayiotis G. Vlachoyiannopoulos, MD

Please address correspondence and reprint requests to:
Panayiotis G. Vlachoyiannopoulos, MD, Department of Pathophysiology, Medical School, National University of Athens, 75 M. Asias Street, 11527 Athens, Greece.
E-mail: pvlah@med.uoa.gr

Received on November 26, 2012; accepted in revised form on February 5, 2013.

Clin Exp Rheumatol 2013; 31 (Suppl. 76): S37-S45.

Key words: scleroderma, psychology, anxiety, depression, social support, coping

Competing interests: none declared.

ABSTRACT

Objectives. *The aim of this paper is to assess the psychological characteristics of personality, depression, anxiety, social support and coping strategies of systemic sclerosis (SSc) patients, their inter-correlations and their association with clinical symptoms.*

Methods. *Patients with SSc (n=85) were interviewed and compared to rheumatoid arthritis (RA) patients (n=120) and healthy controls (HCs [n=125]). Psychological characteristics were assessed by the following psychometric scales: centre of epidemiological studies of depression (CES-D), hospital anxiety and depression scale (HAD), Eysenck personality questionnaire (EPQ), short form of social support (SSq), life experiences survey (LES) and ways of coping (WoC). Clinical data were collected at the same time of the interview. Both control groups were matched to SSc patients in terms of gender, age and educational status. Data were analysed with SPSS software.*

Results. *Compared to control groups, SSc patients expressed more symptoms of depression and anxiety, showed less extraversion and reported more negative life events. They coped less often with positive reappraisal, problem solving, seeking of support and assertiveness, while they sought more often divine help, and they expressed wishing and denial. Inactive disease was associated with a lower probability of reporting depressive symptoms and negative life events and with a higher probability of positively reevaluating a problem. Lung dysfunction, skin involvement, esophageal problems and oral aperture correlated with psychological features.*

Conclusion. *Complications in psychological well-being characterise patients with SSc. This finding, as well as that of psychological characteristics correlating with organic factors, is an indication for designing supportive psycho-educational programmes as complementary therapies.*

Introduction

Systemic sclerosis (SSc) is a systemic autoimmune disease characterised by vasculopathy, and fibrosis of skin and internal organs; it affects commonly individuals between 35 and 65 years of age, mainly women (1). Vasculopathy is defined by the presence of Raynaud's phenomenon, ischaemic digital ulcers or gangrene and pulmonary arterial hypertension. There are two forms of the disease: limited (lSSc) and diffuse (dSSc), with the latter having the worst prognosis mainly due to pulmonary fibrosis, renal and heart involvement (2). Patients with lSSc present Raynaud's phenomenon, which may last for years until other symptoms of the disease develop. Overall, the course of the disease varies showing cutaneous, pulmonary, gastro intenstinal (GI), heart, hepatic and muscloloskceletal problems, calcinosis of the skin, esophageal hypomotility, while a proportion of them develop isolated pulmonary arterial hypertension. The most usual cause of death is cardiopulmonary failure (3).

Chronic autoimmune systemic diseases have been associated with psychological difficulties. Depression is a disorder that occurs in about 4–6% in the general population and around 5–10% in chronic illnesses. The prevalence of depression in patients with SSc measured with different psychometric scales in various studies, ranges between 17–65% (4). Symptoms of depression have been associated with disease severity, years of education, GI function, functional status, coping with stress, pain, body image and neuroticism (5–12). Anxiety has been related to negative psychologi-

cal variables such as fear of negative evaluation from others, lack of attractiveness (13), maladaptive action, image distorting, hostility, sense of coherence and low acceptance (14), and has been related to clinical variables such as lung problems and pain (6).

Positive affect and optimism have proved to help psychological adjustment of patients with chronic illness (15), while neuroticism and high levels of anxiety affect negatively psychosocial adjustment to disease (16). Patients with autoimmune systemic diseases such as Sjögren's and vasculitis exhibited more demureness, restraint, compliance and kindliness than healthy controls (17, 18), while patients with secondary Raynaud's phenomenon have been characterised distant, more in control of their feelings, and having the tendency not to seek help when in need (19). Work published on patients with rheumatoid arthritis (RA) has shown that, personality relates to disease pattern (20). Coping strategies such as humour have been found to be beneficial for quality of life, but not related to objective disease severity, like skin thickening, therefore they cannot be constituents of a therapeutic strategy (21).

In this report we evaluated psychological characteristics of consecutive SSc patients from the largest SSc patient cohort of Greece in order to examine depression, anxiety, personality, social support, coping strategies and possible inter-correlations with the clinical condition of SSc patients. The aim of this study was to examine whether patients' psychological characteristics differ from controls and to find intercorrelations in the psychological field, which could reveal a psychological profile as well as to find possible associations with disease activity and organ involvement.

Materials and methods

Patients with systemic sclerosis (n=85) followed in the systemic autoimmune disease clinic, Department of Pathophysiology Medical School National University of Athens, were recruited. Patients with rheumatoid arthritis (n=120) were also recruited from the same department, to exclude factors related to the chronicity of the disease. Finally, a group of healthy individuals (n=125) participated as controls. They were recruited from the personnel working at the clinic, as well as their relatives. Both control groups were matched to SSc patients in terms of gender, age and educational status. Exclusion criteria of healthy controls were a family history of systemic autoimmune diseases and chronic diseases with disability such as diabetes mellitus type I not treated properly, respiratory failure, renal failure, cardiac failure and mental health issues.

The procedures followed were in accordance with the standards of the responsible ethical issues committee of Laiko University Hospital of Athens, Greece, that approved the study.

Interviews took place in the outpatient department of the clinic and were conducted from the researcher, since a number of patients were disabled. Demographic characteristics were collected as well as information about behaviours of smoking and alcohol use. The main procedure involved administration of psychometric scales and questionnaires, described below. Patients were classified by disease subtype (limited and diffuse). Organ involvement and disease activity were recorded based on the clinical data of the same time of the interview.

Table I. Socio-demographic variables of SSc, RA patients and healthy controls (HC).

Demographic variables	SSc patients (n=85)	RA patients (n=120)	*p*-value SSc *vs*. RA	HC (n=125)	*p*-value SSc *vs*. HC
Women, n (%)	82 (96,4)	111 (91,2)	NS	118 (94,4)	NS
Age (years), mean (SD)	53.3 (13.6)	57.2 (12.9)	NS	53.8 (14.2)	NS
Range	20–82	19–81		21–85	
Marital status, n (%)					
Married	59 (69.4)	80 (67.2)	NS	88 (71.9)	NS
Education level, n (%)					
Elementary school	25 (29.4)	39 (32.5)	NS	38 (30.4)	NS
College-university studies	28 (32.9)	35 (29.1)	NS	41 (32.8)	NS
Time since first diagnosis, mean (SD)	9.2 (7.6)	11.6 (8.8)	0.01	NA	NA
Smoking, n (%)					
Yes	10 (11.8)	38 (31.7)	0.001	41 (33.9)	0.000
No	75 (88.2)	82 (68.3)		80 (66.1)	
Limited (lSSc), n (%)	28 (32.9%)	NA	NA	NA	NA
Diffuse (dSSc), n (%)	57 (67.1%)				

NS: not stated; NA: non applicable.
p-values are based on Mann-Whitney U-test for non-parametric variables.

Disease variables

The diagnosis of systemic sclerosis was based on the American College of Rheumatology classification criteria for definite systemic sclerosis (22). Diffuse cutaneous involvement was defined as skin thickening proximal to the elbows and knees. Limited cutaneous involvement was defined as the presence of skin thickening only distal to the elbows and knees or in the face and remained limited in these areas at least 2 years after the onset of initial scleroderma related changes (2). Disease activity was calculated according to the proposed preliminary criteria of the European Scleroderma Study group (23).

Major organ involvement was defined as previously described (3). More specifically: pulmonary involvement was defined as bibasilar pulmonary fibrosis on chest x-ray or crackles plus forced vital capacity (FVC) <70% of predicted normal plus forced expiratory volume in 1 second >70% of predicted (24). Furthermore, values of total lung capacity (TLCHe) and carbon monoxide diffusing lung capacity (DLCOSB), which were available in patients' files at least once per year, were also recorded. Renal involvement was defined as a serum creatinine level >2.5 mg/dL on two occasions; creatinine clearance <45 mL/min on two occasions; or "renal crisis" defined as acute (within 1

Table II. Frequencies, odds ratios and confidence intervals of psychometric variables in patients and controls.

Variables, n (%)	SSc n=85	RA n=120	HC n=125	OR (95%CI) *p*-value SSc *vs*. RA	OR (95%CI) *p*-value SSc *vs*. HC	OR (95%CI) *p*-value RA *vs*. HC
EPQ-neuroticism						
<7	14 (16.5%)	22 (18.5%)	24 (19.8%)	0.869 (0.41–1.81)	0.797 (0.38–1.64)	1.091 (0.57–2.07)
>7	71 (83.5%)	97 (81.5%)	97 (80.2%)	0.710	0.540	0.791
EPQ-extraversion						
<7	16 (18.8%)	9 (7.6%)	7 (5.8%)	2.834 (1.18–6.76)	3.78 (1.48–9.64)	0.75 (0.27–2.08)
>7	69 (81.2%)	110 (92.4%)	114 (94.2%)	0.016	0.003	0.581
CES-D						
<16	44 (51.8%)	76 (63.9%)	98 (81%)	0.61 (0.35–1.07)	0.25 (0.13–0.46)	2.41 (1.33–4.34)
>16	41 (48.2%)	43 (36.1%)	23 (19%)	0.083	0.000	0.003
HAD-anxiety						
<7	35 (41.2%)	45 (37.8%)	75 (62%)	1.15 (0.65–2.03)	0.42 (0.24–0.57)	2.68 (1.59–4.51)
>7	50 (58.8%)	74 (62.2%)	46 (38%)	0.628	0.003	0.000
HAD-depression						
<7	42 (49.4%)	75 (63%)	97 (80.2%)	0.57 (0.32–1.00)	0.24 (0.13–0.44)	0.42 (0.23–0.75)
>7	43 (50.6%)	44 (37%)	24 (19.8%)	0.053	0.000	0.003
HAD-total						
<14	38 (44.7%)	62 (52.1%)	97 (80.2%)	0.74 (0.42–1.2)	0.20 (0.10–0.3)	0.2 (0.1–0.4)
>14	47 (55.3%)	57 (47.9%)	24 (19.8%)	0.298	0.000	0.000
LES-negative events						
<2	24 (28.2%)	51 (42.9%)	72 (59.5%)	0.52 (0.28–0.95)	0.26 (0.14–0.48)	0.51 (0.30–0.85)
>2	61 (71.8%)	68(57.1%)	49 (40.5%)	0.033	0.000	0.010
LES-positive events						
<2	68 (80%)	103 (86.6%)	57 (47.1%)	0.62 (0.29–1.31)	4.4 (2.3–8.5)	7.2 (3.8–13.6)
>2	17 (20%)	16 (13.4%)	64 (52.9%)	0.210	0.000	0.000
WoC-positive reappraisal						
<2	43 (50.6%)	33 (43.4%)	36 (29.6%)	2.66 (1.4–4.7)	2.41 (1.35–4.30)	1.104 (0.63–1.93)
>2	42 (49.4%)	86 (67.2%)	85 (70.2%)	0.001	0.002	0.729
WoC-problem solving						
<2	51 (60.0%)	32 (26.9%)	38 (31.4%)	4.078 (2.52–7.38)	3.27 (1.83–5.84)	1.245 (0.712–2.17)
>2	34 (40.0%)	87 (73.1%)	83 (68.6%)	0.000	0.000	0.442
WoC-seek support						
<2	38 (44.7%)	43 (36.1%)	44 (36.4%)	1.42 (0.80–2.52)	1.41 (0.80–2.49)	1.01 (0.59–1.71)
>2	47 (55.3%)	76 (63.9%)	77 (63.6%)	0.217	0.000	0.97
WoC-wishing						
<2	18 (21.2%)	48 (40.3%)	57 (41.1%)	0.39 (0.210–0.751)	0.302 (0.60–0.567)	1.31 (0.79–2.19)
>2	67 (78.8%)	71 (59.7%)	64 (52.9%)	0.004	0.000	0.290
WoC-seek divine						
<2	32 (37.6%)	35 (29.4%)	73 (60.3%)	1.44 (0.80–2.61)	0.397 (0.22–0.70)	3.65 (2.13–6.24)
>2	53 (62.4%)	84 (70.6%)	48 (39.7%)	0.217	0.001	0.000
WoC-resignation						
<2	43 (50.6%)	43 (36.1%)	57 (47.1%)	1.81 (1.02–3.18)	1.150 (0.66–2.00)	1.57 (0.939–2.64)
>2	42 (49.4%)	76 (63.9%)	64 (52.9%)	0.039	0.623	0.085
WoC-denial						
<2	42 (49.4%)	66 (55.5%)	82 (67.8%)	0.78 (0.44–1.37)	0.465 (0.262–0.822)	1.68 (0.99–2.85)
>2	43 (50.6%)	53 (44.5%)	39 (32.2%)	0.39	0.008	0.050
WoC-assertiveness						
<2	71 (83.5%)	89 (74.8%)	77 (63.6%)	1.709 (0.84–3.46)	2.89 (1.4–5.73)	0.59 (0.33–1.02)
>2	14 (16.5%)	30 (25.2%)	44 (36.4%)	0.135	0.002	0.61

p-values are based on chi-square tests for categorical variables.

week) rise of diastolic blood pressure >110 mm Hg associated with haematuria, proteinuria, papilloedema, or microangiopathic haemolytic anaemia, which required emergency measures (*e.g*. emergency admission, antihypertensive drugs), or which was fatal.

Esophageal involvement was defined as the appearance of two or more of the following for >3 months: dysphagia, odynophagia, intermittent heartburn, and alleviation of the above symptoms with omeprazole, histamine-2 receptor antagonists, or cisapride. Cardiac involvement was defined as major

conduction disturbances, ventricular arrhythmia, heart failure, or persistent (>2 months) moderate-to-large pericardial effusion detected by echocardiography. Isolated pulmonary arterial hypertension detected by ultrasonography in the absence of interstitial lung disease was recorded. Total skin score (TSS) evaluated according to modified Rodnan skin scoring system (25), and oral aperture were reported. The diagnosis for rheumatoid arthritis control group was based on the American College of Rheumatology 1987 revised criteria for the classification of rheumatoid arthritis (26).

Psychological scales and questionnaires

A battery of psychometric scales was used to assess the psychological characteristics of participants.

The Centre of Epidemiological Studies of Depression (CES-D) is a 20-item questionnaire that measures depressive symptomatology. The occurrence of each depressive symptom is rated on a Lickert scale of 0–3 ('rarely or none of the time' to 'all of the time'), and total score ranges from 0 to 60. A scoring above 16 denotes possible depression (27).

The Hospital Anxiety and Depression scale (HAD) assesses symptoms of anxiety (generalised anxiety) and depression (anhedonia). The HAD scale is a 14 item questionnaire, with 7 items for anxiety and 7 for depression, with each item rating on a four point (0–3) scale. Possible scores range from 0 to 21 for each subscale. A score >7 for either subscale is being suggestive of possible symptomatology and a score of 11 or higher indicates probable 'caseness'. The sum of the two subscales gives the score of emotional distress (0–42). A score above 21 is considered a possible case (28).

The Eysenck Personality Questionnaire (EPQ) is an 84-item scale, which explores personality types. The questionnaire is divided in three dimensions: extraversion, neuroticism and psychoticism. It involves a fourth dimension measuring lie, used to ensure the reliability of participants and will not be included in the results of the study. The responses of the questionnaire are constructed on a yes/no scale. Each dimension gives a separate scoring ranging from 0–21 and is categorised as follows: 0–6=low, 7–13=median, 14–21=high (29).

Short form of Social Support (SSq) is a 6-item questionnaire, which consists of two parts: the number of persons that provide support to each participant (min. 0, max. 9) and the level of satisfaction from that support, measured on a six-point scale (1–6). The concluding counts represent the mean number of persons that provide support and the mean scoring of the level of satisfaction (30).

The Life Experiences Survey (LES) assesses positive and negative life changes with 49 items, considered "major changes", and allows for individualised ratings of the impacts of events on a scale ranging from -3 for the negatively evaluated events to +3 for the positively evaluated events. Summing the negative events gives the total number of negative changes and summing the positive events gives the total number of positive changes, respectively. The final evaluation consists of six parts: scoring of negative events, scoring of positive events, the count of negative and the count of positive events and a total scoring, and total count of events (31).

Ways of Coping (WoC) is a 38-item questionnaire that measures eight coping strategies: positive reappraisal, problem solving, seek of social support, wishing, seek of divine, resignation, denial and assertiveness. Items are scored on a 4-point scale (0–3). There are no cut-off scores and the final scoring is evaluated by an experienced psychologist (32).

Table III. Psychological characteristics of SSc patients and their relation to disease activity and organ involvement.

Psychological variables n (%)	Disease activity No	Yes	*p*-value	OR (95%CI)
Depression (Ces-d)				
<16	31 (36.5)	13 (15.3)	0.029	2.761 (1.131–6.739)
>16	19 (22.4)	22 (25.9)		
Negative life events (LES)				
<2	19 (22.4)	5 (5.9)	0.026	3.677 (1.217–11.110)
>2	31 (36.5)	30 (35.3)		
Positive reappraisal (WoC)				
<2	20 (23.5)	23 (27.1)	0.028	0.348 (0.142–0.854)
>2	30 (35.3)	12 (14.1)		
	Lung fibrosis			
	No	Yes		
Depression (HAD)				
<7	24 (28.2)	17 (20)	0.05	2.471 (1.031–5.919)
>7	16 (18.8)	28 (32.9)		
Positive reappraisal (WoC)				
<2	15 (17.6)	28 (32.9)	0.03	0.364 (0.151–0.858)
>2	25 (29.4)	17 (20)		
	PAH			
	No	Yes		
Depression (Ces-d)				
<16	29 (34.1)	15 (17.6)	0.03	2.729 (1.132–6.581)
>16	17 (20)	24 (28.2)		
Positive reappraisal (WoC)				
<2	18 (21.2)	25 (29.4)	0.03	0.360 (0.149–0.870)
>2	28 (32.9)	14 (16.5)		
	Esophageal hypomotility			
	No	Yes		
Resignation (WoC)				
<2	19 (22.4)	24 (28.2)	0.037	2.903 (1.121–7.518)
>2	28 (32.9)	57 (67.1)		

p-values are based on chi-square tests for categorical variables.

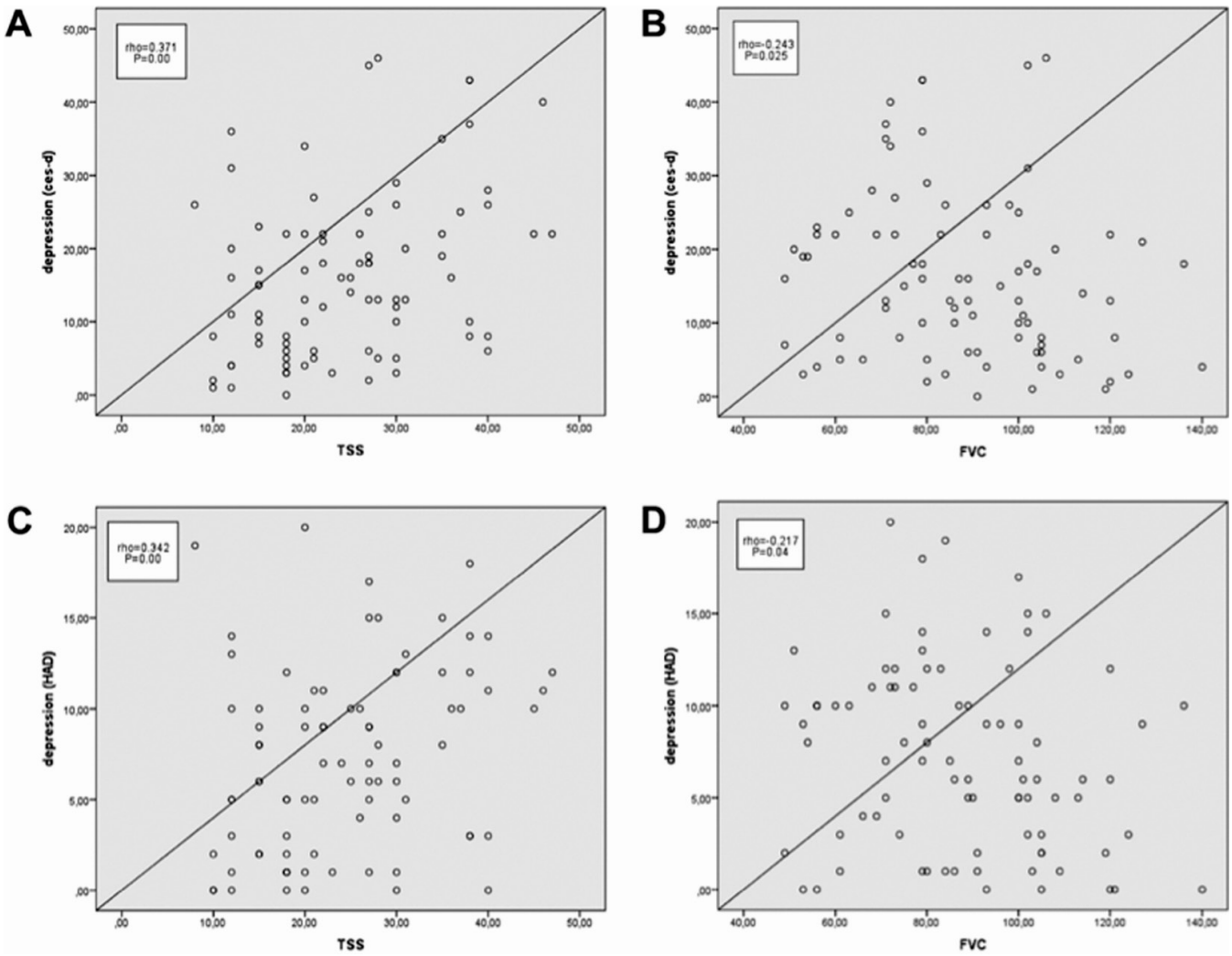

Fig. 1. Spearman's rho correlations in SSc patients between depression CES-D, total skin score (**A**) and FVC (**B**) and depression HAD, total skin score (**C**) and FVC (**D**).

All tests and scales used have been previously validated for the Greek population.

Statistics

Statistical analysis was performed using SPSS software and statistical significance was indicated by p-value <0.05. Descriptive statistics were used to designate demographic data; chi-square (χ^2) tests were used to reveal significant differences between patients and controls. Probabilities of psychological features were calculated with odds ratios (ORs) and their corresponding 95% confidence intervals (CIs). Associations between patient's psychological characteristics and clinical outcomes were measured using ORs and their corresponding 95%CIs for categorical variables and Spearman's rank correlation coefficient for non-categorical variables.

Results

The socio-demographic variables of patients and controls are presented in Table I. Of the 85 SSc patients the majority were female (96.4%) with a mean age of 53.3 years and mean disease duration 8.9 years at the time of the interview. Nearly two-thirds of them were married, while 29.3% of them had elementary school education. Cases and controls were matched in terms of age, gender, marital and educational status, although RA patients had longer disease duration.

Statistical analysis showed that SSc patients as compared to HCs express less often extraversion, and more often depression, anxiety and emotional distress; in addition they report more negative and less positive life events compared to healthy controls. Regarding to coping strategies, patients with SSc use less often positive reappraisal, problem solving, seeking of support and show less assertiveness, while they seek more often divine help and they use wishing and denial. Odds ratios and their corresponding confidence intervals for all psychological characteristics are shown in Table II. Patients have a 2.8 time-fold higher probability of being less extraverted than HCs, 2.66 time-fold higher probability of using less positive reappraisal and 4.07 time-fold of using less problem solving.

In an effort to find out whether psychological characteristics of SSc patients were non-specific, simply related to the chronicity of their disease, an at-

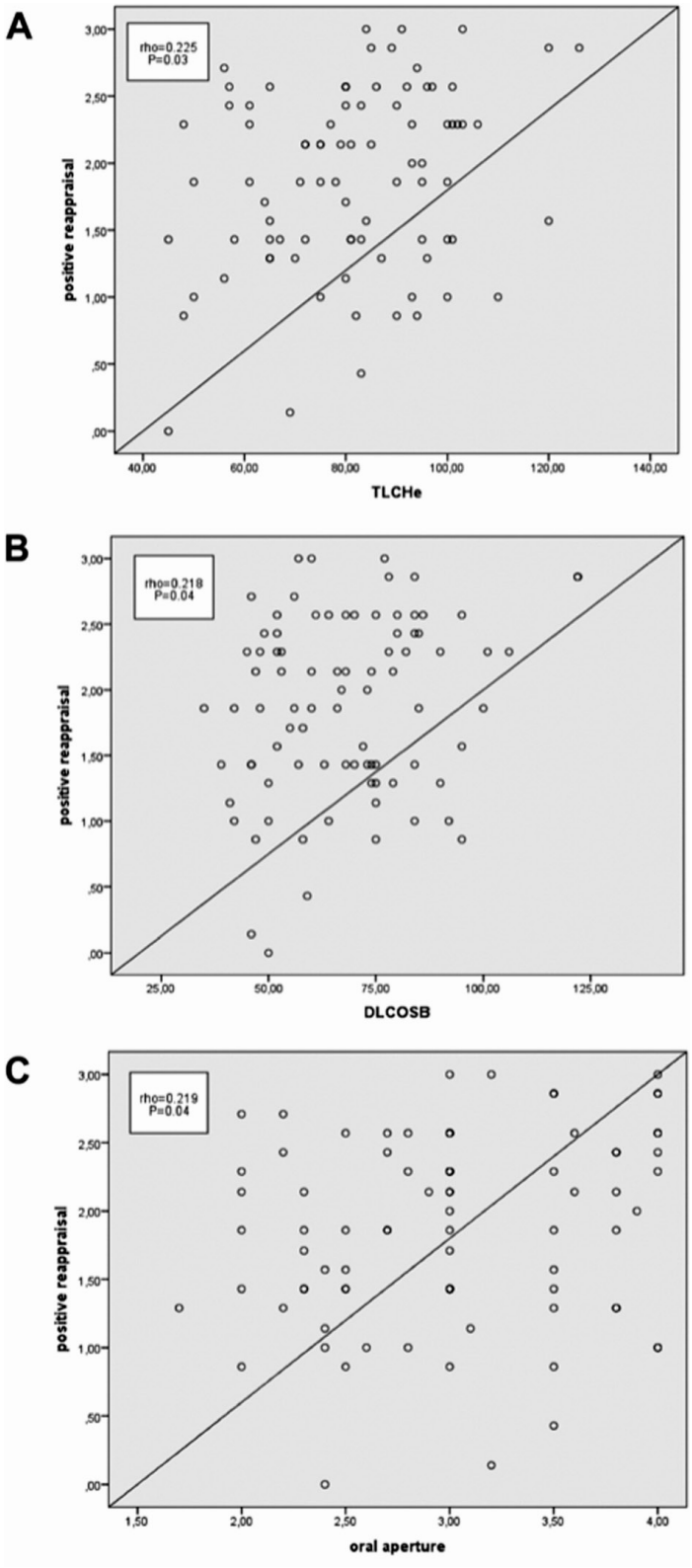

Fig. 2. Spearman's rho correlations in SSc patients between positive reappraisal and TLCHe (**A**), DLCOSB (**B**) and oral aperture (**C**).

tempt was undertaken to compare the prevalence of their psychometric variables with that of RA patients (Table II). Odds ratios and their corresponding confidence intervals revealed that SSc patients have a 3.7 time-fold higher probability of being less extraverted than RA controls, a 4.4 time-fold higher probability of mentioning less positive events, 2.41 time-fold of using less positive reappraisal, 3.27 time-fold of using less problem solving and 2.89 time-fold higher probability of expressing less assertiveness.

Significant correlations using chi-square tests between clinical variables and psychometric variables for SSc patients are depicted in Table III. Inactive disease is associated with less depressive symptomatology, and a lower probability of reporting negative events in the preceding year and a higher probability of using positive reappraisal to cope. Patients with lung fibrosis have a higher probability of presenting with depressive symptomatology and using less positive reappraisal to cope. When patients suffered from esophageal hypomotility, they had a 2.9 time-fold higher probability of using resignation to cope with stress.

Spearman's rho correlations showed that depression (CES-D and HAD-depression subscale) correlated with total skin score and FVC (Fig. 1), and positive reappraisal correlated with TLCHe, DLCOSB and oral aperture (Fig. 2). Psychological inter-correlations are presented in Table IV.

Discussion

The present study aimed to identify dispositional characteristics, psychopathology and environmental factors, associated to scleroderma. In addition, an effort was undertaken to compare SSc patients with healthy individuals and patients with RA in terms of the above characteristics.

The role of those variables in illness progression and mortality has been studied for patients with coronary heart disease, cancer and autoimmune diseases showing an important role of those psychological factors in affecting illness, by various pathways (17, 19, 33, 34). In autoimmune diseases psychopathological symptoms, personality characteristics and environmental factors may affect the progress of illness (17-20, 35, 36).

As depicted by the present study, patients with SSc expressed more often depressive symptoms than controls. It could be assumed that severe physical disability of this disease may cause more psychological burden. However, when SSc patients were compared to RA patients, the frequency of depres-

Table IV. Spearman's rho intercorrelations of psychometric variables for SSc patients.

	Variables, rho, *p* value				
	Depression (Ces-d)	Emotional distress	Neuroticism	Extraversion	Positive reappraisal
Education	-0.255, 0.01	NS	NS	NS	NS
Anxiety	0.476, 0.00	0.753, 0.00	0.376, 0.00	NS	NS
Depression (HAD)	0.893, 0.00	0.881, 0.00	0.372, 0.00	-0.253, 0.02	-0.333, 0.00
Emotional distress (HAD total)	0.844, 0.00	NS	0.423, 0.00	NS	-0.252, 0.02
Neuroticism	0.448, 0.00	0.423, 0.00	NS	NS	NS
Extraversion	-0.275, 0.01	NS	NS	NS	0.341, 0.00
Social support number of supports	NS	-0.245, 0.00	NS	NS	NS
Social support satisfaction	-0.285, 0.00	-0.285, 0.00	NS	NS	0.291, 0.00
Negative life events	0.332, 0.00	0.341, 0.00	0.266, 0.01	NS	NS
Positive life events	NS	NS	NS	0.353, 0.00	NS
Positive reappraisal	-0.311, 0.00	-0.252, 0.02	NS	0.341, 0.00	NS
Problem solving	NS	NS	NS	0.297, 0.00	0.559, 0.00
Seek of social support	-0.293, 0.00	NS	NS	NS	0.400, 0.00
Assertiveness	NS	NS	NS	0.222, 0.04	NS

NS: not stated.

sion was of marginal significance, implying that chronic illness itself causes depressive symptoms in any case. The frequency of anxiety related symptoms was significantly higher in SSc patients than in HCs. Symptoms of depression and anxiety in SSc patients have been previously reported (5, 10-12), and have been linked with organic components of the disease as well as other psychological variables (4, 7, 8, 14). Depressive symptomatology is expected to interact with disease (33); thus, depression, in this study, was found to correlate with lung fibrosis, total skin score and disease activity. Lower education level correlated with depressive symptomatology, as shown in a previous work (9). In addition, depressive symptomatology was positively correlated with the degree of neuroticism and negatively with the degree of extraversion. Finally, lower satisfaction of social support also associated with depression levels.

Patients with SSc were characterised by lower degree of extraversion as compared with control groups. Low extraversion – or introversion – is characterised by more subjective outlook, tendency to self-control, quietness, inhibition, lethargy, tendency to follow the lead of others (29, 37). Our findings suggest that extraversion was related to coping strategies of positive reappraisal, problem solving and assertiveness; thus persons characterised by introversion use less those coping strategies. These findings are consistent with literature reports that extraversion predicts better psychological adjustment to disease, probably through problem solving, social support and cognitive restructuring (37, 38). Likewise, neuroticism has been linked to coping strategies of wishful thinking and withdrawal, which are thought as less flexible (37). Neuroticism has been shown to predict negative life events such as divorce and financial loss (38). Despite the fact than SSc patients did not reach overall higher neuroticism scores, they were found to use more wishing, seeking of divine help, and denial of the problem. Positive reappraisal was repeatedly associated with clinical outcomes, a finding implying that patients with more disability cannot reappraise their problems in a positive way. Resignation was associated with esophageal hypomotility, probably reflecting the severity of the clinical condition.

SSc patients mentioned more negative events in the preceding year, and less positive and they reported to obtain less social support from their surroundings. Negative life events were associated with disease activity, either implying that worsening of the disease was an indicator of negative occurrences, or, that a negative affect influenced a patient's perspective. Those findings supplement the negative affect depiction of SSc patients (6, 9, 16).

No gender differences were found, probably due to women preponderance. A study on gender association with psychological features and clinical symptoms in SSc patients showed no significant differences in depression and anxiety scores between males and females (39). Similarly, other studies report no gender differences in psychological features (4, 8, 10, 14). Only appearance issues, because of the disease deformity, affect to a greater extent women than men (13, 5).

There are certain limitations in this study: since we attempt to study psychological characteristics, a bigger sample would help to generate more valid conclusions. Still, one should be very careful when drawing conclusions involving psychological and personality traits, as they are highly dispersed in the population. The above data contribute to the research on psychological characteristics of patients with SSc and strengthen the notion that psychological profile has a continuous interaction with organic disease. Further research including patients with systemic sclerosis would help to reveal probable psychological mechanisms.

Psychological characteristics and their inter-correlations motivate people to use certain ways of coping more or less effectively to adjust to chronic disease. As regards the relations between personality, coping and health, it seems that personality could be associated to

pathogenesis and could influence the selection of coping, which in turn influences the outcomes, and may impact the response to illness (33, 37), or be harmful itself (40). Thus, extraversion is associated with better physical and mental health, whereas neuroticism is associated to poorer health, although the pathway of the link is not clear (41). Adjustment to disease is crucial for quality of life (15, 16), though it is questionable if it can alter the severity of disease (21). Psychological findings can be viewed as guiding essentials for clinicians to help patients improve their quality of life.

Conclusion

SSc patients differ from healthy and disease controls in terms of higher depressive and anxious symptomatology, less extraverted personality type, experiencing more negative events and usage of coping styles that could be described as less adaptive. Depressive symptomatology and coping styles of SSc patients are associated with disease activity and lung problems. The above data underline the necessity of psychological support in this population either from their social surroundings or by community supportive programmes.

Acknowledgements

Emeritus professor Michalis Madianos (MD, MPH), Faculty of Nursing, University of Athens, Greece, is acknowledged for his consultation in the designing of the study and his contribution in the selection of psychometric scales and the relevant bibliographic references.

References

1. SEIBOLD J: Scleroderma. *In* HARRIS ED, BUDD RC, FIRESTEIN GS, GENOVESE MC, SERGENT JS, RUDDY S, SLEDGE CB *et al*. (Eds.): *Kelley's Textbook of Rheumatology*. Philadelphia, Elsevier 2005: 1279-308.
2. LEROY EC, BLACK C, FLEISCHMAJER R *et al*.: Scleroderma (systemic sclerosis): classification, subsets and pathogenesis. *J Rheumatol* 1988; 15: 202-5.
3. IOANNIDIS JP, VLACHOYIANNOPOULOS PG, HAIDICH AB *et al*.: Mortality in systemic sclerosis: an international meta-analysis of individual patient data. *Am J Med* 2005; 118: 2-10.
4. THOMBS BD, HUDSON M, TAILLEFER SS, BARON M: Prevalence and clinical correlates of symptoms of depression in patients with systemic sclerosis. *Arthritis Rheum* 2008; 59: 504-9.
5. BENRUD-LARSON LM, HAYTHORNTHWAITE JA, HEINBERG LJ *et al*.: The impact of pain and symptoms of depression in scleroderma. *Pain* 2002; 95: 267-75.
6. RICHARDS HL, HERRICK AL, GRIFFIN K, GWILLIAM PDH, FORTUNE DG: Psychological adjustment to systemic sclerosis-exploring the association of disease factors, functional ability, body related attitudes and fear of negative evaluation. *Psychol Health Med* 2004; 9: 29-39.
7. NIETERT PJ, MITCHELL HC, BOLSTER MB, CURRAN MY, TILLEY BC, SILVER RM: Correlates of depression, including overall and gastrointestinal functional status, among patients with systemic sclerosis. *J Rheumatol* 2005; 32: 51-7.
8. BODUKAM V, HAYS RD, MARANIAN P *et al*.: Association of gastrointestinal involvement and depressive symptoms in patients with systemic sclerosis. *Rheumatology* (Oxford) 2011; 50: 330-4.
9. MOSER DK, CLEMENTS PJ, BRECHT ML, WEINER SR: Predictors of psychosocial adjustment in systemic sclerosis. The influence of formal education level, functional ability, hardiness, uncertainty, and social support. *Arthritis Rheum* 1993; 36: 1398-405.
10. JEWETT LR, RAZYKOV I, HUDSON M, BARON M, THOMBS BD: Prevalence of current 12-month and lifetime major depressive disorder among patients with systemic sclerosis. *Rheumatology* (Oxford) 2013; 52: 669-75.
11. KWAKKENBOS L, VAN LANKVELD WG, VONK MC, BECKER ES, VAN DEN HOOGEN FH, VAN DEN ENDE CH: Disease-related and psychosocial factors associated with depressive symptoms in patients with systemic sclerosis, including fear of progression and appearance self-esteem. *J Psychosom Res* 2012; 72: 199-204.
12. ANGELOPOULOS NV, DROSOS AA, MOUTSOPOULOS HM: Psychiatric symptoms associated with scleroderma. *Psychother Psychosom* 2001; 70: 145-50.
13. VAN LANKVELD WG, VONK MC, TEUNISSEN H, VAN DEN HOOGEN FH: Appearance self- esteem in systemic sclerosis – subjective experience of skin deformity and its relationship with physician-assessed skin involvement, disease status and psychological variables. *Rheumatology* (Oxford) 2007; 46: 872-6.
14. HYPHANTIS TN, TSIFETAKI N, PAPPA C *et al*.: Clinical features and personality traits associated with psychological distress in systemic sclerosis patients. *J Psychosom Res* 2007; 62: 47-56.
15. JOACHIM G, ACORN S: Life with a rare chronic disease: the scleroderma experience. *J Adv Nurs* 2003; 42: 598-606.
16. MALCARNE VL, GREENBERGS HL: Psychological adjustment to systemic sclerosis. *Arthritis Care Res* 1996; 9: 51-9.
17. DUPOND JL, HUMBERT P, TAILLARD C, DE WAZIERES B, VUITTON D: Relationship between autoimmune diseases and personality traits in women. *Presse Med* 1990; 19: 2019-22.
18. KARAISKOS D, MAVRAGANI CP, MAKARONI S *et al*.: Stress, coping strategies and social support in patients with primary Sjögren's syndrome prior to disease onset: a retrospective case-control study. *Ann Rheum Dis* 2009; 68: 40-6.
19. BAYLE O, CONSOLI SM, BAUDIN M, VAYSSAIRAT M, FIESSINGER JN, HOUSSET E: Idiopathic and secondary Raynaud's phenomenon. A comparative psychosomatic approach. *Presse Med* 1990; 19: 741-5.
20. MOOS RH, SOLOMON GF: Personality correlates of the rapidity of progression of rheumatoid arthritis. *Ann Rheum Dis* 1964; 23: 145-51.
21. MERZ EL, MALCARNE VL, HANSDOTTIR I, FURST DE, CLEMENTS PJ, WEISMAN MH: A longitudinal analysis of humor coping and quality of life in systemic sclerosis. *Psychol Health Med* 2009; 14: 553-66.
22. Preliminary criteria for the classification of systemic sclerosis (scleroderma). Subcommittee for scleroderma criteria of the American Rheumatism Association Diagnostic and Therapeutic Criteria Committee. *Arthritis Rheum* 1980; 23: 581-90.
23. VALENTINI G, DELLA ROSSA A, BOMBARDIERI S *et al*.: European multicentre study to define disease activity criteria for systemic sclerosis. II. Identification of disease activity variables and development of preliminary activity indexes. *Ann Rheum Dis* 2001; 60: 592-8.
24. VLACHOYIANNOPOULOS PG, DAFNI UG, PAKAS I *et al*.: Systemic scleroderma in Greece: low mortality and strong linkage with HLA-DRB1*1104 allele. *Ann Rheum Dis* 2000; 59: 359-67.
25. KAHALEH MB, SULTANY GL, SMITH EA, HUFFSTUTTER JE, LOADHOLT CB, LEROY EC: A modified scleroderma skin scoring method. *Clin Exp Rheumatol* 1986; 4: 367-9.
26. ARNETT FC, EDWORTHY SM, BLONCH DA *et al*.: The American Rheumatism Association 1987 revised criteria for classification of rheumatoid arthritis. *Arthritis Rheum* 1988; 31: 315-24.
27. RADLOFF LS: The CES-D Scale. *Appl Psychol Meas* 1977; 1: 385-401.
28. ZIGMOND AS, SNAITH RP: The Hospital Anxiety and Depression Scale. *Acta Psychiatr Scand* 1983; 67: 361-70.
29. EYSENCK HJ, HIMMELWEIT HT: Dimensions of personality: London, Routledge & Kegan Paul, 1947.
30. SARASON IG, SARASON BR, SHEARIN EN, PIERCE GR: A Brief Measure of Social Support: Practical and Theoretical Implications. *J Soc Pers Relat* 1987; 4: 497-510.
31. SARASON IG, JOHNSON JH, SIEGEL JM: Assessing the impact of life changes: development of the Life Experiences Survey. *J Consult Clin Psychol* 1978; 46: 932-46.
32. FOLKMAN S, LAZARUS RS: An analysis of coping in a middle-aged community sample. *J Health Soc Behav* 1980; 21: 219-39.
33. REICHE EM, NUNES SO, MORIMOTO HK: Stress, depression, the immune system, and cancer. *Lancet Oncol* 2004; 5: 617-25.
34. KARAISKOS D, MAVRAGANI CP, SINNO MH *et al*.: Psychopathological and personality features in primary Sjögren's syndrome – asso-

ciations with autoantibodies to neuropeptides. *Rheumatology* (Oxford) 2010; 49: 1762–9.
35. KAPOOR SR, HIDER SL, BROWNFIELD A, MATTEY DL, PACKAM JC: Fibromyalgia in patients with rheumatoid arthritis: driven by depression or joint damage? *Clin Exp Rheumatol* 2011; 29 (Suppl. 69): S88-91.
36. ULUS Y, AKYOL Y, TANDER B, DURMUS D, BILGICI A, KURU O: Sleep quality in fibromyalgia and rheumatoid arthritis: associations with pain, fatigue, depression and disease activity. *Clin Exp Rheumatol*. 2011; 29 (Suppl. 69): S92-6.
37. CARVER CS, CONNOR-SMITH J: Personality and coping. *Annu Rev Psychol* 2010; 61: 679-704.
38. SEGERSTROM SC: Individual differences, immunity, and cancer: lessons from personality psychology. *Brain Behav Immun* 2003; 17 (Suppl. 1): 92-7.
39. NGUYEN C, BEREZNE A, BAUBET M *et al*.: Association of gender with clinical expression, quality of life, disability and depression and anxiety in patients with systemic sclerosis. *PLoS ONE* 2011; 6: e17551.
40. DENOLLET J, SYS SU, STROOBANT N, ROMBOUTS H, GILLEBERT TC, BRUTSAERT DL: Personality as independent predictor of long-term mortality in patients with coronary heart disease. *Lancet* 1996; 347: 417-21.
41. HOWARD SF: The multiple linkages of personality and disease. *Brain Behav Immun* 2008; 22: 668-75.