Validation of the Social Appearance Anxiety Scale in Patients with Systemic Sclerosis: A Scleroderma Patient-centered Intervention Network Cohort Study

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Abstract

Objective: Systemic sclerosis (SSc) is a chronic autoimmune disease that can cause disfiguring changes in appearance. This study examined the structural validity, internal consistency reliability, convergent validity, and measurement equivalence across disease subtypes of the Social Appearance Anxiety Scale (SAAS) in SSc.

Methods: Patients enrolled in the Scleroderma Patient-centered Intervention Network Cohort completed the SAAS and measures of appearance-related concerns and psychological distress. Confirmatory factor analysis (CFA) was used to examine the structural validity of the SAAS. Multiple-group CFA was used to determine if SAAS scores can be compared across patients with limited and diffuse disease subtypes. Cronbach's alpha was used to examine internal consistency reliability. Correlations of SAAS scores with measures of body image dissatisfaction, fear of negative evaluation, social anxiety, and depression were used to examine convergent validity. SAAS scores were hypothesized to be positively associated with all convergent validity measures, with all correlations significant and moderate to large in size.

Results: A total of 938 patients with SSc were included. CFA supported the one-factor structure (CFI: 0.92; SRMR: 0.04; RMSEA: 0.08), and multiple-group CFA indicated that the scalar invariance model best fit the data. Internal consistency reliability was good in the total sample, and in disease subgroups. Overall, evidence of convergent validity was found with measures of body image dissatisfaction, fear of negative evaluation, social anxiety, and depression.

Conclusion: The SAAS can be reliably and validly used to assess fear of appearance evaluation in patients with SSc, and SAAS scores can be meaningfully compared across disease subtypes.

Significance and Innovations

- Changes in appearance are common in SSc and can result in significant body image dissatisfaction and appearance-related anxiety.
- The Social Appearance Anxiety Scale can be validly and reliably used to assess fear of appearance evaluation in patients with SSc.
- Social Appearance Anxiety Scale scores can be meaningfully compared across patients with limited and diffuse disease.

Systemic sclerosis (SSc), or scleroderma, is a chronic rheumatic disease characterized by thickening of the skin and internal organs (1). Changes in appearance are common, and can include altered facial features, digital ulcers, hypo- and hyper-pigmentation, hand contractures, and telangiectasias (visible dilation of blood vessels beneath the skin). These changes can have significant psychosocial impacts as they may occur in socially-relevant areas such as the hands and face (2, 3). There is no cure for the disease, and disfiguring appearance changes can be permanent. Given these appearance changes, body image dissatisfaction and appearance-related social discomfort are important concerns for patients with SSc (2, 3).

Social appearance anxiety, or a fear of situations in which one's appearance will be evaluated, may be particularly salient in SSc due to the changes in appearance that can occur, often in socially-relevant areas of the body. Despite the high rates of appearance concerns in SSc, research in appearance-related social anxiety is limited. A small number of studies have evaluated social discomfort due to appearance changes (2, 3) and fear of negative evaluation (4), but no studies have examined social appearance anxiety in patients with SSc. Social discomfort due to appearance changes refers to unease in social interactions because of appearance changes. Fear or negative evaluation refers to worry about being evaluated unfavorably and can include concerns about appearance, but is not specific to appearance. A measure of social appearance anxiety validated in patients with SSc is needed to support research in this area. Since appearance anxiety may be associated with disease severity, such a measure would ideally have measurement equivalence across limited and diffuse disease subgroups. Diffuse SSc is associated with more skin involvement than limited SSc, and thus can be used as an indicator of severity, particularly related to appearance (1).

The Social Appearance Anxiety Scale (SAAS; 5) is a self-report measure that assesses

fear of situations in which one's appearance will be evaluated. The SAAS has demonstrated strong measurement properties in various populations, such as university students (5-6), female eating disorder patients (7), and gay and bisexual men of color (8), but has not been validated in SSc. A unidimensional factor structure has been found in previous studies, and internal consistency reliability has been excellent (αs: .93 to .96). Convergent validity has been demonstrated via significant, moderate to large correlations in the expected directions with measures of depression, anxiety, body image dissatisfaction, and fear of negative evaluation (5-8).

The first objective of the present study was to examine the factor structure of the SAAS in a sample of patients with SSc. A unidimensional factor structure was expected. The second objective was to examine the internal consistency reliability of the measure. Based on previous studies, internal consistency reliability was expected to be strong. The third objective was to examine convergent validity. Based on previous studies in other populations (5-8), we expected significant, positive, moderate to large correlations, defined according to Cohen's (9) rules of thumb [small: $|r| < 0.3$; moderate: $0.3 \leq |r| < 0.5$; large: ($|r| \geq 0.5$)], with measures of depression, body image dissatisfaction (social discomfort subscale, dissatisfaction with appearance subscale), fear of negative evaluation, and social anxiety. Based on previous research and theoretical hypotheses about relationships with convergent validity constructs (5-8), correlations with measures of social discomfort, fear of negative evaluation, and social anxiety were expected to be more robust than correlations with depression and dissatisfaction with appearance. Items from the SAAS were developed consulting diagnostic symptoms of social anxiety disorder. Thus, the SAAS was expected to be more strongly associated with discomfort in social contexts and anxiety as compared to clinical symptoms of depression and dissatisfaction with appearance,

which is distinct from social discomfort (10). The final objective was to determine if SAAS scores can be meaningfully compared across limited and diffuse subtypes.

Methods

Participants and procedures

This study was a cross-sectional analysis of baseline data of patients enrolled in the Scleroderma Patient-centered Intervention Network (SPIN) Cohort who completed study questionnaires from May 2014 through August 2016. Patients in the SPIN Cohort included in the present study were enrolled at 27 centers in Canada, the United States, and the United Kingdom. To be eligible for the SPIN Cohort, patients must have a diagnosis of SSc according to the 2013 ACR/EULAR classification criteria (11) confirmed by a SPIN physician, be at least 18 years of age, have the ability to provide informed consent, and be fluent in English or French. Exclusion criteria for participation in the SPIN Cohort include not having access to the internet or otherwise not being able to respond to questionnaires via the internet. The SPIN sample is a convenience sample. Eligible patients are invited by the attending physician or a supervised nurse coordinator to participate in the SPIN Cohort, and written informed consent is obtained. SPIN Cohort patients complete outcome measures via the internet upon enrollment and subsequently every three months. The SPIN Cohort study was approved by the Research Ethics Committee of the Jewish General Hospital and by the Institutional Reviews Boards of each participating center. In the present study, baseline SPIN Cohort assessments completed in English were analyzed. Only patients who completed all items of the SAAS were included in the present study.

Measures

Demographic and Medical Variables. Demographic variables were collected via self-

report and medical variables by SPIN physicians or nurse coordinators. Variables included: age, gender, years of education completed, marital status, years since first non-Raynaud's symptom, disease subtype, and modified Rodnan skin score.

SAAS (5). The SAAS is a 16-item measure examining fear of situations in which one's appearance will be evaluated. Response options range from 1 (not at all) to 5 (extremely). To calculate a total score, the first item is reverse coded and then all items are summed. Total scores range from 16 to 80, with higher scores indicating greater fear.

Brief Satisfaction with Appearance Scale (Brief-SWAP; 10). The Brief-SWAP is a 6-item measure of body image dissatisfaction that has been psychometrically validated in patients with SSc. Response options range from 1 (strongly disagree) to 7 (strongly agree). Two three-item subscale scores can be calculated and reflect Dissatisfaction with Appearance and Social Discomfort. To calculate subscale scores, 1 is initially subtracted from each item to anchor all items at 0. For Dissatisfaction with Appearance scores, items are then reverse scored and summed. To calculate Social Discomfort scores, items are summed. Subscale scores range from 0 to 18, with higher scores indicating greater body image dissatisfaction. Internal consistency reliability was good in the present sample (Dissatisfaction with Appearance: $\alpha = 0.83$; Social Discomfort: $\alpha = 0.89$).

Brief Fear of Negative Evaluation Scale-II (BFNE-II; 12). The BFNE-II is a revised version of the BFNE, that assesses the degree to which individuals worry about how they are perceived and evaluated by others. Response options for the 12 items range from 1 (not at all characteristic of me) to 5 (extremely characteristic of me). Total scores are calculated by summing individual items and range from 12 to 60. Higher scores indicate greater fear of negative evaluation. Internal consistency reliability in the present study was excellent ($\alpha = 0.98$).

Patient Health Questionnaire-8 (PHQ-8; 13). The PHQ-8 measures depressive symptoms over the last 2 weeks. Response options range from 0 (not at all) to 3 (nearly every day). Scores for each item are summed to produce a total score. Total scores range from 0 to 24 with higher scores indicating more depressive symptoms. Internal consistency reliability in the present study was good ($\alpha = 0.89$).

Social Interaction Anxiety Scale-6 (SIAS-6; 14). The SIAS-6 is a 6-item measure that assesses anxiety resulting from social interactions. Response options range from 0 (not at all characteristic or true of me) to 4 (extremely characteristic or true of me). Total scores are computed by summing scores for all items, and range from 0 to 24. Higher scores indicate greater anxiety from social interactions. Internal consistency reliability was excellent ($\alpha = 0.90$).

Statistical Analysis

Descriptive statistics for demographic and medical variables were calculated for the total sample in SPSS version 22.0. Confirmatory factor analysis using maximum likelihood parameter estimates was used to examine the factor structure of the SAAS in Mplus version 7.2. Model fit was determined considering descriptive fit indices as recommended by Bentler (15): (a) the Comparative Fit Index (CFI), (b) the Root Mean Square Error of Approximation (RMSEA), and (c) the Standardized Root Mean Residual (SRMR). For CFI, values ≥ 0.90 indicate acceptable model fit. For RMSEA and SRMR, values ≤ 0.08 indicate acceptable model fit. The likelihood ratio Chi-squared (χ^2) was reported for completeness, but it is heavily influenced by sample size and does not demonstrate degree of model fit (16). There was statistically significant multivariate skewness and kurtosis (all *ps* < .05) in the present data, so the Satorra-Bentler scaled χ^2 (S-B χ^2; 17) was used. A unidimensional factor structure was hypothesized to best fit the data. If a unidimensional factor structure did not fit the data well, modification indices would be examined

in attempt to improve model fit. Once a factor structure with adequate fit was identified, multiple-group CFA was used to evaluate measurement invariance of the SAAS across limited and diffuse patients with SSc. For the multiple-group CFA, configural invariance, metric invariance, and scalar invariance models were iteratively examined. For the configural invariance model, a one-factor solution was fit to the data in two separate models, one each for the limited and diffuse SSc groups. All parameters were freely estimated. For the more restrictive metric invariance model, factor loadings were constrained to equivalence across disease subtypes. For the most restrictive scalar invariance model, factor loadings and item intercepts were constrained to equivalence across disease subtypes. The CFI was used to statistically compare increasingly restrictive models for the multiple-group CFA. A change in CFI of ≤ .01 was indicative of no difference between nested models (18).

Internal consistency reliability was examined using Cronbach's coefficient alpha. Convergent validity was examined via Pearson product-moment correlations of the SAAS and measures of depression (PHQ-8), body image dissatisfaction (Brief-SWAP), and social anxiety (BFNE-II, SIAS). Fisher's *z* was used to statistically compare correlation coefficients among convergent validity variables.

Results

Descriptive Statistics

Sample statistics are reported in Table 1. Of 1,012 patients who initiated baseline assessments, forty-seven patients were removed from the sample because they did not complete any items of the SAAS, and one patient was removed because one item was not completed. In addition, patients with sine (n = 18) or unknown disease subtype (n = 8) were not included. Participants included in analyses (N = 938) were predominantly female (88 %), married (68%),

and had a mean age of 55.6 years. The mean time since the onset of the first non-Raynaud's symptom was 11.8 years (*SD* = 8.9). The mean SAAS score in the total sample was 28.3 (*SD* = 13.2). SAAS scores significantly differed across limited (*M* = 26.5, *SD* = 11.9) and diffuse (*M* = 30.6, *SD* = 14.4) disease subtype.

Confirmatory Factor Analysis

Results from the CFA supported the hypothesized one-factor model in the total sample (Table 2). The one-factor model fit well based on three descriptive fit indices (CFI: 0.92; SRMR: 0.04; RMSEA: 0.08; S-Bχ^2 = 678.37, $p < .01$). All factor loadings were significant, and all factor loadings ranged from .64 to .90 with the exception of item 1 (.43).

Multiple-group Confirmatory Factor Analysis Models

Configural Invariance. The one-factor model fit the data well in limited (CFI: 0.92; SRMR: 0.04; RMSEA: 0.08; S-B$\boldsymbol{\chi^2}$ = 427.34, $p < .01$) and diffuse (CFI: 0.92; SRMR: 0.04; RMSEA: 0.09; S-B$\boldsymbol{\chi^2}$ = 410.98, $p < .01$) SSc groups. In addition, all factor loadings for items were statistically significant, and all factor loadings were 0.63 or higher, except item 1 (0.42 and 0.43).

Metric Invariance. The metric invariance model fit the data well (CFI: 0.92; SRMR: 0.05; RMSEA: 0.08; S-B$\boldsymbol{\chi^2}$ = 864.43, $p < .01$), indicating that factor loadings were equivalent across disease subtypes. Compared to the less restrictive configural invariance model, model fit was not compromised (ΔCFI < 0.01).

Scalar Invariance. The scalar invariance model fit the data well (CFI: 0.91; SRMR: 0.05; RMSEA: 0.08; S-B$\boldsymbol{\chi^2}$ = 897.98, $p < .01$), indicating that factor loadings and item intercepts were equivalent across disease subtypes. Compared to the metric invariance model, model fit was not compromised (ΔCFI = 0.01).

Internal Consistency Reliability and Convergent Validity

Internal consistency reliability was excellent for the total sample ($\alpha = 0.96$) and for limited ($\alpha = 0.96$) and diffuse ($\alpha = 0.97$) disease subtypes. Correlations with convergent validity measures are shown in Table 3. SAAS scores had significant, positive, large correlations with scores on the Brief-SWAP Social Discomfort subscale, BFNE-II, PHQ-8, and SIAS-6 for the total sample, and for limited and diffuse patients separately. Correlations with the Brief-SWAP Dissatisfaction with Appearance subscale were significant, positive, and moderate in size for the total sample, and for limited and diffuse patients separately. Correlations with the Brief-SWAP Social Discomfort subscale and the BFNE-II were significantly ($p < .05$) higher than correlations with the SIAS-6, PHQ-8, and Brief-SWAP Dissatisfaction with Appearance subscale. Correlations with the SIAS-6 and PHQ-8 were significantly higher than with the Brief-SWAP Dissatisfaction with Appearance subscale, but there were no significant differences between SIAS-6 and PHQ-8 correlation coefficients.

Discussion

The results of the present study demonstrate that the SAAS is a valid and reliable measure for use with SSc patients. Confirmatory factor analyses provided support for the scalar invariance model, indicating a unidimensional factor structure of the measure for all patients with SSc, and across diffuse and limited SSc subtypes. Item 1 had a substantially lower factor loading than other items, but this is consistent with previous studies (5, 7-8). This is likely because of the positive phrasing of the item, as all other items are negatively worded. Internal consistency reliability was excellent. Overall, evidence of convergent validity was found. Correlations between the SAAS and measures of social discomfort, fear of negative evaluation, social anxiety, and symptoms of depression were large, whereas the correlation with a measure

of dissatisfaction with appearance was only moderate. Although the correlation with depressive symptoms was slightly larger than hypothesized, the most robust correlations were with social discomfort related to body image dissatisfaction and fear of negative evaluation, followed by social anxiety, symptoms of depression, and dissatisfaction with appearance. This suggests that SAAS scores are more closely associated with social discomfort as compared to more broad clinical symptoms of psychological distress and dismay about appearance.

There are limitations to this study. The SPIN Cohort is a convenience sample of patients receiving treatment at SPIN recruiting centers. Patients completed study questionnaires online, potentially limiting the generalizability of study findings. Because data are cross-sectional, stability (via test-retest reliability) and sensitivity to change of scores on the SAAS could not be examined.

In sum, findings from the present study suggest that the SAAS can be reliably and validly used to assess fear of appearance evaluation in patients with limited and diffuse SSc, and that SAAS scores can be meaningfully compared across disease subtype.

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Table 1

Sociodemographic and disease variables for patients with systemic sclerosis (N = 938)

Demographic variables	
Age (years), mean (SD)	55.6 (11.8)
Education completed (years), mean (SD)	15.3 (3.2)
Female, n (%)	822 (88)
Married, n (%)	635 (68)
Medical variables	
Years since first non-Raynaud's symptom, mean (SD)	11.8 (8.9)
Disease Subtype, n (%)	
Limited SSc	533 (57)
Diffuse SSc	405 (43)
mRss score	8.4 (8.7) [range = 0 - 48]
Self-report questionnaire scores	
SAAS	28.3 (13.2) [range: 16 - 80]
Brief-SWAP – Dissatisfaction with Appearance	9.2 (5.2) [range: 0 - 18]
Brief-SWAP – Social Discomfort	5.3 (5.3) [range: 0 – 18]
PHQ-8	6.1 (5.4) [range: 0 - 24]
SIAS-6	2.4 (3.8) [range: 0 - 24]
BFNE-II	24.7 (12.1) [range: 12 - 60]

Note. SSc = systemic sclerosis; mRss = modified Rodnan skin score; SAAS = Social Appearance Anxiety Scale; SWAP = Satisfaction with Appearance Scale; PHQ-8 = Patient Health Questionnaire-8; SIAS=6 = Social Interaction Anxiety Scale; BFNE-II = Brief Fear of Negative Evaluation Scale-II.

Table 2

Standardized Factor Loadings from the CFA for the Total sample and the Multiple-group CFA Baseline Models for the SAAS

SAAS Item (abbreviated)	Factor loadings		
	Limited (n = 533)	Diffuse (n = 405)	Total Sample (N = 938)
1. comfortable with the way I appear to others	.42	.42	.43
2. nervous…having picture taken	.64	.63	.64
3. tense…people are looking at me	.74	.76	.75
4. concerned people would not like me	.83	.80	.81
5. worry that others talk about flaws in my appearance	.83	.84	.84
6. concerned people find me unappealing	.89	.91	.90
7. afraid people find me unattractive	.89	.90	.90
8. worry my appearance will make life difficult	.82	.83	.83
9. concerned I have missed out on opportunities	.79	.73	.76
10. nervous when talking to people	.86	.86	.86
11. anxious when people say something about my appearance	.85	.83	.84
12. afraid I would not meet others' standards	.84	.88	.87
13. worry people will judge the way I look	.86	.90	.88
14. uncomfortable when others are noticing flaws	.87	.87	.87
15. worry a romantic partner will/would leave me	.64	.74	.71
16. concerned people think I am not good looking	.86	.87	.87

Note. For all factor loadings $p < .05$.

Table 3

Pearson product-moment correlations among the SAAS and the PHQ-8, SWAP, BFNE-II and SWAP

	SAAS Limited	SAAS Diffuse	SAAS Total
PHQ-8	.52	.53	.53
Brief-SWAP – Dissatisfaction with Appearance	.38	.43	.41
Brief-SWAP - Social Discomfort	.69	.75	.73
BFNE-II	.67	.67	.66
SIAS-6	.52	.56	.55

Note. Values are presented as *r*. All correlations were significant at $p < .05$ (two-tailed). SAAS = Social Appearance Anxiety Scale; SWAP = Satisfaction with Appearance Scale; PHQ-8 = Patient Health Questionnaire-8; SIAS=6 = Social Interaction Anxiety Scale; BFNE-II = Brief Fear of Negative Evaluation Scale-II.