



Assessment of English–French differential item functioning of the Satisfaction with Appearance Scale (SWAP) in systemic sclerosis

Lisa R. Jewett^a, Linda Kwakkenbos^{b,c,*}, Marie Hudson^d, Murray Baron^e, Brett D. Thombs^f, the Canadian Scleroderma Research Group¹

^a Department of Educational and Counselling Psychology, McGill University and Lady Davis Institute for Medical Research, Jewish General Hospital, Montréal, Québec, Canada

^b Department of Psychiatry, McGill University and Lady Davis Institute for Medical Research, Jewish General Hospital, Montréal, Québec, Canada

^c Behavioural Science Institute, Clinical Psychology, Radboud University, Nijmegen, the Netherlands

^d Department of Medicine, McGill University and Lady Davis Institute for Medical Research, Jewish General Hospital, Montréal, Québec, Canada

^e McGill University and Lady Davis Institute for Medical Research, Jewish General Hospital, Montréal, Québec, Canada

^f Departments of Educational and Counselling Psychology; Psychiatry; Medicine; Epidemiology, Biostatistics, and Occupational Health; and Psychology, McGill University and Lady Davis Institute for Medical Research, Jewish General Hospital, Montréal, Québec, Canada

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ABSTRACT

The Satisfaction with Appearance Scale (SWAP) has been used to assess body image distress among people with the rare and disfiguring disease systemic sclerosis (SSc); however, it has not been validated across different languages groups. The objective was to examine differential item functioning of the SWAP among 856 Canadian English- or French-speaking SSc patients. Confirmatory factor analysis was used to evaluate the SWAP two-factor structure (Dissatisfaction with Appearance and Social Discomfort). The Multiple-Indicator Multiple-Cause model was utilized to assess differential item functioning. Results revealed that the established two-factor model of the SWAP demonstrated relatively good fit. Statistically significant, but small-magnitude differential item functioning was found for three SWAP items based on language; however, the cumulative effect on SWAP scores was negligible. Findings provided empirical evidence that SWAP scores from Canadian English- and French-speaking patients can be compared and pooled without concern that measurement differences may substantially influence results.

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1. Introduction

Systemic sclerosis (SSc), or scleroderma, is a rare, chronic autoimmune connective tissue disease. SSc is characterized by abnormal fibrotic processes and excessive production of collagen, which commonly manifest in thickening and hardening of the skin (Boin & Wigley, 2012; Mayes, 2008). As a result, people with SSc often develop visible differences in the texture of the skin, in addition to other disfiguring appearance changes including telangiectasia (visible dilation of blood vessels beneath the skin), hand contractures, skin pigmentation changes, and altered facial features (Mayes, 2008). These appearance changes commonly affect body parts that are highly visible and play a central role in social interactions, such as the face, mouth, and hands (Boin & Wigley, 2012; Rumsey & Harcourt, 2005) and are not alleviated by treatments.

Disfiguring aspects of SSc have been associated with concerns about appearance, attempts to conceal affected body parts, social discomfort, and poor psychological functioning (Jewett et al., 2012; Jewett et al., 2015, 2016; Malcarne, Hansdottir, Greenberg, Clements, & Weisman, 1999; van Lankveld, Vonk, Teunissen, & van den Hoogen, 2007). Increasingly, research examining body image in SSc has focused on the development and validation of measures that accurately reflect disease-specific body image concerns (Jewett et al., 2010, 2015; Mills et al., 2015). One such measure, the Satisfaction with Appearance Scale (SWAP), which was originally developed with burn patients (Lawrence et al., 1998), but has been adapted and validated in SSc, is commonly used as an outcome to assess dissatisfaction with appearance and social discomfort relative to acquired disfigurements from the disease (Jewett et al., 2010, 2012, 2015; Mills et al., 2015).

The measurement properties of the SWAP have been examined for SSc patients in several studies (e.g., Heinberg et al., 2007; Jewett et al., 2010, 2012; Mills et al., 2015), including those using the same cohort of patients as the present study (Jewett et al., 2010, 2012), which have collectively established strong evidence of internal consistency reliability, construct validity, and a two-factor structure

* Corresponding author at: Jewish General Hospital, 4333 Cote Ste Catherine Road, Montréal, Québec H3T 1E4, Canada.

E-mail address: kwakkenbosl@gmail.com (L. Kwakkenbos).

¹ See Appendix A.

with Social Discomfort and Dissatisfaction with Appearance subscales. However, the degree to which the SWAP generates scores that are equivalent across linguistic or cultural groups has yet to be explored. This is an important consideration because patients who complete the SWAP in countries with more than one common language, such as Canada, or as part of an international cohort (Kwakkenbos et al., 2013), which is often the case in rare diseases like SSc, may do so in different languages (e.g., French, English, Spanish).

Importantly, results pooled across language groups are only valid to the extent that the measurement metric is equivalent, meaning that scores are not affected by linguistic or cultural differences, beyond actual differences in the construct being measured (Mokkink et al., 2010). When the measurement metric is equivalent, individuals from different linguistic groups with similar levels of the construct being measured (e.g., social discomfort) should obtain similar scores on the measure (e.g., SWAP) and respond similarly to individual items of the measure. Differential item functioning (DIF), on the other hand, is said to occur when an item has different measurement properties for one group compared to another, apart from any true differences in the construct being measured (Mokkink et al., 2010). When DIF is present, the scores on the item are likely influenced by group characteristics (e.g., language) that are not directly related to the construct being measured (Mokkink et al., 2010). DIF in cross-linguistic comparisons may occur, for instance, because translations shift meanings, formats, or severity of items used in measures (Zumbo, 1999). As such, it is possible that individuals' endorsement of items reflects these changes, or some other characteristic of the test item or testing situation (Zumbo, 2007), beyond actual levels of the construct being measured (e.g., social discomfort due to appearance changes). Evaluation of DIF is essential to disambiguate group comparisons and to determine if scoring differences are actual functions of the outcome being measured, versus an artifact of the measurement process, such as interpretation of item meaning (Teresi & Fleishman, 2007). To date, no studies have assessed DIF for the SWAP in SSc for patients from different linguistic groups. As such, the objective of the present study was to assess the equivalence of SWAP item scores across English- and French-speaking SSc patients in a large Canadian cohort.

2. Method

2.1. Patients and procedure

The study sample consisted of SSc patients recruited from 15 Canadian Scleroderma Research Group (CSRG) Registry sites. To be eligible for the Registry, patients must be at least 18 years of age, classified as having SSc by a CSRG rheumatologist, and fluent in English or French. Patients completed the SWAP in their preferred language. Over 98% of patients in the Registry meet the 2013 ACR/EULAR classification criteria for SSc (Alhajeri et al., 2015). Each year at their annual Registry visit, patients complete clinical evaluations and fill out a series of self-report questionnaires, including the SWAP. Only patients with complete data for all SWAP items were included in this study. The first available assessment with complete SWAP data was included for patients who had filled out the SWAP on more than one occasion. All patients provided informed consent, and the research ethics board of each participating Registry site approved the data collection protocol.

2.2. Measures

2.2.1. Socio-demographic and disease characteristics

Patients enrolled in the CSRG Registry provided socio-demographic data, including age, sex, race/ethnicity, education

level (greater than a high school level of education versus high school or less), marital status (married or living as married versus unmarried). CSRG rheumatologists provided medical information, including disease duration based on time since onset of a patient's first symptom (calculated for both first Raynaud's or non-Raynaud's symptoms) and disease subtype (limited or diffuse cutaneous SSc). Limited cutaneous SSc was defined as skin involvement distal to the elbows and knees only (LeRoy et al., 1998). Patients with sine SSc, which is SSc without skin involvement, were included in the same group as patients with limited cutaneous SSc for the purposes of analysis (Hachulla & Launay, 2011). Diffuse cutaneous SSc was defined as skin involvement proximal to the elbows and knees or the trunk (LeRoy et al., 1998).

2.2.2. The Satisfaction with Appearance Scale (SWAP)

The 14-item SWAP was originally designed to measure non-weight related body image concerns among individuals with burn injuries (Lawrence et al., 1998). Items pertain to social discomfort relative to disfigurement (Social Discomfort subscale) and satisfaction with the appearance of particular body parts (Dissatisfaction with Appearance subscale). Respondents rate the degree to which they feel each item reflects their thoughts and feelings about their appearance on a 7-point scale ranging from 0 (*strongly disagree*) to 6 (*strongly agree*). Item scores are summed to calculate total subscale scores, reverse-scoring items pertaining to satisfaction with appearance. Higher scores indicate greater Social Discomfort and Dissatisfaction with Appearance (Lawrence et al., 1998). The original SWAP was adapted for SSc by replacing the word "burn" with the word "scleroderma" as indicated (Heinberg et al., 2007). The SWAP has consistently demonstrated strong psychometric properties, including internal consistency reliability estimates (i.e., Cronbach's alphas $\geq .88$ for both subscales) and construct validity (i.e., positive moderate correlations with measures of depressive symptoms, quality of life, physical functioning, and disease severity; and low negative correlations with measures of various dimensions of pain) (Jewett et al., 2010, 2012; Mills et al., 2015). Previous studies of the SWAP in SSc samples have consistently found that a two-factor structure (Social Discomfort and Dissatisfaction with Appearance), but not a one-factor structure, fit the data well (Heinberg et al., 2007; Jewett et al., 2010, 2012).

2.3. Data analysis

Descriptive statistics were calculated for all socio-demographic and disease variables, including means and standard deviations (SDs) for continuous variables. Socio-demographic and disease-related variables were compared between English- and French-speaking patients using chi-square tests for categorical variables and *t*-tests for continuous variables.

The factor structure of the SWAP was evaluated first in the total sample using confirmatory factor analysis (CFA). Ideally for DIF assessment, the simplest structure with reasonable fit is used. Given the previously established two-factor structure of Social Discomfort and Dissatisfaction with Appearance for the SWAP (Heinberg et al., 2007; Jewett et al., 2010, 2012), it was expected that a two-factor structure would fit the data reasonably well in the present study.

Item responses for the SWAP are ordinal Likert data, so the weighted least squares estimator with a diagonal weight matrix, robust standard errors, and a mean- and variance-adjusted chi-square statistic was used with delta parameterization (Muthén & Muthén, 1998–2012). Modification indices were used to identify pairs of items within scales for which model fit would improve if error estimates were freed to covary and for which there appeared to be theoretically justifiable shared method effects (e.g., similar

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