

Comparison of a New Sensitive Skin Questionnaire and Baumann's Sensitive Skin Questionnaire in Chengdu, China

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Abstract

Background: Sensitive skin has become increasingly common in china but currently there are few widely recognized tools to investigate it.

Objective: To develop and validate a new localized sensitive skin questionnaire and compare its reliability and structure validity with Baumann's sensitive skin questionnaire in Chengdu.

Method: We developed and examined a new sensitive skin questionnaire (NSS) questionnaire on healthy participants lived in Chengdu over 3 years. Totally 699 participants (231 men and 468 women) aged from 17 to 58 were included in this study. 100 participants were selected randomly to complete the NSS questionnaire and the BSS questionnaire for a second time after day 14. Cronbach's α coefficient and nonparametric spearman's correlation between day 1 and day 14 responses (test-retest) were used to estimate the reliability of the questionnaire. Principal component analysis (PCA) with varimax rotation was used to measure structure validity of the questionnaire.

Result: A 14-item questionnaire was reduced to a more concise 12-item NSS questionnaire based on statistical results (low discriminatory value of certain items or poor sensitivity). 699 participants completed the NSS questionnaire and the BSS questionnaire, both of which showed acceptable internal consistency with the Cronbach's α of 0.802 and 0.823, respectively, and with nonparametric spearman's correlation of 0.906, and 0.796, separately. From PCA with varimax rotation, four main factors accounting for 60.780% of variance were extracted in the NSS questionnaire, while five main factors accounting for 52.248% of variance were extracted in the BSS questionnaire.

Conclusion: The NSS questionnaire is a reliable tool for investigating sensitive skin in Chengdu. And NSS questionnaire appeared to be more preferable than BSS questionnaire.

Keywords: Questionnaire; Sensitive skin; Validity; Reliability

Introduction

Sensitive skin is defined as subjective symptoms (i.e., tingling, burning, itching, tautness) with or without objective signs of lesion, which is easily irritated by physical factors (i.e., heat, cold, wind, ultraviolet), chemical factors (i.e., cosmetics, soaps, pollutants), or psychological factors (i.e., stress, anxiety) [1]. Sensitive skin is increasingly common [2]. In the UK, it was reported that 34.6% of women and 29.1% of men perceived their facial skin as sensitive skin [3]. Jourdain et al. reported that 52% of women has sensitive facial skin [4]. In a recent study conducted among 1039 subjects in USA, about 77.3% of individuals claimed to have sensitive facial skin [5]. A Chinese community-based survey conducted in 9154 residents of Beijing, Guangzhou, and Shanghai, the number of Chinese who claimed sensitive skin was 32.07% in Shanghai, 45.32% in Beijing, and 61.43% in Guangzhou [6]. China is the third largest country in the world with a wide range of climates and latitude. And Chengdu is located in west China. Some environmental changes (i.e., sun exposure, dryness, dampness) may have impact on sensitive skin [7].

Unfortunately, there are limited data of sensitive skin available to people in Chengdu.

Although the pathophysiology of sensitive skin is unclear, some studies suggest that sensitive skin could arise from an impaired skin barrier function [8], a neurosensory hyper-reactivity [9], or immunoreactivity [10]. Noninvasive methods have been developed to analysis the objective effect such as trans-epidermal water loss, hydration of the stratum corneum, redness, surface PH [11]. However, a study revealed notable differences between instrument measurements and subjective perception [12].

The lack of visible signs and the high subjectivity of sensitive skin make it difficult to use a simple method to diagnose and quantify this condition. Description from patients is much more reliable. The best method to study sensitive skin is utilizing questionnaire [13]. Doctor Misery developed a 10-item sensitive scale for measuring the severity of sensitive skin [14], but there is no translation in any language other than French [13]. Doctor Baumann has designed a well-known skin type questionnaire in her book 'the skin type solution' [15]. It was translated into more than 10 languages. However, data about validity and reliability of Baumann's sensitive skin questionnaire is scarce for

all populations, particularly for Chinese. Any measurement instrument should have its reliability and validity retested, as they can show different reliabilities and validities in different samples or diseases. Moreover, there are differences in skin sensitivity between ethnic groups. Euro-Americans were found to have higher skin reactivity to wind. Afro-Americans presented a lower incidence of recurring facial redness. Asians appeared to have higher sensitivity to spicy food, to sudden change in temperature, and tend to report sensory irritation [4]. Therefore, it is necessary to develop a new localized questionnaire to study sensitive skin.

In this study, we drew up a new sensitive skin (NSS) questionnaire and compared the reliability, validity of the new questionnaire with Baumann's sensitive skin (BSS) questionnaire.

Materials and Methods

The questionnaire

The new questionnaire was drawn up by a panel of dermatologists based on Baumann's sensitive skin questionnaire and the interviewees' description. Common language about skin sensitivity was collected by a literature search, interviews with Chinese patients with sensitive skin. Subjective symptoms (pricking, itching, burning, redness, general discomfort, flushes) as well as objective symptoms (redness, scaling, swelling, etc.) were collected to describe sensitive skin. This first draft questionnaire was submitted to an independent group of 12 lay people and the comments of them were used to generate an improved version of the 14-item questionnaire. The improved questionnaire was then tested on healthy volunteers. The 14-item questionnaire was reduced to a validated 12-item NSS questionnaire based on statistical results (low discriminatory value of certain items or poor sensitivity). The new questionnaire items were grouped into 4 dimensions representing physical factor, chemical factor, psychological factor and host factor. The clinical signs of sensitive skin were graded as follows: 1(never), 2(sometimes), 3(frequently) and 4(always). For the items: history of allergic diseases, family history of allergic diseases, and facial dermatoses, a binary scale "yes" (present=3) or "no" absent=1. A total score (0-20) is calculated. A score of 16 is considered as slightly sensitive, a score of 23 as moderately sensitive, a score of 30 or greater as extremely sensitive skin.

Subjects

The trial subjects for the questionnaire comprised 231 male and 468 female from September 2015 to December 2015 and all 699 volunteers were healthy participants lived in Chengdu over 3 years. The key exclusion criteria included pregnancy, currently nursing or subjects who were unwilling or unable to complete the questionnaires. All volunteers gave their informed consent to participate in the study. 100 participants were selected randomly to complete the NSS questionnaire and the BSS questionnaire for a second time after 14 days.

Procedure

Each participant was investigated by face-to-face interviews and her/his general information (i.e., age, gender, phone number) was also registered. The quality of the interviews was systematically examined by calling 5% of the participants. If this procedure had exposed an abnormal finding in a single questionnaire, all the interviews carried

out by the interviewer would be double checked. No such abnormal finding was detected during the study.

Statistical analysis

Participants completed the two questionnaires for the assessment of its reliability and structure validity. The reliability of questionnaire was studied by computing Cronbach's α coefficient and non-parametric spearman's correlation.

The structure validity of questionnaire was studied by principal component analysis (PCA) with varimax rotation. Quantitative variables were compared among study groups using Wilcoxon test or Kruskal-Wallis tests. All tests were two-sided. The risk of type 1 error (α) was set at 0.05 for the entire study. Statistical analyses were performed using SPSS software version 16.

Results

Of the 705 who took part in the study, 6 were excluded for lacking full data, leaving data from 699 participants for analysis. Totally 699 participants aged from 17 to 58 (28.7 ± 9.8 years) were included in the study. Of those who completed questionnaires, 47.8% were 24 or younger, 48.9% were between 25 and 50, and 3.3% were 51 or older.

A-14 item questionnaire was designed by a panel of experts. The results of the corrected item-total correlation coefficients for each item are showed in Table 1, from which we found that the item 10 had a relatively low discriminative value (0.118).

From principal component analysis, item 7 had the lowest communalities with a value of 0.436 (Table 2). Based on the results and with panel's approval, we removed 2 items (item 7, and item 10) from the original questionnaire. This phase led to define a more concise 12-item NSS questionnaire.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	19.07	16.415	0.619	0.767
Q2	19.20	16.911	0.623	0.768
Q3	19.09	17.025	0.606	0.770
Q4	19.09	16.780	0.645	0.766
Q5	19.27	17.443	0.492	0.780
Q6	19.09	17.467	0.463	0.783
Q7	19.41	18.523	0.345	0.793
Q8	19.34	18.128	0.429	0.786
Q9	19.57	19.211	0.275	0.798
Q10	19.70	20.221	0.118	0.806
Q11	19.56	19.058	0.299	0.796
Q12	19.58	19.669	0.260	0.797
Q13	19.68	19.980	0.228	0.799
Q14	19.62	19.648	0.285	0.796

Table 1: Cronbach's α coefficient of the NSS questionnaire (n=699).

	Initial	Extraction
Q1	1.000	0.601
Q2	1.000	0.627
Q3	1.000	0.538
Q4	1.000	0.626
Q5	1.000	0.520
Q6	1.000	0.456
Q7	1.000	0.436
Q8	1.000	0.537
Q9	1.000	0.629
Q11	1.000	0.569
Q12	1.000	0.694
Q13	1.000	0.700
Q14	1.000	0.572

Table 2: Communality of the NSS questionnaire (n=699); Extraction method-Principal component analysis.

The NSS and the BSS questionnaires showed acceptable internal consistency with the Cronbach's α of 0.802 and 0.823, respectively. As for the test-retesting reliability, we recruited 100 participants to complete the NSS questionnaire and the BSS questionnaire twice. Non-parametric spearman's correlation between day 1 and day 14 responses (test-retest) of the NSS questionnaire and the BSS questionnaire were 0.906, 0.796, respectively (Table 3).

Among the 966 volunteers, subjects with extremely sensitive skin was 3.29% in total, moderately sensitive skin was 24.32%, slightly sensitive skin was 54.22%, and not sensitive skin was 18.17% , it was significantly different among four groups(P <0.001).

	The questionnaire NSS	The questionnaire BSS
Spearman's correlation	0.906**	0.796**
P value	<0.001	<0.001
**Correlation is significant at the 0.01 level (2-tailed)		

Table 3: Spearman's coefficient between day 1 and day 14 of the two questionnaires (n=100).

Principal component analysis (PCA) with varimax rotation was used to analysis the structure validity. The values of KMO >0.5 and chi-square p-value <0.05 in two questionnaires were indicative of good fit of the model (Table 4). From the PCA with varimax rotation, four main factors accounting for 60.780% of variance were extracted in the NSS questionnaire, while five main factors accounting for 52.248% of variance were extracted in the BSS questionnaire (Figure 1).

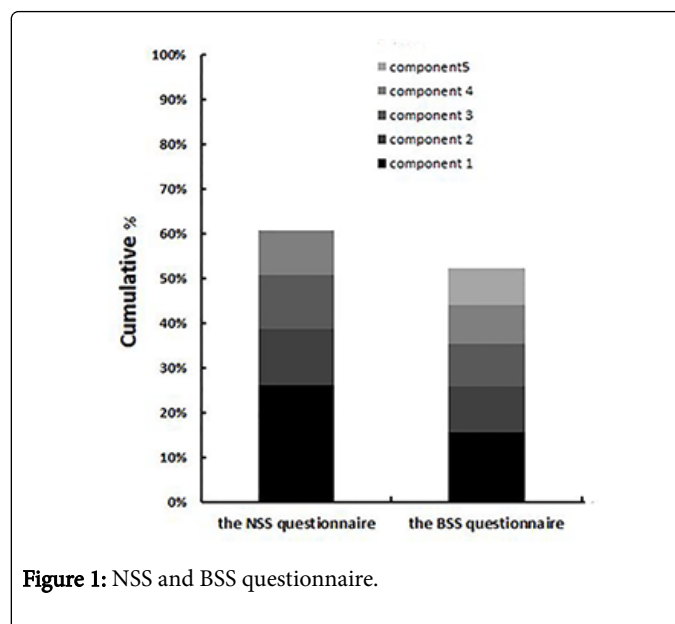


Figure 1: NSS and BSS questionnaire.

		The NSS questionnaire	The BSS questionnaire
Kaiser-Meyer-Olkin Measure of sampling adequacy		0.852	0.854
Bartlett's Test of Sphericity	Chi-Square	1.910	2.695
	P value	<0.001	<0.001
KMO >0.5, or P <0.05 means that the questionnaire is eligible for factor analysis.			

Table 4: Kaiser-Meyer-Olkin and Bartlett's test of sphericity of the NSS and the BSS questionnaires (n=699).

Discussion

Nowadays, sensitive skin is common but currently there has been no effective questionnaire for investigating it in China. Sensitive skin questionnaire introduced by Baumann is well known. Many dermatologists use BSS questionnaire to define sensitive skin in general population. However, the accuracy and applicability of BSS questionnaire in local Chinese population is still uncertain. A study performed by Wang et al. found that Baumann skin type indicator is not very suitable to Chinese people [16]. To figure out this problem and design a questionnaire focusing on Chinese people, we develop the NSS questionnaire. The new questionnaire was tested on 699 subjects and subsequently reduced to a validated 12-item NSS questionnaire based on statistical results. A few items in the survey did not provide reliable data. The low corrected item-total correlation coefficients for item 10 'Shaving causes your face to break out, get a rash, itch, sting or swell because shaving is nearly a daily work for male, and the item with four more concise possible grades may make it. The value of communalities for the item 7 'visible red or blue broken blood vessels on the face', however, was lower, it can probably be attributed to the fact that visible red blood vessels are symptoms of sensitive skin or are caused by a long time sun exposure or extreme environment exposures, etc.

The reliability to what extent is a questionnaire measures the same thing consistently. In our study, we adopted Cronbach's α coefficient and test-retest reliability to measuring the reliability of the questionnaire. Cronbach's α coefficient is a measure of squared correlation between observed scores and true scores and it is widely used for estimating internal consistency. The value of Cronbach's α coefficient is between 0 and 1, and the higher value means higher reliability of a questionnaire [17]. The test-retest reliability is presented in the form of non-parametric spearman's correlation. In this trial, A series of methodically designed items yielded adequate internal consistency ($\alpha=0.802$) and test-retest reliability ($r=0.906$). Regarding the structure validity of the questionnaire, we used factor analysis to determine whether the underlying factors of a multivariate data set reflect the underlying constructs of the questionnaire. Principal factor extraction with varimax rotation was performed to determine the domains of the questionnaire. The four principal factors were consistent with the primary components on which the questionnaire was initially based and were found to explain 60.780% of the total variance. As a whole, the results of the study indicate good reliability and validity of the NSS questionnaire. Therefore, the use of this tool for the investment of sensitive skin is a reliable method.

The five principal factors resulting from the analysis explain 52.248% of the total variance in the BSS questionnaire. The structure validity of the NSS questionnaire was better than that of the BSS questionnaire in this study. It suggested that NSS questionnaire is more suitable for local people than the BSS questionnaire. On one hand, there are differences in skin reactivity and symptomatology of sensitive skin between ethnic groups [4]. Study suggested that Asians appeared to be more reactive [18]. And all the items in the NSS questionnaire were based the reported issues by Chinese patients with sensitive skin. On the other hand, Doctor Baumann composed the questionnaire by the influence of western culture. The cross-culture adaptation and translation of the Baumann's sensitive skin questionnaire may cause the questionnaire unreliable and the results difficult to interpret.

The use of the 12-item NSS questionnaire appears to be more preferable than the 19-item BSS questionnaire for the following reasons: (a) it is easier and quicker to complete; (b) it has better validity and reliability; (c) it focuses on Chinese people's perception, reactivity about their skin and it conforms to Chinese language culture.

To the extent of our knowledge, the study is the first reported study that assessed test-retest, structure validity of the NSS questionnaire to check its reproducibility and reliability. The major strength of the study is the inclusion of a high number of local participants, which making the NSS questionnaire more suitable to Chinese skin condition. There are potential limitations to the current study. Information regarding skin reactivity was self-reported, and thus subject to recall bias.

In conclusion, the NSS questionnaire is a reliable tool for investigating sensitive skin in Chengdu. The NSS questionnaire appeared to be more preferable than the BSS questionnaire locally.

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