Iranian Voice Quality of Life Profile (IVQLP): Factor Analysis

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Summary: Objectives. An important domain in health-related quality of life evaluations is quality of life perceptions due to having a voice disorder. The objective of this study was to examine the factor structure of the Iranian Voice Quality of Life Profile (IVQLP) based on Exploratory Factor Analysis and confirmatory factor analysis.

Methods. The study sample consisted of 280 patients (174 males and 106 females) diagnosed with MTD, benign organic disorders such as polyps and nodules, and unilateral vocal fold paralysis and cancer. To evaluate the different dimensions of the IVQLP, a principal component analysis (PCA) was conducted. Confirmatory factor analysis (CFA) was used to investigate the fitting of extracted dimensions and construct validity of the IVQLP.

Results. The results showed that the IVQLP has a 4-factor structure. The first factor has 17 items and refers to Emotions. The second factor has 12 items and refers to Individual/Social Relations. The third factor with 6 items refers to Occupation, and the forth with 5 items relates to Psychosomatic characteristics.

Conclusions. The conclusion of this study is that the concept of quality of life in Iranian patients with voice disorders is somewhat different from that of Western patients. This difference can be seen in. the large number of items related to an Emotional factor and the identification of a Psychosomatic factor.

Key Words: Quality of life–Health related quality of life–Voice disorders–Iranian population–IVQLP.

INTRODUCTION

One of the main domains in health-related quality of life (HRQoL) studies is the quality of life related to having a voice disorder. Voice-disordered quality of life is a "disease-specific construct" that assesses activity limitations and participation restrictions resulting from having a voice disorder.[1,2] Based on the literature, quality of life is a culture-dependent concept.[3–5] Because a no-culture-based instrument exists for the people of Iran to measure outcomes of voice disorders, it was decided to develop a tool for assessing quality of life based on the Iranian culture, and this has been named the Iranian Voice Quality of Life Profile (IVQLP) (see Appendix S1 with 65 items and Appendix S2 with 43 items).[5] The 65-item version is the primitive version of the IVQLP, whereas the 43-item version was obtained after a Rasch analysis.[5] This instrument makes it possible to evaluate the level of self-perceived handicap that Iranian patients experience as a result of their voice disorders. The IVQLP has good internal consistency and reliability, and can accurately reflect the subjective perceptions of Iranian patients relative to voice disorder severity.[5] Construct validity testing is an ongoing process and has been incorporated as part of IVQLP development.

Exploratory factor analysis (EFA) is a technique within factor analysis, the main goal of which is to identify the underlying relationships between the measured variables,[6] and serves to identify a set of latent constructs underlying a test of measured variables.[7] Also, because the IVQLP is in its early stages of development, the relationships among variables are unknown or ambiguous, a situation for which EFA is well suited for analysis.[8] A commonly used method to investigate construct validity is confirmatory factor analysis (CFA).[9,10] Like EFA, CFA can transform the overall number of observed variables into latent factors based on commonalities within the data. CFA differs from EFA in that it assists in the reduction of measurement error and allows for the comparison of alternatively proposed *a priori* models at the latent factor level.[11] CFA can also be used to statistically compare the factor structure of two or more groups (eg, different disease conditions). The use of CFA to investigate the construct validity of hypothesis-based testing instruments adds a level of statistical precision and can assist in the development of abbreviated forms of an instrument or confirmation of its possible subdomains. Finally, the EFA and CFA are used for identifying construct validity. Therefore, the purpose of the current study was to identify the construct validity of the new index (IVQLP) using EFA and CFA.

METHODS

Participants

The study sample consisted of 280 patients, 174 males and 106 females, diagnosed between September 2015 and February 2016 in Tehran city with muscle tension dysphonia, benign organic disorders such as polyps and nodules, unilateral vocal fold paralysis, and cancer. These individuals had an age range of 18–75 years, with a mean age of 43.16 ± 13.63 years. The dysphonia group consisted of the following subgroups: mild dysphonia—110 individuals with muscle tension disorder (65 males, 45 females); moderate dysphonia—99 individuals (63 males, 36 females) with benign organic disorders such as polyps and nodules; and severe dysphonia—41 individuals with unilateral vocal fold paralysis (25 males, 16 females) and 30 individuals with cancer (21 males, 9 females). Individuals with dysphonia had vocal pathologies for at least 6 months and were selected from the ENT ward of

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Amir Alam Hospital in Tehran city. People who participated in the current study had no surgical or speech therapy intervention for at last 6 months prior to the study.

Instruction

The 280 individuals rated their responses to each question on a 4-point Likert scale in the IVQLP questionnaire. In this scale, a rating of 1 meant "never affected" and 4 meant "always affected." The subjects were given an explanation of the purpose of the study and were assured of confidentiality of their responses.

Statistical analysis

To evaluate the different dimensions of the IVQLP, a principal component analysis (PCA) as the first phase of EFA was conducted using *SPSS 22.0* (IBM Corporation, New York, United States). Before the PCA was performed, various assumptions on the intercorrelations of the 43 IVQLP items were tested. The determinant has to be >0.00001 and Bartlett's test was highly significant ($P < 0.001$). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for all variables, as well as the individual variables, was set at >0.75.

We opted to extract factors with eigenvalues greater than 1 (Kaiser's criterion [K1]) and to repeat the PCA after inspection of the scree plot, a graph plotting each eigenvalue against the factor.[12] The cutoff point for selecting factors should be at the point of inflection of this curve.[13] We chose a factor solution after analyzing the interpretability and estimating the reliability of the retained factors. Per factor, four variables are the minimum[14] and at least four factor loadings have to be greater than 0.6.[15] With communalities in the 0.5 range, samples between 100 and 200 can be good enough.[16]

PCA was conducted with oblique rotation and interpreted using primarily the pattern matrix.[12] To assess the fit of the factor models, the differences between the observed correlations and the model-based correlations were taken into account. No more than 50% of the residuals should be greater than 0.05.[12]

CFA was used to investigate the fit of extracted dimensions and the construct validity of the IVQLP. Several fit indices were selected to test which CFA model best represents the present dataset: root mean square error of approximation (RMSEA), comparative fit index (CFI), chi-square, and change in chi-square given the change in degrees of freedom between models. RMSEA is a measure of the average of the residual variance and covariance; good models have RMSEA values that are at or less than 0.08.[17,18] CFI is an index that falls between 0 and 1, with values greater than 0.90 considered to be indicators of good fitting models.[18] When comparing models, a lower chi-square value indicates a better fit, given an equal number of degrees of freedom.[18] CFA was carried out by *LISREL 8.8* (Scientific Software International, Skokie, IL).

RESULTS

EFA

Bartlett's test of sphericity relates to the significance of the study and thereby shows the validity and suitability of the responses collected to the problem being addressed through the study. For factor analysis to be recommended suitable, the Bartlett's test of sphericity must be less than 0.05.[19]

Exploring the correlation matrix suggests that the variables were suited for a factor analysis. Bartlett's test was 13,751.6 and it was highly significant ($P < 0.0001$). Also, KMO is a measure of sampling adequacy that is recommended to check the case-to-variable ratio for the analysis being conducted[19] while the KMO ranges from 0 to 1; the worldwide accepted index is over 0.6. In the current study, the KMO resulted in a value of 0.97. The K1 criterion resulted in five-factor and four-factor solutions.

The five-factor solution

The five-factor solution explained 72.9% of the variance. The inspection of the scree plot indicated a five-factor solution (Figure 1).

Stevens recommends interpreting only factor loadings with an absolute value greater than 0.4 (which explains approximately 16% of the variance).[20] Therefore, the construct matrix that was obtained was based on a seven varimax rotation and factor loadings with an absolute value greater than 0.4 (Table 1).

As shown in Table 1, all of the 43 items have factor loadings with an absolute value greater than 0.4.

Based on the findings, the following conclusions were reached:

(1) Items 11, 22, and 43 are complex and their factor loading is focused on two factors.
(2) The rest of the items are very pure or without complexity.
(3) The maximum coefficient is related to item 40 (0.887).
(4) The minimum coefficient is related to item 1 (0.505).

Some of the items have a factor loading that is focused on more than one factor, and also the questions related to the first and fifth factors were very similar to each other and belongs to the emotional domain. Therefore, the separation of content into two factors (the first and fifth) did not have any theoretical justification. Thus, it was decided that the complex items 11, 22, and 43 could be deleted and factor analysis was performed again. This reanalysis resulted in a four-factor structure.

The four-factor solution

The four-factor solution explained 70.97% of the variance. The inspection of the scree plot supported the four-factor solution (Figure 2). The eigenvalues of the four factors, % of variance, and cumulative % are shown in Table 2. The construct matrix that was obtained based on the six varimax rotation and factor loadings with an absolute value greater than 0.4 is shown in Table 3.

In general, this study shows the following results:

(1) The first factor with 17 items refers to the emotional factor.
(2) The second factor with 12 items refers to the individual or social relations factor.
(3) The third factor with 6 items refers to the occupational factor.