CROSS-CULTURAL ADAPTATION OF THE MINNESOTA LIVING WITH HEART FAILURE QUESTIONNAIRE FOR GERMAN-SPEAKING PATIENTS

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We performed a cross-cultural adaptation of the "Minnesota Living with Heart Failure Questionnaire" (LHFQ) for use in German-speaking chronic heart failure patients. The instrument was translated and back translated, pre-tested and reviewed by a committee. The German version was tested in 114 patients with chronic heart failure. Reliability was assessed by a test-retest procedure and Cronbach's coefficient alpha of internal consistency (0.94). To assess concurrent validity, we compared the LHFQ sum scores with the New York Heart Association classification rating ($r = 0.53$; $p < 0.0001$), the 6-minute walk ($r = -0.39$; $p < 0.0001$), the left ventricular ejection fraction ($r = -0.24$; $p = 0.011$) and big-endothelin ($r = 0.27$; $p = 0.004$). Construct validity on the LHFQ scores in comparison with the Medical Outcomes Study SF-36 Health Survey (MOS SF-36) was significant (-0.41 to -0.74; all $p < 0.0001$). The reliability and validity of the German version of the LHFQ was proved; the questionnaire can be recommended for use in future clinical trials.

Key words: "Minnesota Living with Heart failure Questionnaire", chronic heart failure, cross-cultural adaptation, German-speaking.

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INTRODUCTION

Chronic heart failure (CHF) is an increasing challenge for health care policies and a common clinical syndrome with an enormous impact on the prognosis and lifestyle of patients. Impaired left ventricular function leads to reduced exercise capacity, dyspnoea and early onset of fatigue. Measurement of these impairments may not entirely reflect the patient's dysfunction in daily life. Therefore, additional evaluation of the impact of CHF on the patient's perception of the disease is of great concern in health care. Dissatisfaction with health and physical functioning are well known problems in patients suffering from CHF (1).

Quantification of the patient's suffering requires the use of health-related quality of life instruments. Health-related quality of life may be determined either by generic measures like the Medical Outcomes Study SF-36 Health Survey (MOS SF-36) or may be disease-specific in nature. Although it has been shown that the MOS SF-36 improves after a rehabilitation programme in patients with CHF (2), disease-specific instruments are recommended additionally (3). They may provide additional information on clinically relevant domains and may be more sensitive to clinical changes (4, 5).

A number of disease-specific measures of the patient's perception of disease for heart failure have been developed. Examples of instruments measuring the functional status of patients with CHF are the Minnesota Living with Heart Failure Questionnaire (LHFQ) (6, 7), the Chronic Heart Failure Questionnaire (8), the Yale scale (9), the Quality of Life Questionnaire in Severe Heart Failure (10) and, most recently, the Kansas City Cardiomyopathy Questionnaire (11) and the Left Ventricular Dysfunction Questionnaire (12).

For each measure, there is some evidence regarding key measurement properties, responsiveness and validity. An instrument is responsive if it can detect important changes, even if the changes are small. An instrument is valid if it is really measuring what it is supposed to measure. So far, only one disease-specific instrument that addresses a wide spectrum of health-related quality of life impairment, the Minnesota Living with Heart Failure Questionnaire, has shown responsiveness within double-blind, multicentre, pharmaceutical clinical trials (13, 14) and within rehabilitation studies (15). This established disease-specific instrument for measuring the functional status of patients with CHF is a 21-item, self-administered questionnaire that covers physical, socioeconomic and psychological impairments that patients often relate to their heart failure.

The present authors are inclined to agree with Deyo et al. (16) who urge investigators not to "reinvent the wheel" by developing new or ad hoc measures when standard instruments can serve the purpose. Nevertheless, there is a need for measures specifically designed to be used in non-English-speaking countries, since cultural groups vary in disease expression and in their use of various health care systems. This need has become more urgent with the growing number of large multicentre international trials (17). It is clear that one cannot directly transpose a scale from one culture to another without revalidating the scale for the second environment (18). Because of linguistic and cultural differences (18), a simple direct translation of a questionnaire from one language to another does not permit its use in clinical trials. The translation must be validated

in order to achieve equivalent meaning and to allow comparability of data. Furthermore, the perception of quality of life and the ways in which health problems are expressed vary from culture to culture (19).

The LHFQ was selected because its measurement properties have been shown to be valid and suitable for patients with chronic heart failure. The LHFQ is a self-administered questionnaire consisting of 21 items identified primarily from a comprehensive list of sickness-related dysfunction on the Sickness Impact Profile (20). Items were chosen to determine how patients perceive the effects of chronic heart failure on their lives. The respondents are asked to rank each impairment on a scale between 0 and 5, according to how much it prevented them from living as they wanted to. Thus total scores may vary from 0 (no disability) to 105 (severe disability).

The purpose of this study was to describe the process used to translate and test the adequacy of the German-language version of the LHFQ in terms of reliability and validity.

MATERIAL AND METHODS

Translation

Two translations from English to German were carried out by two independent professional translators whose mother tongue was German, allowing detection of errors and divergent interpretations of items with ambiguous meaning in the original instrument. One of the translators was informed of the purpose of the process and the concepts involved in the instrument. This was done in order to obtain a better idiomatic and conceptual rather than literal equivalence between the two versions of the questionnaire, and to render the measurement more reliable. The other translator was not informed of the purpose of the translation; this was done to elicit unexpected meanings from the original tool (19).

The back translation method requires the use of at least two translators working independently. One translates the material into German, and the German version is then given to a second person to be translated back into English. The two versions are then checked for inconsistencies. In our case two bilingual professional translators (whose mother tongue was English) with no prior knowledge of the LHFQ back translated the German version into English independently. Back translators who are unaware of the intent and concepts underlying the material are free of bias and expectations and their back-translation may reveal unexpected meanings or interpretations in the final version (19). In order to produce a final version based on the various translations and back-translations, a review committee consisting of three physiatrists, one cardiologist, one psychologist, and one nurse, all experienced in chronic heart failure patients was constituted.

Pre-test

The German version was pre-tested by 20 patients (10 males and 10 females) with CHF to establish that the version was comprehensible and that the items measured what they were intended to measure. The interviewer was asked to document any problems occurring during the administration of the questionnaire. At the end of the interview each respondent was asked to comment on the questionnaire and to identify any words or questions that were difficult to understand. Based on their comments, the final version was developed by the committee after very few revisions. The committee agreed to put the phrase "Did your heart failure prevent you from living as you wanted to during the last month by …" at the beginning of each question instead of placing the question only once at the beginning of the questionnaire as in the original version. The second revision concerned question number 15 which obviously refers to the medico-legal system of the United States. Since medical care in German speaking countries is covered by the social insurance system, the committee choose the phrase "… causing additional costs".

Table I. *Characteristics of patients*

Characteristics	($n = 114$)
Male (n)	98 (86%)
Age (years)	57 ± 9
Aetiology of cardiomyopathy (n) idiopathic/ ischaemic/other	76/32/6
NYHA I/II/III/IV (n)	36/36/35/7
LVEF (%)	27 ± 12

Mean ($\pm$SD), unless stated otherwise.
NYHA = New York Heart Association; LVEF = left ventricular ejection fraction.

Patients

The study was conducted at the heart failure outpatient clinic of the Second Department of Medicine (Cardiology) from January to March 2000. After patient information had been handed out and verbal informed consent obtained, 114 patients with CHF (98 males and 16 women) were consecutively enrolled into the study over a period of 3 months. The average age of the patients was 57 years (range 29–79 years). Table I summarizes the demographic characteristics of the study population.

Reliability

For self-rated tests, the test-retest reproducibility is assessed by administering the scale on two occasions, separated by a time interval that is sufficiently short for us to assume that the variable being measured has not changed (21). In this investigation we used a time interval of 24 hours. Twenty consecutive patients were asked to complete a second questionnaire after 24 hours. No significant differences in demographic data were observed between these 20 patients and the larger group. During the 24-hour interval none of the patients had an intervention, change of treatment or change in clinical conditions.

Validity

Concurrent validity was measured by comparing the LHFQ responses with other measurements performed at approximately the same time. One internal criterion was the New York Heart Association classification with a four-step classification of breathlessness during physical exertion. An external criterion was the 6-minute walking test (22), a widely used procedure to assess an individual's functional ability (activity limitation). Patients were asked to walk a hallway 50 metres in length to cover as much ground as possible during 6 minutes in a self-chosen walking speed and by the end of the test feel that this was as much ground they could cover in 6 minutes. They were allowed to stop during the test; all tests were supervised by the same physician. A further external criterion was plasma big-endothelin. A blood sample was taken routinely from an antecubital vein prior to functional testing. Big-endothelin is a valid measure for the severity of chronic heart failure and reflects the dimension of impairment (23). Left ventricular ejection fraction (EF) was measured by echocardiography. Echocardiography has a good reproducibility (24) and accuracy for measuring EF (25).

To test the construct validity, a strong relationship between the LHFQ sum score and the functional status measured by the Medical Outcome Study Short Form-36 questionnaire (MOS SF-36) was hypothesized. The MOS SF-36 is a widely accepted generic instrument for the assessment of health-related quality of life in patients (26, 27). On the basis of a German adaptation of the MOS SF-36, the results of psychometric testing in healthy and impaired populations were evaluated (28). The questionnaire consists of 36 items related to 8 scales. These scales cover different health concepts. Responses to the questions of each scale are summed and then converted to a 0 to 100 scale, with 100 indicating best function. These concepts are then summarised into three general health attributes: functional status, well-being and overall health. The functional status includes physical functioning (PFI) such as walking and climbing stairs (10 items), limitations in role functioning due to physical limitations (ROLPHYS) such as duties at home or at work (4

Table II. *Mean (± SD) of "Minnesota Living with Heart Failure Questionnaire" (LHFQ) scores according to the New York Heart Association (NYHA) classification*

NHYA (*n*)	LHFQ Score
I (36)	19.1 ± 15.7
II (36)	35.3 ± 24.5
III (35)	43.7 ± 22.4
IV (7)	67.1 ± 26.9

Table III. *Spearman's correlation coefficients of the "Minnesota Living with Heart Failure Questionnaire" (LHFQ) sum score with the 8 subscales of the MOS SF-36 (all <0.0001)*

	Correlation with the LHFQ
Physical functioning	−0.598
Role physical	−0.544
Role emotional	−0.409
Social functioning	−0.524
Mental health	−0.624
Pain perception	−0.577
Vitality	−0.737
General health perception	−0.650

items); limitations in role functioning due to emotional limitations (ROLEM, 3 items) and the degree to which health interfered with social functioning and interaction with others (SOCIAL, 2 items). Well-being was addressed by three scales measuring mental health (MH, 5 items) addressing depression and mood state, energy/fatigue (VITAL, 4 items) and pain (PAIN, 2 items). Finally, overall health includes measurement of general health perception (GHP, 5 items) and changes in health. The MOS-SF 36 was assessed together with the LHFQ.

Statistical analysis

Descriptive statistics were calculated for each of the measured variables. Means and standard deviations were determined to describe the demographic data of the patients as well as the LHFQ scores.

In 13 patients the time to fill out the LHFQ was assessed. For all correlations we use Spearman's rank correlation coefficients to account for discrete and skew distributions of some of the measurement variables as, e.g., walking distance and NHYA-classification. To assess the test-retest reliability we computed the Spearman rank correlation coefficient between the LHFQ score determined at baseline and after 24 hour in a group of 20 patients. For the difference of these two scores we computed the mean and standard deviation (29). The internal consistency (tested in 114 patients) for this measurement was assessed with Cronbach's alpha (30). Cronbach's alpha measures the average correlation of items within the test (30).

RESULTS

One hundred and fourteen patients completed the questionnaire at baseline and an additional 20 patients completed it after 24 hours. Patients were generally able to fill in the questionnaires without help. The mean time required to fill out the LHFQ was approximately 5 minutes (mean: 286 seconds; SD = 29; *n* = 13).

Test-retest reliability for the LHFQ was r = 0.8 (Spearman; *p* < 0.0001; *n* = 20). The mean difference of test two (after 24 hours) minus test one (at baseline) was 1.25; the SD 3.49. Reliability estimated by the internal consistency reached a Cronbach's alpha of 0.94 (tested in 114 patients). Means and standard deviations of the LHFQ in the 4 groups according to the NYHA classification are given in Table II.

Concurrent validity was assessed by evaluating the relationship of the LHFQ sum scores to measures of functional ability and plasma levels of big-endothelin. The correlation of the LHFQ score with the distance during the 6-minute walking test was r = −0.39 (*p* < 0.0001) and the value of the NYHA classification was r = 0.53 (*p* < 0.0001). Spearman correlation coefficients for comparison of the LHFQ sum scores with plasma levels of big-endothelin was r = 0.27 (*p* = 0.004) and with left ventricular ejection fraction, r = −0.24 (*p* = 0.011).

While determining construct validity, a correlation between the LHFQ sum scores and the functional status of the MOS SF-36 was hypothesised. As indicated in Table III, the correlation between the functional scales of the MOS SF-36 with the LHFQ sum scores were statistically significant (*p* < 0.0001) and ranged from r = −0.41 (ROLEM) to r = −0.74 (VITAL).

DISCUSSION

Our report discusses the German translation and preliminary psychometric testing of the Minnesota LHFQ. This widely used CHF outcome measure was chosen because it is an established disease-specific instrument which has shown validity and responsiveness within double-blind, multicentre, pharmaceutical clinical trials (13, 14). It is a self-administered questionnaire and easy to fill in.

Although German and English are linguistic relatives, most questions required a different phrasing to avoid misunderstanding and to ensure idiomatic equivalence. The structure of the questionnaire was not altered and the 21 items were retained. Nevertheless, based on the experience of the initial 20 respondents the committee found it meaningful to set the phrase "Did your heart failure prevent you from living as you wanted to during the last month by …" at the beginning of each question instead of placing the question only once at the beginning of the questionnaire as in the original version. We are well aware that this substantially lengthens the questionnaire but we still think it expresses the structure of the instrument more clearly.

Our patient sample is similar to that in Rector's original report with respect to age, sex and NYHA classification (7). When splitting the LHFQ into NYHA classifications our patients score equally in NYHA I but slightly better in NYHA II and III (7). This might have been due to the improved drug regimen that alleviated the patients' symptoms at rest. Nevertheless, our results suggest that the translated instrument is both reliable and valid. The short-term reliability within 24 hours is well within the acceptable range.

Significant correlations could be established between the LHFQ sum scores and measures of physical activity. As expected, a positive correlation was found with the NYHA classification and a negative, somewhat weaker one with the 6-

minute walking test. Similar significant correlations with measures of physical activity were found in a recent report using the LHFQ as a control instrument (11). Previous reports established a significant correlation between exercise capacity and both the MOS SF-36 (2) and the Sickness Impact Profile (6). Nevertheless, it still remains questionable whether health related quality of life is exclusively determined by a patient's functional level (7). As a measure of the severity of disease we used plasma levels of big-endothelin. This parameter also showed a significant correlation with the LHFQ sum score. Only a weak correlation with left ventricular ejection fraction was found. This is in line with previous studies demonstrating no correlation between exercise capacity and the degree of left ventricular dysfunction. Therefore left ventricular dysfunction does not seem to represent a valid measure of a patient's limitation of activity (31).

To test construct validity we used the MOS SF-36 questionnaire. This instrument is available in a validated German version and proved to be suitable for CHF patients (2). Significant correlations were found between the LHFQ and all subscales of the MOS SF-36. This indicates that the LHFQ equally addresses all relevant domains of health related quality of life. Finally, LHFQ seemed to properly address the patients' overall health perception, as shown by a high correlation with the corresponding domain of the SF-36.

A questionnaire evaluating patients suffering from CHF must be simple and short because the patient's concentration is often impaired by the underlying disease (32). Filling in the German version of the LHFQ is only moderately time consuming. Like the original report, it took approximately 5 minutes for the patients to complete the questionnaire. Nevertheless, we found it useful to offer assistance to the patients and to briefly re-assess the questionnaire before collecting it. Therefore, the overall time effort was approximately 10 minutes. Recently, two new instruments for comprehensive assessment of the impact of the disease on the patient's quality of life have been published (11, 12). Both used LHFQ as the reference measure and reported similar or only marginally better psychometric properties. However, the value of both instruments in randomised controlled trials is not proven to date.

In conclusion, our study shows that it is possible to translate a functional status questionnaire into German while ensuring satisfactory psychometric properties. Translating existing scales appears to be feasible, and is clearly much more efficient than developing a new scale. Since we were able to demonstrate the similarity of the instrument with respect to metric properties, a similar responsiveness for the German version of the LHFQ may be expected. As the German version of the LHFQ appears to be a reliable and valid questionnaire for the assessment of health related quality of life of German-speaking patients suffering from CHF, the use of this translated instrument may be recommended in future clinical trials in order to obtain comparable results. The translated and cross-culturally adapted form of this established instrument of patient self-assessment may provide an important perspective on congestive heart failure and the efficacy of medical therapy for German-speaking countries.

The final German version of the Living with Heart Failure Questionnaire can be obtained from the authors on request.

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