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ORIGINAL ARTICLE

Psychometric properties of the EUROHIS-QOL 8-item index (WHOQOL-8) in a Brazilian sample

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Objective: To test the psychometric properties of the EUROHIS-QOL 8-item index in a Brazilian sample.
Methods: The sample consisted of 151 patients and 174 healthy controls (n=325). Several psychometric properties were tested.
Results: Reliability showed good internal consistency (Cronbach's alpha = 0.81). The measure showed good discriminant validity between patients and healthy controls (mean1 = 3.32, SD1 = 0.70; mean2 = 3.77, SD2 = 0.63, t = 6.12, $p < 0.001$). Convergent validity showed significant correlations ($p < 0.001$) between the EUROHIS-QOL 8-item index and all domains of the WHOQOL-Bref (overall r = 0.47; general health r = 0.54; physical r = 0.69; psychological r = 0.62; social relationship r = 0.55; environment r = 0.55) and between the EUROHIS-QOL 8-item index and the domains of the SF-36, except for the social domain (p = 0.38). On Rasch analysis of unidimensionality, general fit measures showed adequate performance. The EUROHIS-QOL 8-item index also showed good fit on confirmatory factor analysis (CFA) (chi-square = 18.46, degrees of freedom [df] = 15; comparative fit index [CFI] = 0.99; root mean square error of approximation [RMSEA] = 0.03; goodness of fit index [gfi] = 0.99; root mean square residual [RMR] = 0.03; p = 24).
Conclusion: The EUROHIS-QOL 8-item index showed good psychometric properties. It is a reliable quality of life measure that can be used in Brazilian populations.

Keywords: Psychometric properties; quality of life; EUROHIS-QOL 8-item index; short form; WHOQOL-8

Introduction

The World Health Organization (WHO) and the WHOQOL group define quality of life (QoL) as an "individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns."[1] They have developed two main generic measures of QoL: the WHOQOL-100 and its abbreviated version, the WHOQOL-Bref, with the participation of different countries and cultures – including a Brazilian Portuguese version.[2,3] These versions have been extensively used, as seen by the number of times the original articles were cited.[3,4] A Google search showed 1,199 citations for the papers describing the Brazilian validation of the WHOQOL-100 and 1,589 regarding the short version of the instrument (WHOQOL-Bref), which indicates great interest in evaluation of QoL measures, especially their shorter versions.[3,4]

The best known short-form QoL instrument is the SF-12 version of the 36-Item Short Form Health Survey (SF-36).[5] However, the need remained for instruments that were even shorter, more practical, less expensive, and faster and easier to administer; thus, some investigators constructed abbreviated versions as monitoring tools, as well as for use in large epidemiological studies.

Thus, the WHOQOL group developed the EUROHIS-QOL 8-item instrument, which originated from the WHOQOL-Bref items. Samples from European countries such as France, Germany, Ireland, Lithuania, Latvia, Croatia, Romania, Slovakia, the Czech Republic, and Israel were used in its validation.[6] Conceptually, each WHOQOL-Bref original domain (physical, psychological, social, and environmental) is represented by two items in the EUROHIS-QOL 8-item index.[7]

A search of the MEDLINE (via PubMed) and PsycINFO databases using Eurohis and Whoqol 8 as key terms revealed several studies with different main objectives, such as evaluation of the psychometric properties of the EUROHIS-QOL 8-item in specific populations,[8-11] cross-cultural assessments,[12-18] and multinational studies.[19-24] Only two studies were conducted in Brazil, where the EUROHIS-QOL 8-item has not yet been evaluated in local samples.[18,25]

The objective of the present study was to test the psychometric properties of the EUROHIS-QOL 8-item index in a Brazilian sample. The quality of the instrument was analyzed for reliability (using Cronbach's alpha coefficient), convergent validity (using Pearson correlations of

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the EUROHIS-QOL 8-item index with other QoL instruments), discriminant validity (comparing the EUROHIS-QOL 8-item measures among a group of sick individuals and a group of healthy controls), factor analysis (using a structural equation model), and unidimensionality (using Rasch model properties)

Methods

Subjects and procedures

The study population was recruited by convenience among adult patients (age 18 years or older) treated at Hospital de Clínicas de Porto Alegre (HCPA), state of Rio Grande do Sul, Brazil (n=151), and healthy individuals from the community who were in the geographical area close to the hospital (n=174). The inclusion criteria for the patient group were: be either an inpatient or outpatient of any clinical or surgical specialty at HCPA, have a clinical condition, and agree to participate in the study. The healthy control group was composed of individuals who did not have any clinically detectable disease; individuals who had any chronic disease, used any medicine regularly, or had consulted any doctor or health professional in the preceding month (except for preventative examinations) were excluded.

The healthy control group consisted mostly of relatives or chaperones of subjects from the patient group. In the absence of a chaperone at the time of data collection in the group of patients, the chaperone of another patient (who was not involved in the study) was recruited. This procedure was used to make groups as homogeneous as possible. Both groups were matched for age and sex.

Procedures

All subjects participated voluntarily in the study. All those who completed the survey provided written consent for participation. The study protocol was approved by the HCPA ethics committee (protocol no. 11-045).

Measures

EUROHIS-QOL 8-item

This is a QoL measure consisting of eight items (overall QoL, general health, energy, daily living activity, self-esteem, social relationships, finances, and home) extracted from the WHOQOL-Bref. Each item is answered individually on a five-point scale (the same as in the WHOQOL-Bref). In the initial study, which involved a sample of 10 countries, this instrument had a Cronbach's alpha of 0.83.[6,7]

WHOQOL-Bref

The WHOQOL-Bref is a 26-item QoL assessment instrument adapted from the WHOQOL-100. It was developed simultaneously at 15 international centers, consists of four domains (physical, psychological, social, and environmental), and is answered individually on a five-point scale.[4]

36-Item Short Form Health Survey (SF-36)

The SF-36 is a generic measure for assessing QoL, consisting of 36 items that evaluate eight subscales (functional capacity, physical aspects, general health, vitality, social functioning, emotional aspects, and mental health). It is also answered individually and has a final score of 0 to 100.[26,27]

Hospital Anxiety and Depression (HAD)

This instrument comprises 14 multiple-choice questions divided across two seven-item subscales: one for anxiety and another for depression. The overall score for each subscale ranges from 0 to 2.[28]

Cumulative Illness Rating scale (CIRS)

The CIRS evaluates the presence and severity of medical comorbidities. It uses clinical criteria to assign each body system (e.g., renal, respiratory, vascular) a severity grade.[29] This scale was used only with the patient group.

In addition to these instruments, the Brazilian Market Research Association economic classification criteria[30] were used to evaluate socioeconomic status, measured through ownership of consumer goods and individual educational attainment.

Statistical analysis

For reliability and as an internal consistency test of the scale items, Cronbach's alpha was calculated. A value over 0.70 is considered adequate.[31]

Floor and ceiling effects were considered problematic if more than 20% of participants chose the lowest or the highest possible score of the scale item. The criterion for missing data was that a good scale item should have a maximum nonresponse rate of 5%.[32]

A multiple linear regression analysis was also carried out to investigate whether other variables, such as disease, age, marital status, education, socioeconomic class, sex, anxiety, and depression, influenced the findings of the study.

A *t*-test for independent samples was used to compare the patient and control groups to assess discriminant validity. The same comparison was performed between depressed and non-depressed groups, as assessed using the HAD.

To verify convergent validity, Pearson correlations with two other measures of QoL, the WHOQOL-Bref and SF-36, were calculated. A Rasch analysis was used to assess the unidimensionality of the scale, and the results were examined using measures of fit. In a Rasch analysis, residuals greater than 2.5 with a significant chi-square score ($p < 0.05$) are considered unacceptable. Items with such problematic residuals are excluded from the analysis, and the analysis is then redone to check whether this procedure improved the model fit. The Rasch analysis considers six general statistics to determine model fit. Four are item-person interaction statistics, with Z statistical distribution (mean [M] and standard deviation [SD]), where values equal to 0 and SD equal to 1 indicate

perfect fit for the model. The other two fit statistics are item-trait interaction with the total item chi-square, which needs to present a low score, and the p-value, which must not be significant ($p > 0.05$) for good fit to the Rasch model.[33-35]

SEM (using maximum likelihood as the estimation method) was used to analyze the factor structure. The measures of fit used were the chi-square statistic (ideally demonstrating nonsignificance, i.e., $p > 0.001$), the comparative fit index [CFI] (values close to 1 indicate a good fit), the root mean square error of approximation [RMSEA] (a value of 0 indicates perfect fit), the goodness of fit index [GFI] (values close to 1 indicate perfect fit), and the RMSR (a value of 0 indicates perfect fit).[36,37]

The best fit of a model is defined by analyzing diagnoses such as standardized loading (which must not be lower than 0.5), the standardized residuals (which should be less than 2.5), and the modification index (MI) (which must not be greater than 4). The result is defined by a combination of these various diagnoses and by software-based statistical analysis. Identification of the highest MI values shows paths identified through analysis of the variation in error covariance to better fit the model.[37]

Descriptive statistical analysis was performed using the following software products: RUMM 2020 for the Rasch analysis,[38] AMOS 4.01[39] for confirmatory factor analysis (CFA), and SPSS version 20.0 for the classical psychometric analysis.

Results

The study population consisted of 325 adults divided into two groups: patients (n=151) and healthy controls (n=174). The general characteristics of the sample are described in Table 1. The groups were homogeneous in terms of age ($t = 1.21$; $p = 0.23$), sex (chi-square = 3.36, $p = 0.67$), ethnicity (chi-square = 0.14, $p = 0.91$), education (chi-square = 5.6; $p = 0.65$), and prevalence of anxiety (chi-square = 0.00, $p = 1$) and depression (chi-square = 0.07, $p = 0.79$). However, a significant difference in marital status was found (chi-square = 5.2; $p = 0.023$): the control group had a significantly greater number of married individuals, whereas the patient group had more single individuals and individuals of higher socioeconomic class (chi-square = 17.76, $p = 0.013$).

For patients, the most frequently compromised systems were the respiratory (40/151, 26.5%), cardiovascular (29/151, 19.3%), musculoskeletal/integumentary (28/151, 18.8%), hematopoietic (27/151, 17.9%), and endocrine (24/151, 14%) systems.

Table 1 General sample description

	Sick (n=151)	Healthy (n=174)		p-value
Age, mean (SD)	44.77 (13.82)	46.72 (15.05)	t = 1.21; df = 323	0.23*
Sex			χ^2 = 3.36; df = 1	0.67†
Women	74 (49.00)	104 (59.77)		
Men	77 (51.00)	70 (40.22)		
Ethnicity			χ^2 = 0.14; df = 1	0.91†
Caucasian	118 (79.19)	139 (80.34)		
Non-Caucasian	31 (20.80)	34 (19.65)		
Marital status			χ^2 = 5.2; df = 1	0.023†
Single	78 (52.00)	67 (38.72)		
Married	72 (48.00)	106 (61.27)		
Education			χ^2 = 5.6; df = 2	0.65‡
Primary	68 (47.22)	77 (45.03)		
Secondary	58 (40.28)	56 (32.75)		
Higher	18 (13.50)	38 (22.22)		
Socioeconomic class§			χ^2 = 17.76; df = 7	0.013‡
A1	1 (0.66)	1 (0.59)		
A2	6 (4.00)	8 (4.68)		
B1	9 (6.00)	27 (15.79)		
B2	31 (20.67)	50 (29.23)		
C1	54 (36.00)	54 (31.58)		
C2	31 (20.67)	23 (13.45)		
D-E	18 (12.00)	8 (4.68)		
Depressed	38 (44.70)	47 (55.29)	χ^2 = 0.07; df = 1	0.79†
Anxious	60 (46.15)	70 (53.84)	χ^2 = 0.00; df = 1	1†

Data presented as n (%), unless otherwise specified.
df = degree of freedom; SD = standard deviation; χ^2 = chi-square.
* *t*-test for independent samples.
† Chi-square Pearson test; ‡ chi-square test with Yates continuity correction.
§ Brazilian Market Research Association economic classification criteria, 2006.

Psychometric properties of the EUROHIS-QOL 8-item index

Reliability (internal consistency)

Internal consistency was measured using Cronbach's alpha coefficient. The EUROHIS-QOL 8-item index showed good internal consistency, with $\alpha = 0.81$. When each item was deleted, Cronbach's alpha coefficient ranged from 0.77 to 0.81; this shows that all items have similar importance in the construction of the instrument, and that no single item is more important than the others.

Floor, ceiling, and missing data effects

The missing data rate did not exceed 5% for any item in the sample. Analysis of floor effects likewise showed that no more than 10% of respondents selected the lowest level of the scale. However, there was an appreciable ceiling effect for the social and environment domains (10 and 14% respectively).

Influence of other variables

To investigate whether there were other variables influencing our findings, we compared subgroups within the overall sample. We analyzed the results of the EUROHIS-QOL 8-item index by age, in individuals aged 45 or older (M = 3.61; SD = 0.70), and in those younger than 45 years (mean = 3.50; SD = 0.70), and found no significant difference in QoL (t = 1.42; p = 0.15). Additionally, there was no significant difference between women (mean = 3.54; SD = 0.70) and men (mean = 3.58; SD = 0.69) (t = 0.44; p = 0.65).

A multiple linear regression was also carried out to control for disease, age, marital status, education, socioeconomic class, sex, anxiety, and depression. We found significant correlations between the EUROHIS-QOL 8-item index score and education (B = -0.16; p = 0.04), economic status (B = -0.11; p = 0.05), disease (B = -0.41; $p < 0.001$), anxiety (B = -0.03; p = 0.02), and depression (B = -0.05; $p < 0.001$).

Discriminant validity between patients and healthy controls who were depressed or non-depressed

To ascertain discriminant validity, the ability of the EUROHIS-QOL 8-item index to differentiate patients (n=151) from healthy controls (n=174) was assessed. We verified the discriminant ability of the instrument among patients (mean = 3.32; SD = 0.70) and healthy individuals (mean = 3.77; SD = 0.62) (t = 6.12; degrees of freedom [df] = 323; $p < 0.001$), and among depressed (mean = 3.14; SD = 0.69) and non-depressed (mean = 3.72; SD = 0.61) (t = 7.25; df = 314; $p < 0.001$) as well as anxious (mean = 3.26; SD = 0.72) and non-anxious (mean = 3.78; SD = 0.56) (t = 6.92; df = 232; $p < 0.001$) subjects. The healthy subjects and those who were not depressed and not anxious showed significantly higher QoL than the comparison group.

Convergent validity

Convergent validity was assessed by Pearson correlation between the EUROHIS-QOL 8-item index and the WHOQOL-Bref and SF-36 domains. All correlations were significant ($p < 0.001$), except for the social domain of the SF-36 (p = 0.38), as shown in Table 2.

Table 2 Correlations between EUROHIS-QOL 8-item and QoL, anxiety, and depression measures

QoL, anxiety, and depression measures	Correlation with EUROHIS-QOL 8-item*
WHOQOL-Bref domains	
Overall QoL	0.47
General health	0.54
Physical health	0.69
Psychological	0.62
Social relationships	0.55
Environment	0.55
SF-36 domains	
Overall QoL	0.36
Physical functioning	0.49
Role physical	0.45
Bodily pain	0.43
General health	0.52
Vitality	0.21
Social functioning	0.049†
Role emotional	0.38
Mental health	0.17
Anxiety (HAD)	-0.39
Depression (HAD)	-0.45

HAD = Hospital Anxiety and Depression scale; QoL = quality of life; SF-36 = 36-Item Short Form Health Survey; WHOQOL-Bref = World Health Organization Quality of Life instrument.
* $p < 0.01$; † p = 0.38.

Unidimensionality

A Rasch analysis was used to estimate the unidimensionality of the instrument. On general measures of model fit, the EUROHIS-QOL 8-item index exhibited adequate statistical performance; fit was considered "good" at first assessment. For item-person interaction, the item fit residual was mean = -0.01 and SD = 1.51 and the person-fit residual was mean = -0.38 with SD = 1.19. For the item-trait, the total item chi-square was 69.60 ($p < 0.001$), and the personal separation index was 0.82.

All residual values were within acceptable limits, without the need to exclude any item for subsequent retesting.

Factor validity of the EUROHIS-QOL 8-item index

CFA was performed using SEM to test the single-factor model of the EUROHIS-QOL 8-item index (Figure 1).

The model fit the data acceptably (CFI = 0.90; GFI = 0.93), with an adequate contribution of the latent factor in each item. However, some indices were improved (chi-square = 89.52; df = 20; RMSEA = 0.11; root mean square residual [RMR] = 0.06; $p < 0.001$) through model fitting. Figure 1 shows the initial model.

The procedure performed to achieve the best fit for this eight-item scale resulted in significant improvement in the unidimensionality indices of the items (chi-square = 18.46; df = 15; CFI = 0.99; RMSEA = 0.03; GFI = 0.99; RMR = 0.03; p = 24), as shown in Figure 2.

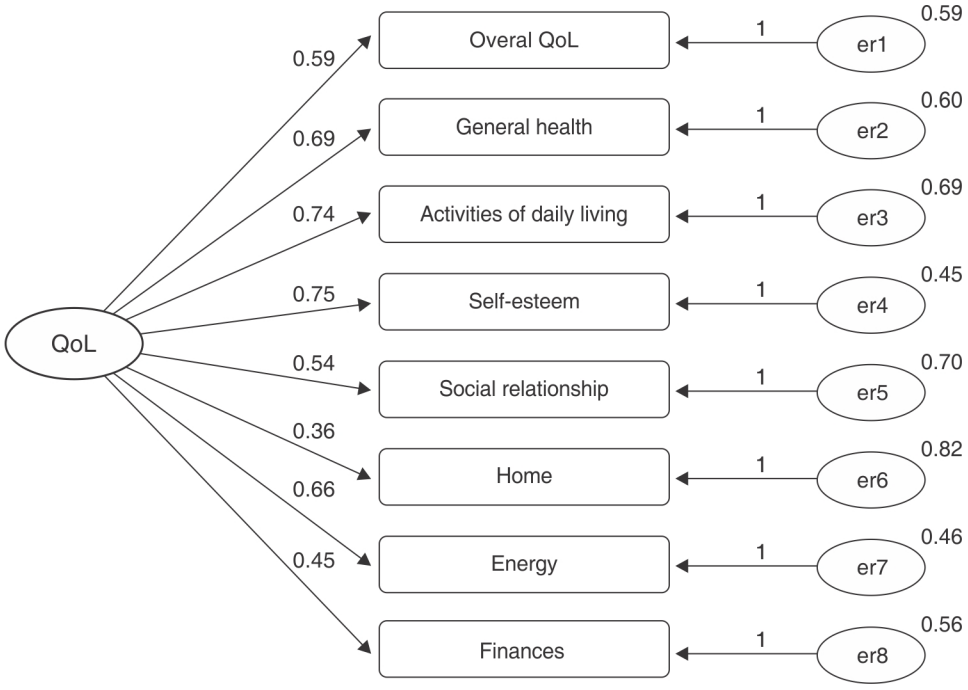

Figure 1 Confirmatory factor analysis for the eight items of the EUROHIS-QOL 8-item with one latent variable (QoL). er = error; QoL = quality of life.

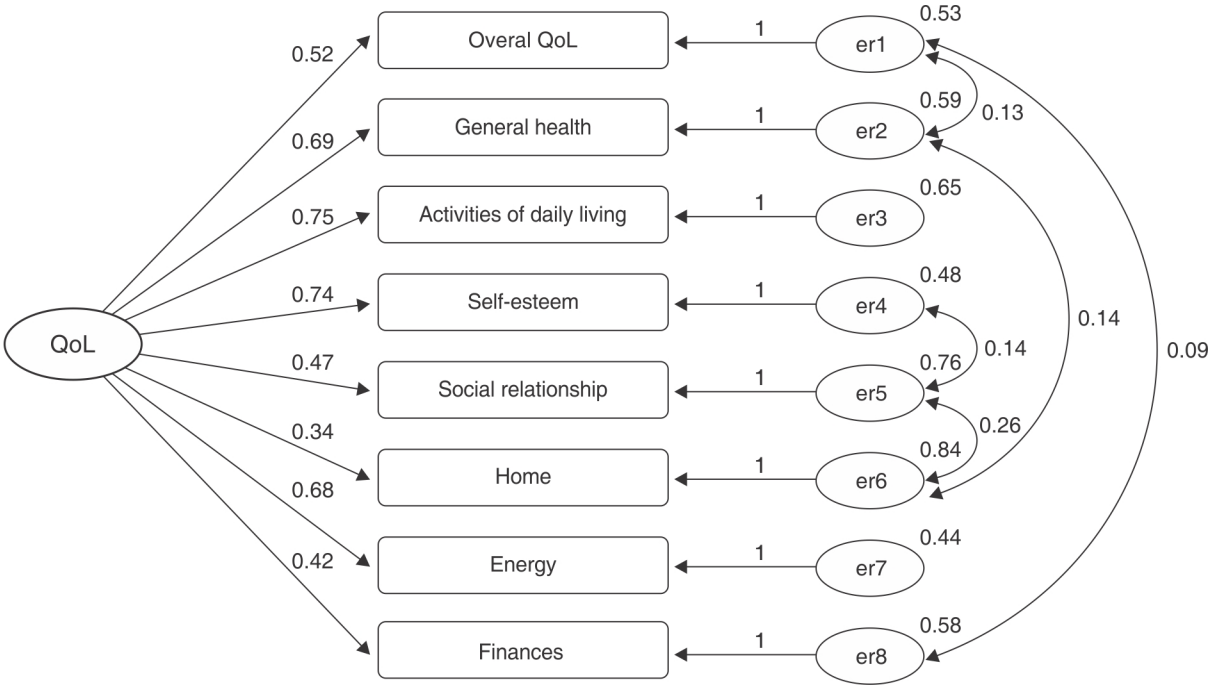

Figure 2 Confirmatory factor analysis for the eight items of the EUROHIS-QOL 8-item with one latent variable (QoL) adjusted for covariances. er = error; QoL = quality of life.

Discussion

Our findings suggest that the EUROHIS-QOL 8-item index has acceptable reliability (internal consistency), discriminant validity (to distinguish between patients and healthy controls and depressed and non-depressed subjects), convergent validity, unidimensionality, and factor validity. This was the first study to assess the EUROHIS-QOL 8-item index in a Latin American sample, as well as the first study in a non-European or Anglo-Saxon population.

Our results corroborate the cross-cultural validity of the instrument, which has already been evaluated in studies in different countries and maintained acceptable psychometric properties. This was demonstrated, e.g., by the field research conducted in countries including England, France, Croatia, Czech Republic, Romania, Slovakia, Lithuania, and Latvia, as well as in a further comparative study with the WHOQOL-Bref involving samples from Australia, Spain, Brazil, Israel, Russia, and the United States.[6,25] Germany, Portugal, New Zealand, and Italy also validated the EUROHIS-QOL 8-item index for use with their populations.[8-11]

The reliability (internal consistency) of the EUROHIS-QOL 8-item, as measured by Cronbach's alpha coefficient, was shown to be excellent, with a total value of 0.81 and no need to exclude any item. This also shows that each item had a similar importance in constructing the instrument, with no prominence of any item over the others (exclusion of which would "pull" the assessment up or down). The high score reinforces the correct choice of core items that constitute this measure of QoL, and shows that the EUROHIS-QOL 8-item measures the QoL construct satisfactorily. CFA showed acceptable fit to the data, as well as adequate contribution of the latent factor to each item. However, lower coefficients were observed in the environment domain, related to the QoL construct. The items home and finances, which are part of the environment domain, remained lower both in the initial model and after fitting. This domain was also problematic in other studies that assessed the EUROHIS-QOL 8-item index.[6] Home was an item that showed different functioning in the variable country when the UK, France, and Germany were compared with Eastern countries and the Balkans.[6] This item also had to be deleted to ensure the unidimensionality of the index (as assessed by Rasch analysis) in a cross-cultural study that involved six countries and assessed patients with and without depression.[25] The results of evaluation suggest that this item may have been influenced by cultural differences. The item finance, when excluded from the study carried out in Portugal, greatly increased Cronbach's coefficient.[9] In a study in New Zealand, the unidimensional structure improved when the same item was removed.[11] In the Italian validation, the environment domain had a lower item-total correlation using Cronbach's alpha coefficient, and the need to remove items was questioned.[10]

Regarding the EUROHIS-QOL 8-item structure, some CFA adjustments were necessary to achieve acceptable indexes such as RMSEA, RMR, and the chi-square statistic, and, consequently, a unidimensional structure. Thus, the necessary covariates were the general domain items (QoL and satisfaction with health) that had the same formation as WHOQOL-Bref subdomains: between QoL and finance ("have you enough money to meet the needs") and between self-esteem ("how satisfied are you with yourself") and relationships ("how satisfied are you with your personal relationships"). There was a correlation between relationships and home ("How satisfied are you with the conditions of your living place?"), and an inverse relationship between the general health and environment domains. The EUROHIS-QOL 8-item showed similar performance in cross-cultural research conducted in Australia, Brazil, Spain, Israel, Russia, and the United States, where covariance was found between self-esteem and relationship and between relationship and home, as was inverse covariance between general health and finance.[25] Covariance between overall QoL and home and between relationship and self-esteem also appeared in the Portuguese sample.[9]

A cross-cultural study for psychometric assessment of the EUROHIS-QOL 8-item index in Romania also found significant model improvement after covarying the items in the environment domain.[6] Items from this domain (home and finance) are connected with the most objective conditions of QoL. Therefore, we believe their variation relates more directly to economic than to cultural or subjective aspects.

On Rasch analysis, the EUROHIS-QOL 8-item index was shown to be a unidimensional measure. All items were acceptable in terms of residuals; thus, there was no need to exclude any item. Our sample showed greater strength in this regard compared to a previous cross-cultural study that used the same method of analysis, in which items had to be deleted to improve the unidimensional performance of the instrument.[25] However, it must be borne in mind that these studies were conducted in different cultures. This emphasizes the importance of evaluating instruments within the specificity of each culture and context to confirm their psychometric properties for that situation.

Regarding convergent validity, Pearson's correlations between the EUROHIS-QOL 8-item index and the WHOQOL-Bref were statistically significant for all domains. Correlations with the SF-36 were also significant in all but the social domain. On analysis of validation of the SF-36 for the Portuguese language, we found that the social domain had inexpressive, insignificant, or unmentioned correlations when compared with clinical parameters and other QoL measures, which seems to show a problem in this area of the instrument; this should be investigated further.[27]

The EUROHIS-QOL 8-item index, as expected, also differed significantly between patients and healthy subjects, showing good discriminant capacity. This result is in agreement with a field study that also compared QoL between patients and healthy controls across several countries.[6] We also found that the instrument had significant capacity to discriminate between depressed and non-depressed subjects, corroborating the findings of a 2012 study conducted with a cross-cultural sample of depressed and healthy subjects.[25]

Our study has some limitations. The EUROHIS-QOL 8-item index was tested in a tertiary hospital setting, with a population of low socioeconomic level, which may have influenced our results somewhat. Furthermore, no attempt was made to control for type of disease. Thus, future studies to assess the psychometric properties of the EUROHIS-QOL 8-item index in different contexts and samples are required.

The EUROHIS-QOL 8-item index has only been validated in populations from Europe and Oceania. However, in this first study of its use in a Latin American population from Brazil, its adequate psychometric properties were maintained. We can thus consider that the

EUROHIS-QOL 8-item index is valid cross-culturally, as is the WHOQOL. However, unlike the WHOQOL-100 and WHOQOL-Bref, the EUROHIS-QOL 8-item is a unidimensional index that consists of only eight items; nevertheless, it was still adequate and reliable, providing further evidence that the correct items – i.e., those which most strongly represented the QoL construct – were selected.

The EUROHIS-QOL 8-item index is a short, unidimensional instrument, and is reliable for the assessment of QoL in Brazilian populations. It should be particularly useful in settings where a longer instrument would be difficult or impossible to administer, such as in elderly or disabled subjects, or in research situations that require data collection from a large number of participants.

Disclosure

The authors report no conflicts of interest.

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