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The EUROHIS-QOL 8-Item Index: Comparative Psychometric Properties to Its Parent WHOQOL-BREF

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ABSTRACT

Objectives: To test the psychometric properties of the EUROHIS-QOL 8-item index, a shortened version of the World Health Organization Quality of Life Instrument-Abbreviated Version (WHOQOL-BREF). **Methods:** The sample consisted of 2359 subjects identified from primary care settings, with 1193 having a confirmed diagnosis of depression. Data came from six countries (Australia, Brazil, Israel, Russia, Spain, and the United States) involved in a large international study, the Longitudinal Investigation of Depression Outcomes. The structure of the EUROHIS-QOL 8-item index follows that of the WHOQOL-BREF assessment. Internal consistency was measured by using Cronbach's alpha. Convergent validity was assessed by using correlations with different measures for mental health (Symptom Checklist 90), physical health (self-evaluation), and quality of life (WHOQOL-BREF and short form 36 health survey). Discriminant group validity was assessed between diagnosed depressed and nondepressed patients. Differential item functioning and unidimensionality were analyzed by using Rasch analysis. Factor structure was assessed with structural equation modeling analyses. **Results:** Internal consistency was acceptable (ranged between 0.72 and 0.81 across countries), and the index discriminated

well between depression ($t = 6.31-20.33$; $P < 0.001$) across all countries. Correlations between the EUROHIS-QOL 8-item index and different measures—Symptom Checklist 90 ($r = -0.42$), physical health ($r = -0.42$), WHOQOL-BREF domains ($r = 0.61-0.77$), and short form 36 health survey ($r = 0.58$)—were all significant ($P < 0.001$). The index is unidimensional with desired item fit statistics. Two items (“daily living activities” and “enough money to meet your needs”) had residuals exceeding 4. Differential item functioning was observed with general quality of life, general health, relationships, and home items for age. A common one-factor structure with acceptable fit was identified in three out of six countries (comparative fit index = 0.85, root mean square error of approximation = 0.11). **Conclusions:** The EUROHIS-QOL 8-item index showed acceptable cross-cultural performance and a satisfactory discriminant validity and would be a useful measure to include in studies to assess treatment effectiveness.

Keywords: depression, outcomes research, psychometric properties, quality of life, questionnaire development.

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Introduction

The WHOQOL group defines quality of life (QOL) as an “individual's perception of their position in life within the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” [1]. To facilitate the measurement of QOL, the World Health Organization Quality of Life Instrument-Abbreviated Version (WHOQOL-BREF) [2,3], the abbreviated generic measure of QOL developed by the World Health Organization, was developed simultaneously in several cultures and languages. The 26 items of the WHOQOL-BREF are distributed into four domains—physical, psychological, social relationships, and environment—and are answered by using individualized five-point response scales. Each subscale is scored positively.

The need for more practical, shorter, and easily administered QOL instruments is leading researchers to focus their attention on constructing short-form versions of QOL questionnaires to be used not only as monitoring instruments but also for screening pur-

poses in clinical studies and to build health economic measures. One of the most commonly known is the development of the Medical Outcome short form (12) [SF-12] health survey measure adapted from the short form 36 health survey [4]. A shortened measure based on the WHOQOL-BREF concepts would add different information about QOL than that which is measured by the SF-12, because the SF-12 was constructed on the basis of a conceptual model more related to health status.

From this perspective, the WHOQOL group developed the EUROHIS-QOL 8-item index as an economic screening measure [5], validated by using European data collected in France, Germany, the United Kingdom, Lithuania, Latvia, Croatia, Romania, Slovakia, the Czech Republic, and Israel. Conceptually, the EUROHIS-QOL 8-item index consists of two items from each domain of the original WHOQOL-BREF (physical, psychological, environmental, and social). The EUROHIS-QOL 8-item index, despite having this conceptual limitation of the unidimensional structure, showed good internal consistency across countries, acceptable convergent validity with physical and mental health measures, and discrimi-

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Table 1 – General descriptions of baseline sample of LIDO study.

	N	Age ± SD	n (%)		
			Female	Major depression*	Good health
Total	2359	41.6 ± 14.9	1619 (68.6)	1193 (50.6)	1407 (59.8)
Be'er Sheva, Israel	383	41.4 ± 14.3	237 (61.9)	184 (48)	244 (64.2)
Barcelona, Spain	472	41.5 ± 15.2	335 (71.0)	214 (45.3)	275 (58.5)
Melbourne, Australia	437	39.4 ± 14.3	284 (65.0)	245 (56.1)	253 (57.9)
Porto Alegre, Brazil	391	39.9 ± 13.6	294 (75.2)	208 (53.2)	340 (87.0)
Seattle, United States	366	41.8 ± 15.0	245 (66.9)	175 (47.8)	245 (67.1)
St. Petersburg, Russia	310	47.0 ± 16.2	224 (72.3)	167 (53.9)	50 (16.1)

CES-D, Center for Epidemiologic Studies Depression Scale; CIDI, Composite International Diagnostic Interview; DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*; LIDO, Longitudinal Investigation of Depression Outcomes.

* CES-D score ≥ 16 and positive CIDI for major depression (DSM-IV criteria).

nated well between healthy individuals and those having chronic health conditions [5,6].

By using a standard database search (PubMed, MEDLINE®, and PsychINFO®), we identified that the highest number of published studies using the EUROHIS-QOL 8-item index were conducted in Germany. The index was validated and standardized in German [7] and has been used in different settings in this country: a population survey on chronic fatigue and somatization syndrome [8], a nonclinical nationally representative survey of East and West Germans [9], in the mental health of refugees [10] and returnees [11], and in a study investigating QOL from three different perspectives [12]. Outside Germany also, this index performed well in different contexts: as a psychosocial factor in an Australian investigation on an Internet intervention for depression [13] and in a Brazilian study on self-reported overweight [14], as an outcome measure in a cohort of hospitalized patients with cerebral leukoaraiosis in Israel [15], to describe the health and well-being of older people in two Nairobi slums [16] and in rural South Africa [17], and to examine the prevalence and correlates of somatic distress in Civil war survivors from Kosovo [18].

The WHOQOL-BREF, however, has been studied in several groups of diseases [19] including major depression [20–30], but the psychometric properties of the EUROHIS-QOL 8-item index remain unstudied in depressed patients, as well as in samples from non-European countries.

The Longitudinal Investigation of Depression Outcomes (LIDO) study was a multicenter, cross-national observational study that followed patients with depressive disorders in primary care settings for 12 months in six countries. All LIDO publications that aimed at assessing QOL (measured by the WHOQOL-BREF and the Quality of Life in Depression Scale) concluded that depressed partic-

ipants have poor QOL, even when other variables, such as demographic variables, health status, and severity of depression, are taken into account [31–35]. Each of these findings affirms that the WHOQOL-BREF is potentially useful in the study of depressed patients' QOL. Whether the EUROHIS-QOL 8-item index will retain this usefulness in evaluating depressed patients' QOL is still unknown. Therefore, potentially, the LIDO database allows us to test empirically the psychometric properties of the structure of the EUROHIS-QOL 8-item index in primary care depressed patients in cross-cultural settings.

Methods

The LIDO study design, including sample size estimations, methodology, and instrumentation, are thoroughly described elsewhere [33,36]. In summary, patients attending primary care centers in six sites (Barcelona, Spain; Be'er Sheva, Israel; Melbourne, Australia; Porto Alegre, Brazil; Seattle, United States; and St. Petersburg, Russia) were screened for symptoms of depression. Those meeting inclusion criteria—a new and/or untreated episode and a score of more than 16 on the Center for Epidemiological Studies Depression scale (CES-D) [37]—were interviewed and assessed by using a standardized diagnostic instrument for major depression, the Composite International Diagnostic Interview (CIDI) [38]. This article analyzes the baseline and 9-month follow-up data of the LIDO study.

Sample selection

Selection of primary care settings by investigators was pragmatic, and based primarily on good working relationships with

Table 2 – Descriptive properties for eight items and total score of the EUROHIS-QOL 8-item index for baseline depressed sample of LIDO study (n = 1193).

EUROHIS-QOL 8-item index	MD (%)	Mean	SD	Floor (%)	Ceiling	R _{item total}	Skewness
How would you rate your quality of life?	0.2	3.14	0.89	0.05	0	0.68	−0.36
How satisfied are you with your health?	0.2	2.76	1.02	0	0	0.62	0.03
Do you have enough energy for everyday life?	0.3	2.81	0.96	0	0.03	0.66	−0.01
How satisfied are you with your ability to perform your daily living activities?	0.3	2.47	1.12	0	0.04	0.56	0.30
How satisfied are you with yourself?	0.2	2.71	0.99	0	0.02	0.67	0.11
How satisfied are you with your personal relationships?	0.3	2.69	1.05	0	0.04	0.69	0.17
Have you enough money to meet your needs?	0.2	2.90	1.15	0	0	0.59	−0.03
How satisfied are you with the conditions of your living place?	0.3	3.22	1.20	0	0	0.58	−0.44
QOL total score	0.6	2.84	0.66	0.002	0.003		−0.10

LIDO, Longitudinal Investigation of Depression Outcomes; MD, missing data; QOL, quality of life.

Table 3 – Descriptive and psychometric properties of the total score of the EUROHIS-QOL 8-item index, by country for baseline depressed sample of LIDO study (n = 1193).

Country	N	α	MD	Total*		Female		Male		ES	Younger†		Older		ES
				Mean	SD	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Israel	184	0.81	2.2	3.01 ^{c,e}	0.75	3.01	0.74	3.02	0.76	-0.03	3.09	0.83	2.92	0.64	0.11
Spain	214	0.75	0	2.94 ^{c,e,f}	0.55	2.97	0.54	2.86	0.56	0.10	2.94	0.53	2.94	0.57	0
Australia	245	0.79	0.2	2.71 ^{a,b,d}	0.69	2.80	0.69	2.54	0.65	0.19	2.70	0.71	2.73	0.66	-0.02
Brazil	208	0.72	0.5	3.08 ^{c,e,f}	0.53	3.09	0.54	3.03	0.50	0.06	3.09	0.53	3.06	0.53	0.03
United States	175	0.80	0	2.66 ^{a,b,e}	0.67	2.68	0.65	2.61	0.71	0.05	2.60	0.66	2.73	0.67	-0.10
Russia	167	0.72	0	2.59 ^{a,b,d}	0.57	2.55	0.58	2.70	0.56	-0.13	2.74	0.57	2.51	0.57	0.20
Total	1193	0.78	0.6	2.84	0.66	2.86	0.65	2.78	0.67	0.06	2.87	0.67	2.81	0.63	0.05

ANOVA, analysis of variance; ES, effect size; LIDO, Longitudinal Investigation of Depression Outcomes; MD, missing data.

* ANOVA, $F = 20.23$; $P < 0.001$; the mean difference is significant at the 0.05 level for (a) Israel, (b) Spain, (c) Australia, (d) Brazil, (e) the United States, and (f) Russia.

† Age group: <45 y versus ≥45 y.

the primary care physicians and clinic managers. There were three main types of service contacts: primary care/outpatients units, day hospital, and inpatients units. A convenience sample was collected.

For inclusion in the LIDO study, participants had to be 18 to 75 years old, be a patient in a participating primary care setting, and meet the CIDI criteria for current major depression. They also had to be able and willing to participate in planned visits and/or study-required contacts; provide adequate contact details to ensure follow-up; give written informed consent; read, understand, and complete the self-administered surveys in the primary language at the site; and plan to be available for the 12 months of the study. Individuals were not included if during the recruitment period they 1) were receiving treatment for depression or had been treated for depression in the past 3 months; 2) had been diagnosed with a major psychiatric disorder or psychosis; or 3) had a diagnosis of dementia, Alzheimer’s disease, or organic brain syndrome.

Measures

The EUROHIS-QOL 8-item index [5,6] is composed of eight items (overall QOL, general health, energy, daily life activities, esteem, relationships, finances, and home) taken from the WHOQOL-BREF. In the present article, all the analyses were performed by using the 8-item index. This index has the same response scale as the WHOQOL-BREF; that is, each question has an individualized five-point scale. Each subscale is scored positively. For this study, we analyzed secondary data, where participants did not fill in the actual EUROHIS-QOL 8-item index.

The CES-D is a 20-item scale designed to measure symptoms of depression in community populations. This measure uses a four-point response scale, with higher scores indicating the presence and persistence of symptoms [37].

The CIDI version 2.1 [39] is a completely structured psychiatric diagnostic assessment developed for use in cross-national epidemiological studies. Data from the CIDI were used to assess diagnostic criteria for depression from the American Psychiatric Association.

Diagnostic and statistical manual of mental disorders, fourth edition [40]

The WHOQOL-BREF [2,3] is a 26-item instrument adapted from the larger WHOQOL-100 survey, a multilingual assessment for generic QOL that was developed concurrently across 15 international field centers. The items of the WHOQOL-BREF form four domains (physical, psychological, social, and environment) and are answered by using individualized five-point scales. Each subscale is scored positively. This measure was evaluated cross-culturally by using Rasch analysis, focusing on its interval scales. The WHOQOL-BREF domain locations’ ranges were as follows: physical: -0.71 to 0.55; psychological: -0.52 to 0.32; environment: -0.59 to 0.57, and social: -0.33 to 0.27 [41].

All measures were obtained simultaneously. The LIDO study included other instruments assessed at baseline, which can be found in detail in Chisholm et al. [36]. These measures included symptomatology (Symptom Checklist 90[42]), condition-specific QOL (Quality of Life in Depression Scale [43]), functioning (Medical Outcomes Study SF-12 and short form 36 health survey mental

Table 4 – Discriminant validity (t test) of the total score of the EUROHIS-QOL 8-item index (n = 2359) for depressed versus nondepressed sample, by country and total sample for baseline sample of LIDO study.

Country	Depressed sample*			Nondepressed sample			Total t	P, effect size
	Mean	SD	n	Mean	SD	n		
Israel	3.02	0.75	184	3.63	0.55	196	9.01	<0.001, 0.42
Spain	2.94	0.55	214	3.42	0.49	256	9.97	<0.001, 0.42
Australia	2.71	0.69	245	3.30	0.64	192	9.10	<0.001, 0.41
Brazil	3.08	0.53	208	3.47	0.47	182	7.63	<0.001, 0.36
United States	2.66	0.67	175	3.23	0.63	191	8.50	<0.001, 0.40
Russia	2.59	0.57	167	2.98	0.52	143	6.31	<0.001, 0.34
Total	2.83	0.66	1193	3.08	0.53	1166	20.33	<0.001, 0.20

CES-D, Center for Epidemiologic Studies Depression Scale; CIDI, Composite International Diagnostic Interview; DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*; LIDO, Longitudinal Investigation of Depression Outcomes.

* CES-D score ≥16 and positive CIDI for major depression (DSM-IV criteria).

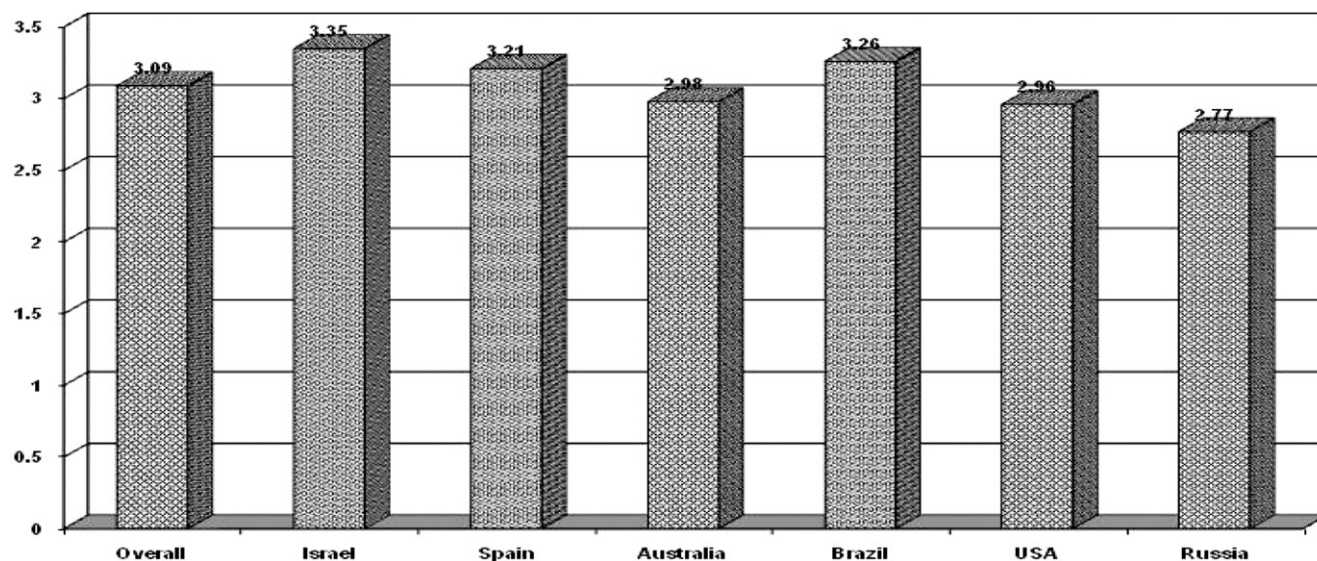


Fig. 1 – Adjusted means for total score EUROHIS-QOL 8-item index for different countries. Scores were adjusted for gender, age, marital and health status, highest year of education, and severity of depression.

health index subscales [44]), comorbid conditions (Alcohol Use Disorders Identification Test [45]), and economic measures developed specifically for the LIDO study (demographic questions, resource utilization questionnaire, local sociodemography/service profile, and service costs).

Statistical analysis

Internal consistency was measured by using Cronbach's alpha. Convergent validity was assessed by using Pearson correlations with different measures for mental health (Symptom Checklist 90), physical health (self-evaluation), and QOL (WHOQOL-BREF and short form 36 health survey). Discriminant group validity was assessed between diagnosed depressed and nondepressed patients, using *t* tests and analyses of variance. For convergent validity, it was expected that the measures of mental and physical health would be negatively related to the EUROHIS-QOL 8-item index score and the measures of QOL will have a positive relationship. For discriminant validity, it was expected that the EUROHIS-QOL 8-item index scores would be different between depressed and nondepressed patients.

Differential item functioning (DIF) and unidimensionality were assessed by using Rasch analysis. Factor structure was assessed by using structural equation modeling (SEM) analyses. To assess sensitivity to change, the longitudinal data (month 9) were analyzed. DIF means that an item performs and measures differently for one subgroup of a population than for another. According to this definition of DIF, there should be no association between item and variables studied (country, gender, and age group) using the analysis of variance *P*-value criteria of >0.001 [46].

Results of SEM [47] and Rasch analysis [48] were examined by using measures of fit.

For SEM, the estimation method used was the maximum likelihood and the fit statistics included the chi-square statistic (ideal nonsignificant, $P > 0.001$), the comparative fit index (CFI) (where values close to 1 indicate a very good fit), the root mean square error of approximation (RMSEA) (where a value of 0 indicates a perfect fit), the goodness-of-fit index (where values close to 1 indicate perfect fit), and the root mean square residual (where a value of 0 indicates a perfect fit). Looking for the best model fit, the most relevant covariances were identified by looking at the highest values for the modification indices (MI), and then the analyses

were run again, allowing the error covariances to vary, and the measures of model fit were rechecked.

For the Rasch analysis [48], residuals greater than 2.5 and a significant chi-square ($P < 0.001$) were considered unacceptable. Items with problematic residuals were excluded from the analysis, and then the analysis was run again to see whether this procedure would improve the model fit. To determine model fit, the Rasch analysis considers three overall fit statistics. Two are item-person interaction statistics, distributed as *Z* statistics (the first statistic is the mean and the second is the SD), where values of 0 and an SD of 1 will indicate perfect fit to the model.

In the third overall fit statistic, the chi-square item-trait interaction (total items) statistic should be nonsignificant. An estimate of the internal consistency reliability of the scale is also presented, based on the Person Separation Index (values of 0.7 would indicate

Table 5 – Correlation between the EUROHIS-QOL 8-item index and QOL and mental health measures for depressed baseline sample of LIDO study (n = 1193).

Correlation	EUROHIS-QOL 8- item index*
Self-report health	−0.42
SCL-90 anxiety dimension	−0.48
SCL-90 phobic anxiety dimension	−0.36
QLDS score	−0.64
CES-D score	−0.62
WHOQOL-BREF domains	
Physical	0.73
Psychological	0.77
Social relationship	0.61
Environment	0.72
SF-12 mental health index	0.58

CES-D, Center for Epidemiologic Studies Depression Scale; LIDO, Longitudinal Investigation of Depression Outcomes; QLDS, Quality of Life Depression Scale; QOL, quality of life; SCL-90, Symptom Checklist 90; SF-12, Medical Outcome short form (12) health survey; WHOQOL-BREF: World Health Organization Quality of Life Instrument-Abbreviated Version.

* $P < 0.001$.

Table 6 – Item fit for the EUROHIS-QOL 8-item index for depressed baseline sample of LIDO study (n = 1193) (using RUMM).

Item	Analysis 1				Analysis 2			
	Location	Residuals	χ^2	P	Location	Residuals	χ^2	P
How would you rate your quality of life?	-0.39	-1.94	32.08	<0.001	-0.49	0.94	3.35	0.95
How satisfied are you with your health?	0.17	1.6	13.06	0.16	0.16	0.84	3.8	0.92
Do you have enough energy for everyday life?	0.02	-0.79	18.75	0.03	0.01	0.38	12.09	0.21
How satisfied are you with your ability to perform your daily living activities?	0.30	4.63	41.08	<0.001	0.21	-1.30	21.98	0.01
How satisfied are you with yourself?	0.21	-0.94	25.46	0.003	0.12	1.84	5.15	0.82
How satisfied are you with your personal relationships?	0.13	-1.75	15.47	0.08				
Have you enough money to meet your needs?	-0.13	4.36	25.24	0.003				
How satisfied are you with the conditions of your living place?	-0.31	2.78	15.57	0.08				
Measures of model fit	Analysis 1				Analysis 2			
Item fit residual, mean (SD)	0.93 (2.69)				0.54 (1.165)			
Person fit residual, mean (SD)	-0.32 (1.27)				-0.48 (1.31)			
Total item χ^2	186.69				46.37			
Chi-square P	0.001				0.42			
PSI	0.78				0.77			

LIDO, Longitudinal Investigation of Depression Outcomes; PSI, person separation index; RUMM, Rasch unidimensional measurement models.

the ability to differentiate two groups and 0.8 would allow for three groups) [49].

Descriptive and basic statistical analyses were performed by using SPSS 13.0 (Chicago, IL, USA) [50], SEM by using AMOS (Chicago, IL, USA) [51], and Rasch analysis by using the RUMM 2020 (Perth, Western Australia) package [52].

Results

The sample consisted of 1193 primary care patients ranging from 167 in Russia to 245 in Australia. Data presented in Table 1 provide a summary description of the baseline sample in terms of age, gender, occurrence of major depression, and self-report of health along with sample sizes.

EUROHIS-QOL 8-item index psychometric properties

Descriptive country differences in the EUROHIS-QOL 8-item index

The descriptive country differences in the EUROHIS-QOL 8-item index are presented in Table 2. Overall, the rate of missing data and

floor and ceiling effects for the eight items of the EUROHIS-QOL 8-item index were low (below 1% and about 1%, respectively; Table 2).

Table 3 shows means and SDs of the total EUROHIS-QOL 8-item index across the six countries. These analyses suggest that there were no considerable country differences on a descriptive level. There were no differences among countries comparing the total mean of the EUROHIS-QOL 8-item index for gender and age ($t_{age} = 0.002$; $P = 0.99$ and $t_{gender} = 1.36$; $P = 0.18$). Younger (<45 years) and older groups (≥ 45 years) were defined by the median of the sample, which was 45 years old.

Internal consistency

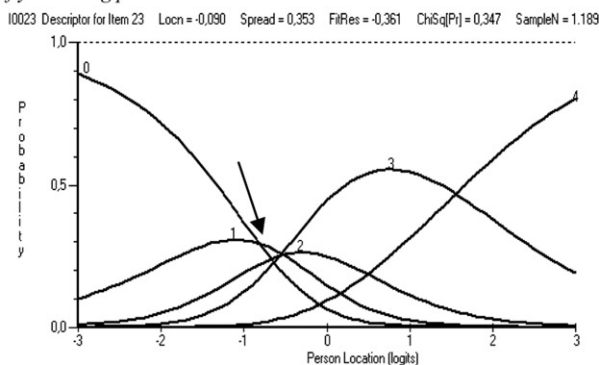
The internal consistency was measured by Cronbach’s alpha. The index showed good total internal consistency within each country, Israel 0.81, Spain, 0.75, Australia 0.79, Brazil 0.72, the United States 0.80, and Russia 0.72. The alpha for the total EUROHIS-QOL 8-item index was 0.78.

Discriminant validity between depressed and nondepressed patients

The EUROHIS-QOL 8-item index significantly discriminated ($t = 6.31$ – 20.33 ; $P < 0.001$) between patients with and without major

Disordered Thresholds

Conditions of your living place



Rescoring

Conditions of your living place

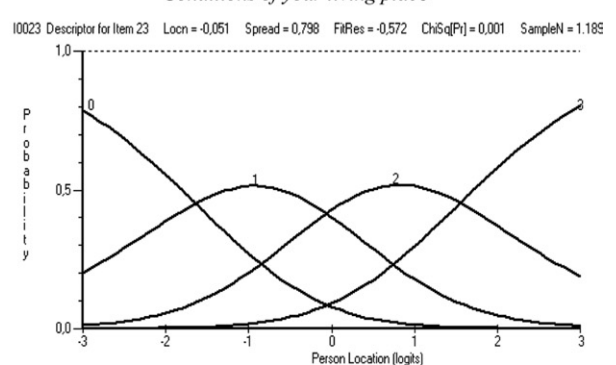


Fig. 2 – Category probability curves for home: disordered threshold and rescoring.

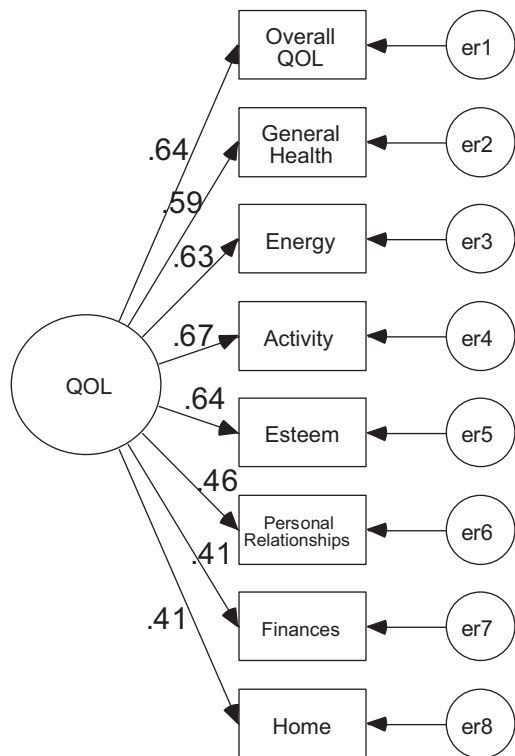
Table 7 – CES-D and QOL measures for depressed baseline sample and after follow-up of 9 mo LIDO study (n = 975).

Measures	Mean (SD)		t	P	Effect size
	Baseline	9 mo			
CES-D score	29.01 (10.66)	20.07 (12.78)	19.40	<0.001	0.36
EUROHIS-QOL 8-item index	2.88 (0.64)	3.17 (0.7)	14.03	<0.001	-0.21
WHOQOL-BREF domains					
Physical	50.96 (17.65)	59.47 (19.06)	14.79	<0.001	-0.23
Psychological	46.17 (15.9)	53.68 (17.30)	13.45	<0.001	-0.22
Social	49.51 (20.81)	56.27 (21.14)	9.81	<0.001	-0.16
Environment	51.68 (15.24)	55.68 (15.99)	9.28	<0.001	-0.13
QLDS	11.95 (7.64)	8.6 (8.04)	14.14	<0.001	-0.21

CES-D, Center for Epidemiologic Studies Depression Scale; LIDO, Longitudinal Investigation of Depression Outcomes; QLDS, Quality of Life Depression Scale; QOL, quality of life; WHOQOL-BREF, World Health Organization Quality of Life Instrument-Abbreviated Version.

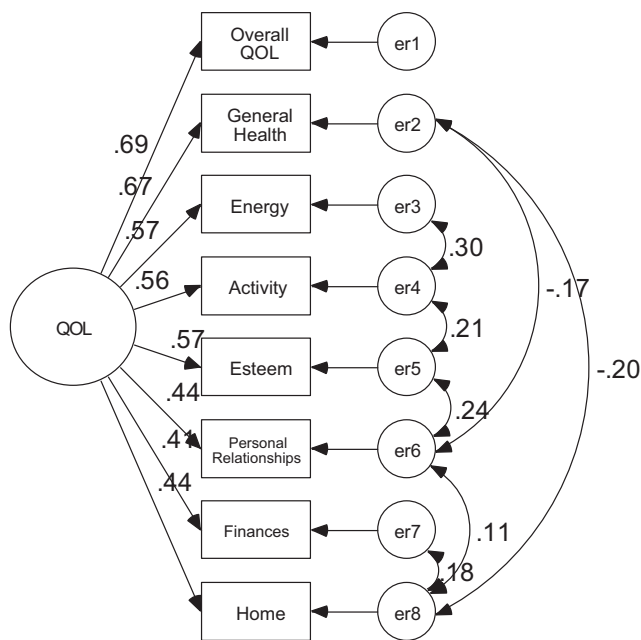
depression disorder (CES-D score ≥ 16 and positive CIDI for major depression—*Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* criteria) in all countries (Table 4). Figure 1 presents adjusted means for total score of the EUROHIS-QOL

8-item index for different countries. Scores were adjusted for gender, age, marital and health status, highest year of education, and severity of depression.



Country	N	X ²	DF	P	CFI	RMSEA	GFI	RMR
Israel	184	81.86	20	<0.001	0.84	0.13	0.89	0.11
Spain	214	97.54	20	<0.001	0.78	0.13	0.90	0.08
Australia	245	73.18	20	<0.001	0.88	0.10	0.93	0.08
Brazil	208	59.31	20	<0.001	0.85	0.09	0.93	0.06
USA	175	43.01	20	0.002	0.93	0.08	0.95	0.06
Russia	167	98.61	20	<0.001	0.70	0.15	0.87	0.10
Total	1193	337.85	20	<0.001	0.85	0.11	0.93	0.07

Fig. 3 – Confirmatory factor analysis (CFA) for the eight items of the EUROHIS-QOL 8-item index with one latent variable (QOL), overall and each country (n = 1193). QOL, quality of life. CFI, comparative fit index; GFI, goodness-of-fit index; RMR, root mean square residual; RMSEA, root mean square estimation approximation.



Country	N	X ²	DF	P	CFI	RMSEA	GFI	RMR
Israel	184	26.94	13	0.01	0.97	0.08	0.96	0.06
Spain	214	19.23	13	0.11	0.98	0.05	0.98	0.03
Australia	245	14.20	13	0.36	0.99	0.01	0.99	0.04
Brazil	208	26.12	13	0.02	0.95	0.07	0.97	0.04
USA	175	21.34	13	0.07	0.98	0.06	0.97	0.04
Russia	167	15.21	13	0.29	0.99	0.03	0.98	0.05
Total	1193	50.40	13	<0.001	0.98	0.05	0.99	0.03

Fig. 4 – Confirmatory factor analysis (CFA) for the eight items of the EUROHIS-QOL 8-item index with one latent variable (QOL), overall and each country (n = 1193) adjusted for covariances. QOL, quality of life. CFI, comparative fit index; GFI, goodness-of-fit index; RMR, root mean square residual; RMSEA, root mean square estimation approximation.

Convergent validity

The convergent validity was assessed by Pearson correlations. Correlations between the EUROHIS-QOL 8-item index and different measures for mental health, physical health, and QOL were all significant ($P < 0.001$) as shown in Table 5. The strongest correlations were between the EUROHIS-QOL 8-item index and WHO-QOL-BREF domains ($r_{\text{physical}} = 0.73$; $r_{\text{psychological}} = 0.77$; $r_{\text{social}} = 0.61$; $r_{\text{environment}} = 0.72$; P 's < 0.001).

Unidimensionality

Applying Rasch analysis to estimate the unidimensionality of the measure, the scale showed acceptable item fit statistics (Table 6). In terms of residuals, item 4 (“ability to perform your daily living activities”), item 7 (“enough money to meet your needs”), and item 8 (“conditions of your living place”) showed unacceptable scores (residuals >2.5 —Table 6, Analysis 1). Deleting item 6 “personal relationships,” item 7 “enough money to meet your needs,” and item 8 “conditions of your living place” resulted in the best overall measures of fit for the EUROHIS-QOL index, where the item fit residual mean and SD changed from 0.93 (SD 2.69) to 0.54 (SD 1.16); person fit residual mean and SD changed from -0.32 (SD 1.27) to -0.48 (SD 1.31); total chi-square changed from 186.69 to 46.37; P value changed from <0.001 to 0.42; and person separation index changed from 0.78 to 0.77 (Table 6, Analysis 2).

Item 8 (“conditions of your living place”) showed disordered thresholds and needed to be rescored as shown in Figure 2. Category 2 was less likely to be responded to, and so this was collapsed with category 3.

Sensitivity to change

A sample of patients ($n = 975$) was assessed at baseline and after 9 months of follow-up at main variables: the CES-D score, the EUROHIS-QOL 8-item index, WHOQOL-BREF domains, and the Quality of Life in Depression Scale score. The EUROHIS-QOL 8-item index total score mean significantly improved (2.88 vs. 3.17; $t = 14.03$; $P \leq 0.001$; effect size = -0.21) after a 9-month follow-up, as well as all the other main measures assessed (Table 7).

Universal applicability and factorial validity of the EUROHIS-QOL 8-item index

A confirmatory factor analysis was performed by using SEM, for testing the one-factor model of the EUROHIS-QOL 8-item index (Fig. 3). The analyses were performed across all countries, as well as in each country sample. The model fitted the data acceptably

(CFI = 0.85, RMSEA = 0.11) with adequate contribution of the latent factor on each item. The model fit varied across counties, with a better fit in the United States (CFI = 0.93, RMSEA = 0.08) and Australia (CFI = 0.88, RMSEA = 0.10) and a poorer fit in Spain (CFI = 0.78, RMSEA = 0.13) and Russia (CFI = 0.70, RMSEA = 0.15).

Recalculating the analysis with the six items covering more subjective aspects of QOL (items “overall QOL,” “general health,” “energy,” “ability to perform your daily living activities,” “satisfaction with yourself,” “personal relationships”), this procedure improved the unidimensionality of the index (CFI = 0.90, RMSEA = 0.13). The RMSEA and CFI values, however, indicated that the model could be improved. However, because our purpose was to evaluate the performance of the 8-item measure, we continued with analysis of the 8-item index to find a better model fit.

Looking for the best model fit for the 8-item scale, the most relevant covariances were identified by looking at the highest values for the MI, and then the error covariances were allowed to vary. Using these procedures, the model improved considerably (CFI = 0.98, RMSEA = 0.049). The most relevant covariances were identified between the following items: item 6 “personal relationships” with item 5 “satisfaction with yourself” (MI = 57.44) and item 8 “conditions of your living place” (MI = 26.45); item 7 “enough money to meet your needs” with item 8 “conditions of your living place” (MI = 52.74); item 3 “energy” with item 4 “ability to perform your daily living activities” (MI = 53.25); item 4 “ability to perform your daily living activities” with item 5 “satisfaction with yourself” (MI = 38.71); item 2 “general health” with item 8 “conditions of your living place” (MI = 24.61); item 2 “general health” with item 6 “personal relationships” (MI = 16.82) (Fig. 4).

DIF analysis for the EURO-HIS-QOL 8-item index

Table 8 shows summary of the DIF analysis for country, gender, and age group. Only item 7 (“enough money to meet your needs”) showed DIF for country, item 1 (“quality of life in general”) showed DIF for gender, and item 1 (“quality of life in general”), item 2 (“general health”), item 7 (“enough money to meet your needs”), and item 8 (“conditions of your living place”) displayed DIF for age.

Discussion

Our findings describe acceptable psychometric properties of the EUROHIS-QOL 8-item index, in terms of internal consistency, discriminant validity between depressed and nondepressed patients, convergent validity, unidimensionality, sensitivity to change, uni-

Table 8 – Differential item functioning of the eight items of the EUROHIS-QOL 8-item index for depressed baseline sample of LIDO study (n = 1193).

Item	Country		Gender		Age group*	
	F	P	F	P	F	P
How would you rate your quality of life?	15.39	0.00001	13.99	0.0002	19.68	0.000009
How satisfied are you with your health?	5.59	0.00003	4.71	0.03	38.64	0.000003
Do you have enough energy for everyday life?	6.46	0.00006	5.44	0.02	0.11	0.74
How satisfied are you with your ability to perform your daily living activities?	24.45	0.000001	0.07	0.80	3.66	0.06
How satisfied are you with yourself?	4.94	0.0002	0.93	0.33	0.00	0.99
How satisfied are you with your personal relationships?	6.15	0.00003	2.65	0.10	0.15	0.70
Have you enough money to meet your needs?	7.52	0.00002	0.51	0.48	12.05	0.0005
How satisfied are you with the conditions of your living place?	0.96	0.43	0.96	0.33	16.42	0.00006

Analysis of variance: All probabilities Bonferroni adjusted at the 0.003 significance level.

LIDO, Longitudinal Investigation of Depression Outcomes.

* Age group: <45 y versus ≥ 45 y.

versal applicability, factorial validity, and DIF analysis. This is the first study to assess these issues in the context of depressed primary care patients in six countries worldwide (Australia, Brazil, Spain, Israel, Russia, and the United States). Also, the results affirm that the EUROHIS-QOL 8-item index retains the acceptable psychometric properties of its parent WHOQOL-BREF.

The unidimensionality tests as well as the factorial validity show that this index presents some limitations on its unidimensional structure. The results of the CFA showed that the EUROHIS-QOL items have a performance similar to that of the original WHOQOL-BREF structure of subdomains. The “energy” item was correlated with “ability to perform daily life activities” (physical domain), “satisfaction with yourself” with “personal relationships” (psychosocial domain), and “enough money to meet your needs” with “conditions of your living place” (environment domain). When items related to environment (“enough money to meet your needs” and “conditions of your living place”) and social (“personal relationships”) domains were excluded from the analysis of the unidimensionality (using Rasch), this index had an excellent performance as a unidimensional scale. Future investigations would be able to study whether our results can be generalized to nondepressed samples.

As would be expected, the EUROHIS-QOL 8-item index scores are significantly different between depressed and nondepressed patients, as well as the WHOQOL-BREF [53], pointing to good discriminative properties when used with depressed patients. This finding is in agreement with a previous study that found that depression and QOL measures can have overlapping items [30]. Interestingly, three (“energy,” “ability to perform daily life activities,” and “satisfaction with yourself”) of the five items that formed the unidimensional scale could be considered as items of a depression scale.

Each of these findings suggest that this measure can be considered in other studies that need a more practical, shorter, and easier to apply instrument for assessing QOL. While this applies to population surveys, we have also demonstrated adequate performance of the EUROHIS-QOL-8 by using a primary care cohort with depression.

This study did not aim to propose that the EUROHIS-QOL 8-item index should replace the WHOQOL-BREF. The concept of QOL underlying the WHOQOL measures is based on the fact that QOL is a multidimensional construct. Because this index is a unidimensional instrument composed of only eight items, the broadness and representation of the items selected could be questioned. However, the fact that this index maintained suitable psychometric properties is an argument in favor of considering the use of this measure in circumstances where the use of a longer instrument could be too laborious, for example, in patients with acute stroke [15] or other disabling health conditions, and also as a QOL measure for constructing health-economic assessments. Future research will be needed to specify in each context whether this index will maintain suitable psychometric properties.

The finding that age is an important factor in item functioning is in agreement with some current research [54,55]. The importance of the diagnosis of depression in old age is well recognized [56]. Therefore, any QOL measure should take into account the need for specific measures for different age populations. This has been a concern of some authors who have been working on the design of specific instruments for older people [54] and for children [55]. On the other hand, the fact that only one item displayed country-specific DIF, that is, item 7 (“enough money to meet your needs”), which could be determined by differences in provision of economic resources in the countries studied, point to the cross-cultural inadequacy for these studies.

The fact that we analyzed secondary data, where participants did not fill in the actual EUROHIS-QOL 8-item index can be a limitation of the present study. However, it is plausible to assume that

if participants had to fill in a shorter instrument, its psychometric properties could be even better, and so the performance of the index could be underestimated in the present study, but only future research could answer this hypothesis.

The EUROHIS-QOL 8-item index showed appropriate psychometric properties for being considered as a measure in studies with non-European depressed patients.

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