Original Article

Cross-Cultural Adaptation and Validation of Singapore Malay and Tamil Versions of the EQ-5D

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Abstract

Introduction: The aims of this study were to cross-culturally adapt and evaluate the validity of the Singaporean Malay and Tamil versions of the EQ-5D. Materials and Methods: The EQ-5D was cross-culturally adapted and translated using an iterative process following standard guidelines. Consenting adult Malay- and Tamil-speaking subjects at a primary care facility in Singapore were interviewed using a questionnaire (including the EQ-5D, a single item assessing global health, the SF-8 and sociodemographic questions) in their respective language versions. Known-groups and convergent construct validity of the EQ-5D was investigated by testing 30 *a priori* hypotheses per language at attribute and overall levels. Results: Complete data were obtained for 94 Malay and 78 Indian patients (median age, 54 years and 51 years, respectively). At the attribute level, all 16 hypotheses were fulfilled with several reaching statistical significance (Malay: 4; Tamil: 5). At the overall level, 42 of 44 hypotheses related to the EQ-5D/ EQ-VAS were fulfilled (Malay: 22; Tamil: 20), with 21 reaching statistical significance (Malay: 9; Tamil: 12). Conclusion: In this study among primary care patients, the Singapore Malay and Tamil EQ-5D demonstrated satisfactory known-groups and convergent validity.

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Introduction

The EQ-5D is a widely used preference-based instrument (available in at least 60 language versions and used in more than 800 published studies to date[1]) that provides both a health profile (for assessing health status) and health utility index for individuals or groups, thus allowing clinical and economic evaluation of medical interventions.[2] Each language version of the EQ-5D needs to be cross-culturally adapted and to demonstrate satisfactory psychometric properties before routine use in any given socio-cultural setting.[3,4] The purpose of this paper is thus to report on the cross-cultural adaptation and construct validation of Singapore Malay and Tamil language versions of the EQ-5D in Singapore, an island state in Southeast Asia, an ethnically and linguistically diverse region with a population of 443 million,[5] which is seeing an increasing stream of pharmacoeconomics and outcomes research-related activities.[6]

Materials and Methods

Subjects and Study Design

This Instituitional Review Board (IRB) approved study involved cross-cultural adaptation of Singapore Malay and Tamil EQ-5D versions followed by a cross-sectional validation study in a primary care population.

Cross cultural adaptation: The Singapore Malay EQ-5D was culturally adapted from the Malaysian Malay EQ-5D while the Singapore Tamil EQ-5D was translated from the

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source UK English version using a standardised forward-back translation process (following EuroQol Group guidelines). The Group's input was obtained to achieve a consensus version for each language.[7,8] Cognitive debriefing of preliminary Malay and Tamil versions was carried out among native Malay- and Tamil-speaking Singaporeans with diverse socio-demographic backgrounds and health conditions to assess the understandability and ease of completion of these versions.

Cross-sectional validation study: Consenting Malay- or Tamil-speaking patients (age ≥21 years, no obvious incoherence in speech and/or thoughts assessed by recruiters) seeking treatment at a primary care facility in Singapore were interviewed using a questionnaire containing their respective language versions of the EQ-5D, the SF-8 (previously culturally adapted in Singapore), a single item assessing global health using a 6-point scale (very poor to excellent) and questions assessing sociodemographic characteristics.

Instruments

1. EQ-5D: The EQ-5D consists of a self-classifier comprising 5 single-item health dimensions, each with 3 response levels, generating 243 health states (each mapped to a utility score using a utility function representative of the general UK population[9]), and a visual analog scale (EQ-VAS).[2] The EQ-VAS is a 20-cm vertical, 0-100 points "thermometer", with 100 representing "best imaginable health state" and 0 representing "worst imaginable health state".

2. SF-8 (4-week recall): The SF-8 measures 8 domains of health and is scored on the same metric as the SF-36.[10] Hence, scores between the 2 instruments are directly comparable. We have previously demonstrated that the physical functioning (PF), role limitations due to physical health problems (RP), social functioning (SF) and mental health (MH) scales of the SF-36 had similar psychometric properties in the Singaporean and US populations,[11] and thus utilised SF-8 scores for these scales, using US norms in assessing the construct validity of the EQ-5D.

3. Family functioning measure (FFM): The FFM, previously validated for use in Singapore,[12] is a 3-item Likert-type scale assessing the quality of interactions among family members,[13] with higher scores (range, 0 to 100) reflecting better family functioning.

Statistical Analyses

Known-groups and convergent construct validity[14] of the EQ-5D was investigated by testing 30 *a priori* hypotheses (8 at individual attribute level and 22 at overall level) based on the literature[15,16] or clinical experience. We dichotomised subjects into subgroups with better or worse health status using self-reported health status, median SF-8 item scores or sociodemographic or clinical variables (Table 1). Given the small number of subjects reporting severe limitations for EQ-5D items, we collapsed EQ-5D responses into 2 levels – with and without problems.

Hypotheses Concerning Levels within Particular Attributes

We hypothesised that subjects would be more likely to report problems as follows: for EQ-5D mobility if they were older (known-groups approach[14]) or obese[17] or had lower PF scores (convergent validity[14]); for EQ-5D self-care and usual activities if they had lower RP scores; for EQ-5D anxiety/depression if they were female[18] or had lower MH scores; and for EQ-5D pain if they were obese.[17]

Hypotheses Concerning Overall Scores

We hypothesised that subjects would have lower overall EQ-5D utility and EQ-VAS scores if they were older, female, had fewer years of education, were unmarried,[15] obese,[17] suffered from chronic medical conditions or reported worse global health, lower SF-8 PF, RP, MH or FFM scores.

Hypothesised trends were tested using Mann-Whitney (continuous variables) and Fisher's exact (categorical variables) tests. Correlations between EQ-5D utility and EQ-VAS scores were investigated using Spearman's rank correlation. Missing data were handled by listwise deletion. Data were analysed with STATA.[19]

Results

Cross-cultural Adaptation and Cognitive Debriefing

In cognitive debriefing (n = 10 per language), subjects generally did not have concerns with the phrasing of Singapore Malay and Tamil EQ-5D versions. However, Malay subjects expressed a preference to revise the phrase used for depression to one that was culturally more appropriate (i.e., generalised sadness). Indian subjects also expressed a preference to revise the phrase used for questionnaire to one that was less technical (i.e., survey form). Their suggestions were supported by the interviewers and endorsed by the EuroQoL group. Although 4 Indian subjects did not follow the EQ-VAS instructions to link the box representing their state of health to the VAS but marked directly on the VAS instead, no revision to the instructions was made because marking on the VAS directly was considered by the EuroQoL group to be acceptable and appropriate (personal communication – EQ Executive Office).

Cross-sectional Validation Study

Complete data were obtained from 94 Malay and 78 Indian patients who presented at a primary care facility in

Table 1. Subjects' Characteristics and EQ-5D and SF-8 Scores

	Questionnaire language*	
	Malay (n = 94)	**Tamil (n = 78)**
Female — n (%)	56 (60)	50 (64)
Median age in years (IQR)	54.0 (43.0, 69.0)	51.0 (41.0, 65.0)
Median education in years (IQR)	6.0 (3.0, 8.5)	6.0 (2.3, 10.0)
Married — n (%)	66 (70)	56 (72)
Obese† — n (%)	76 (81)	66 (85)
Median family functioning measure scores (IQR)	54.2 (50.0, 75.0)	75.0 (50.0, 85.4)
Global health‡ — n (%)		
Good (4-6 points)	74 (79)	44 (56)
Poor (1-3 points)	20 (21)	34 (44)
Chronic medical conditions§ — n (%)		
No	29 (31)	29 (37)
Yes	65 (69)	49 (63)
Reported problems for EQ-5D items‖ — n (%)		
Mobility	17 (18)	32 (41)
Self-care	3 (3.2)	3 (4)
Usual activities	15 (16)	18 (23)
Pain	59 (63)	53 (68)
Anxiety/depression	33 (35)	36 (46)
Reported problems for selected SF-8 Attributes‖ — n (%)		
Physical functioning	48 (51)	52 (67)
Role-limitations	30 (32)	46 (59)
Mental health	45 (48)	50 (64)
EQ-5D utility scores		
Median (IQR)	0.796 (0.725, 1)	0.727 (0.689, 0.821)
Mean (SD)	0.784 (0.202)	0.732 (0.207)
EQ-VAS scores		
Median (IQR)	70.0 (60.0, 80.0)	70.0 (60.0, 80.0)
Mean (SD)	71.6 (11.96)	67.4 (13.58)
Most common medical conditions‖ — n (%)		
Hypertension	34 (41)	16 (24)
Hyperlipidaemia	27 (33)	25 (38)
Diabetes	23 (28)	22 (33)
Upper respiratory tract infection	16 (19)	7 (11)
Osteoarthritis	6 (7)	5 (8)

IQR: interquartile range; SD: standard deviation

* Malay questionnaires were administered to 97 patients, of whom 1 declined to provide sociodemographic or clinical information, and 2 had missing EQ-5D (n = 1) or EQ-VAS (n = 1) scores. Tamil questionnaires were administered to 89 patients, of whom 2 declined to provide sociodemographic or clinical information, and 9 had missing EQ-5D (n = 8) or EQ-VAS (n = 1) scores.

† Obese: Body Mass Index (BMI) ≥23.0 kg/m², revised definition for Asians (Choo V. WHO reassesses appropriate BMI for Asian populations. Lancet. 2002;360:235.)

‡ Global health rated on a 6-point Likert scale (1 – very poor; 6 – excellent).

§ Physician-reported using standardised form.

‖ Figures should be read as row percentages.

Singapore in April 2005, the sociodemographic characteristics of whom are summarised in Table 1. Both Malay and Indian patients reported most problems with pain and least problems with self-care items of the EQ-5D. As expected in a primary care setting, these problems were mild, with median EQ-5D scores for both groups being 0.796 and 0.727, respectively. Spearman's rank correlation coefficient for Malay EQ-5D/VAS was 0.41 ($P = 0.001$), while that for Tamil EQ-5D/VAS was 0.31 ($P < 0.001$).

Table 2. Construct Validity of the Singapore Malay and Tamil EQ-5D at the Attribute Level

Respondent characteristics	**EQ-5D mobility item**			
	Malay		**Tamil**	
	No problem (n = 77)	With problems (n = 16)	No problem (n = 46)	With problems (n = 32)
Median (IQR) age	54.0 (42.0, 67.0)	56.0 (49.0, 80.0)	42.0 (32.0, 56.0)	63.0 (53.0, 70.0)***
Obese†‡ — n (%)	62 (81)	14 (88)	39 (87)	27 (90)
Median (IQR) SF-8 physical functioning scores	54.1 (40.1, 54.1)	48.3 (40.1, 51.2)*	51.2 (46.3, 54.1)	40.1 (30.3, 48.3)***
	EQ-5D self-care item			
	Malay		**Tamil**	
	No problem (n = 91)	With problems (n = 3)	No problem (n = 75)	With problems (n = 3)
Median (IQR) SF-8 role-physical scores‡	54.0 (46.9, 54.0)	38.7 (28.3, 38.7)**	46.9 (38.7, 54.0)	28.3 (28.3, 46.9)*
	EQ-5D usual activities item			
	Malay		**Tamil**	
	No problem (n = 79)	With problems (n = 15)	No problem (n = 60)	With problems (n = 18)
Median (IQR) SF-8 role-physical scores	54.0 (46.9, 54.0)	46.9 (38.7, 54.0)**	46.9 (38.7, 54.0)	38.7 (36.1, 54.0)*
	EQ-5D anxiety/depression item			
	Malay		**Tamil**	
	No problem (n = 61)	With problems (n = 33)	No problem (n = 42)	With problems (n = 36)
Female – n (%)	35 (57)	21 (64)	25 (60)	25 (69)
Median (IQR) SF-8 mental health scores	56.8 (49.6, 56.8)	49.6 (41.5, 56.8)***	56.8 (49.6, 56.8)	41.5 (41.5, 49.6)***
	EQ-5D pain item			
	Malay		**Tamil**	
	No problem (n = 35)	With problems (n = 58)	No problem (n = 23)	With problems (n = 52)
Obese†‡ — n (%)	27 (77)	49 (84)	20 (87)	46 (88)

† Obese subjects were defined as body mass index ≥23.0 kg/m^2, based on the revised definition for Asians. (Choo V. WHO reassesses appropriate body-mass index for Asian populations. Lancet 2002;360:235).

‡ Fisher's exact test

*P <0.05, **P <0.01, ***P <0.001, unmarked P ≥0.05; Median scores varied for each language group.

1. *Testing of hypotheses concerning levels within particular attributes (Table 2)*: In the Malay EQ-5D, all 8 *a priori* hypotheses were fulfilled, with 4 reaching statistical significance. Similarly, in the Tamil EQ-5D, all 8 *a priori* hypotheses were fulfilled, with 5 reaching statistical significance.
2. *Testing of hypotheses concerning overall scores (Table 3, unsupported hypotheses indicated by shaded boxes)*: In the Malay EQ-5D/EQ-VAS, all 11 *a priori* hypotheses related to the EQ-5D utility scores were fulfilled, with 5 reaching statistical significance. All 11 *a priori* hypotheses related to the EQ-VAS scores were also fulfilled, with 4 reaching statistical significance.

In the Tamil EQ-5D/EQ-VAS, all 11 *a priori* hypotheses related to the EQ-5D utility scores were fulfilled, with 6 reaching statistical significance. Nine of 11 *a priori* hypotheses related to the EQ-VAS scores were fulfilled, with 6 reaching statistical significance.

Table 3. Construct Validity of the Singapore Malay and Tamil EQ-5D and EQ-VAS at the Overall Scale Level

	EQ-5D utility				EQ-VAS			
	Malay		Tamil		Malay		Tamil	
Variable	**n**	**Mean (SD) scores**	**n**	**Mean (SD) scores**	**n**	**Mean (SD) scores**	**n**	**Mean (SD) Scores**
Age (y)								
21 to median	47	0.839 (0.155)**	39	0.782 (0.190)*	47	74.8 (13.3)**	39	71.0 (13.1)*
≥Median	47	0.728 (0.228)	39	0.682 (0.215)	47	68.4 (9.56)	39	63.8 (13.1)
Gender								
Male	38	0.789 (0.203)	28	0.744 (0.186)	38	73.4 (13.2)	28	64.6 (13.3)
Female	56	0.780 (0.203)	50	0.725 (0.220)	56	70.4 (11.0)	50	69.0 (13.5)
Education (y)								
≥Median	52	0.823 (0.166)*	44	0.776 (0.174)*	52	73.4 (12.6)	44	69.6 (14.4)
<Median	42	0.735 (0.232)	34	0.674 (0.235)	42	69.4 (10.9)	34	64.6 (11.9)
Marital status								
Married	66	0.817 (0.170)	56	0.736 (0.203)	66	72.3 (11.2)	56	69.6 (13.0)*
Unmarried	28	0.706 (0.249)	22	0.720 (0.222)	28	70.0 (13.7)	22	61.8 (13.4)
Obese†								
No	17	0.833 (0.108)	9	0.776 (0.109)	17	74.1 (13.3)	9	61.1 (19.0)
Yes	76	0.779 (0.209)	66	0.733 (0.213)	76	71.2 (11.7)	66	68.3 (12.6)
Chronic medical conditions								
No	29	0.855 (0.106)*	29	0.745 (0.230)	29	72.8 (11.8)	29	68.3 (13.5)
Yes	65	0.752 (0.226)	49	0.724 (0.195)	65	71.1 (12.1)	49	66.9 (13.6)
Global health‡								
Good (4-6 points)	74	0.815 (0.168)**	44	0.801 (0.168)***	74	72.9 (12.1)*	44	74.1 (9.66)***
Poor (1-3 points)	20	0.666 (0.269)	34	0.642 (0.222)	20	66.8 (10.3)	34	58.8 (13.0)
Family functioning measure§								
≥Median	47	0.791 (0.205)	45	0.758 (0.198)	47	72.0 (12.4)	45	70.4 (12.8)
<Median	47	0.776 (0.201)	33	0.696 (0.218)	47	71.2 (11.7)	33	63.3 (13.5)
SF8 physical functioning scores								
≥Median	66	0.803 (0.187)	45	0.819 (0.141)***	66	73.6 (11.9)**	45	71.1 (13.0)**
<Median	28	0.738 (0.231)	33	0.613 (0.226)	28	67.0 (10.9)	33	62.4 (12.6)
SF8 role-physical scores								
≥Median	64	0.817 (0.153)	49	0.793 (0.159)***	64	73.7 (11.7)**	49	70.9 (12.9)**
<Median	30	0.712 (0.268)	29	0.628 (0.239)	30	67.2 (11.4)	29	61.6 (12.7)
SF8 mental health scores								
≥Median	49	0.844 (0.143)**	51	0.781 (0.171)**	49	73.4 (11.9)	51	70.6 (13.5)**
<Median	45	0.718 (0.236)	27	0.640 (0.241)	45	69.7 (11.8)	27	61.5 (11.6)

Median scores varied for each ethnic group.

† Body mass index categories based on revised definitions for Asians. (Choo V. WHO reassesses appropriate body-mass index for Asian populations. Lancet 2002;360:235)

‡ Global health rated on a 6-point Likert scale (1 – very poor; 6 – excellent).

§ The family functioning measure (FFM), previously validated in Singapore, is a 3-item Likert scale assessing the quality of interactions among family members, with higher scores (range, 0 to 100) reflecting better family functioning. (Thumboo J, Fong KY, Chan SP, Leong KH, Feng PH, Thio ST, et al. Validation of the medical outcomes study family and marital functioning measures in SLE patients in Singapore. Lupus 1999;8:514-20)

* P <0.05, **P <0.01, ***P <0.001, unmarked P ≥0.05

Shaded cells show unsupported hypotheses (i.e., trends were not in the hypothesised direction).

Discussion

In this paper, we cross-culturally adapted and assessed the construct validity of the Singapore Malay and Tamil versions of the EQ-5D. Construct validity of these versions was supported as the majority of *a priori* hypotheses at attribute and overall scale levels were fulfilled for both language versions, often reaching statistical significance. These results are supportive of the clinical application of these EQ-5D versions in Singapore. They are also encouraging in suggesting that these EQ-5D versions may be useful for other regions in Asia sharing these same language(s) (an estimated 17 million Malay and 66 million Tamil users[20]), thus supporting the need for further validation studies in these varied socio-cultural contexts.

That all 19 hypotheses (attribute level: 8; overall level: 11) related to the Malay EQ-5D and 17 of 19 hypotheses (attribute level: 8; overall level: 11) related to the Tamil EQ-5D were fulfilled was encouraging. However, the weaker correlation between Tamil EQ-5D and Tamil EQ-VAS versus Malay EQ-5D and Malay EQ-VAS requires further investigation as this could potentially affect the equivalence of Malay and Tamil questionnaires.

We recognise several limitations in this study. First, our subjects generally reported good health status, such that the number of subjects in some subcategories defined by health status and sociodemographic characteristics was small. For example, only 3 subjects reported any problems on the self-care dimension in both the Malay and Tamil EQ-5D. This could reduce our ability to detect a true difference, in the instances where hypotheses were not supported. Second, we used the UK utility function (representing health preferences of the UK general population)[9] to compute EQ-5D utility scores in this study as a Singapore utility function was not yet available.

In conclusion, the Singapore Malay and Tamil EQ-5D demonstrated satisfactory known-groups and convergent validity in this primary care population. Further studies of the Malay and Tamil EQ-5D in other clinical populations would further generate evidence supporting the use of these language versions in Singapore.

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