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## PATIENT-REPORTED OUTCOMES

# Are English and Chinese Versions of the Audit of Diabetes-Dependent Quality of Life Equivalent? An Exploratory Study Based on the Universalist Approach

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## A B S T R A C T

**Objective:** To translate and culturally adapt the UK English Audit of Diabetes-Dependent Quality of Life (ADDQOL) into Chinese for Singapore. **Methods:** Translation was integrated into investigation of conceptual, item, semantic, and operation equivalence. Conceptual equivalence, item equivalence, and operation equivalence were assessed by literature review, expert judgment, and cognitive debriefing. Semantic equivalence was studied by using an optimized procedure including forward and backward translation, clinician review, and cognitive debriefings. Cognitive debriefings were done with five Chinese-speaking diabetic patients at polyclinics. Reliability, responsiveness, and construct validity tests were used to evaluate measurement equivalence. English- and Chinese-speaking diabetic patients by convenient sampling at a Diabetes Society of Singapore's public event were recruited for the measurement equivalence study. Mann-Whitney *U* tests, chi-square tests, and descriptive analyses were used for group comparisons and Spearman's correlation coefficients for construct validity tests. **Results:** Forty-two English-speaking and 26 Chinese-speaking diabetic patients (45.5% females) with a mean age of 54.2 ± 10.07 years were recruited. Chinese-speaking respondents were more likely than the English-speaking group to be unemployed, less educated, and with poorer family functioning ( $P < 0.05$ ). Conceptual equivalence, item equivalence, operation equivalence, and semantic equivalence

were all demonstrated. Cronbach's alpha for internal consistency and intraclass correlation coefficient for test-retest reliability were 0.94 and 0.65, respectively. Distributions of responses were found to be similar except for some difference that can be justified by different demographic background. Convergent validity was suggested by weak to moderate correlations between "Present QOL" on the ADDQOL and EuroQol five-dimensional questionnaire ( $r = 0.268$ ;  $P = 0.185$ ) and six-dimensional health state short form (derived from short form 36 health survey) scores ( $r = 0.351$ ;  $P = 0.078$ ); divergent validity was shown by a weak correlation between ADDQOL average weighted impact (AWI) and ADDQOL "Present QOL" scores ( $r = 0.027$ ,  $P = 0.896$ ), a moderate correlation between ADDQOL AWI and six-dimensional health state short form (derived from short form 36 health survey) mental scores ( $r = 0.247$ ;  $P = 0.224$ ), and a positive correlation between ADDQOL AWI and family functioning scores ( $r = 0.288$ ;  $P = 0.182$ ). **Conclusions:** The ADDQOL has been translated and culturally adapted successfully into a Chinese version for Singapore. Our study provides justification for further research with large sample sizes among the Chinese-speaking population in Singapore.

**Keywords:** diabetes, equivalence, quality of life, translation.

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## Introduction

The Audit of Diabetes-Dependent Quality of Life (ADDQOL) is a valid and reliable diabetes-specific quality of life (QOL) measure originally developed in the United Kingdom. It has two distinguishing features: one is to allow patients to indicate which aspects of life do not apply to them by using the "not applicable" (N/A) options; the other is the application of importance ratings of each domain so as to give a weighted score in the end [1]. The English version of the ADDQOL was culturally well adapted for use

in Singapore without any modification, and the equivalence between the adapted and the original version was also demonstrated [2]. To date, however, a Chinese version of ADDQOL was not available. In Singapore itself, about 32% of the local ethnic Chinese are monolingual in Chinese [3]. Given the large number of monolingual Chinese-speaking diabetes patients in Singapore and the importance of cross-cultural data pooling and comparisons in health-related quality-of-life (HRQOL) studies, it is very important to have a well-adapted and validated Chinese version of ADDQOL for Singapore [4].

Conflicts of interest: The authors have indicated that they have no conflicts of interest with regard to the content of this article.

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A universalist approach to the cross-cultural adaptation of HRQOL instruments proposed by Herdman et al. [5] suggests that a questionnaire is not suitable for translation into the target language before conceptual equivalence and item equivalence are demonstrated. The universalist model of cross-cultural adaptation criticized a commonly used approach, where translation is completed first and then post hoc analysis is performed to demonstrate equivalence, especially the measurement equivalence. According to the universalist approach, six types of equivalence should be investigated in sequence as follows: 1) conceptual equivalence to investigate which domains are important to the concept in the target culture and the relationships between them, which can be achieved by reviewing local literature, consulting experts in the target culture, and discussing with target group; 2) item equivalence to critically examine the items used to tap those domains as the relevance of items may vary across cultures, which can also be achieved by literature review, expert judgment, and assessment by target population; 3) semantic equivalence to ensure that any translation that takes place leads to semantically equivalent items with the recommended translation process, which is to be done according to the following steps: initial discussion with the developer about the underlying concept (this step should be completed in the phase of “conceptual equivalence”), forward translation, backward translation, cognitive debriefing (CD), harmonization review, feedback by developer, revision, and proofreading and approval of final version by the developer [6]; 4) operational equivalence to ensure that the measurement methods used are appropriate to the culture in question, which can be investigated by using similar methods as mentioned in “item equivalence”; 5) measurement equivalence to examine the outcome of the process in terms of instrument behavior; reliability, responsiveness, construct validity (convergent and divergent validity, known-group validity) [3] tests are often used; and 6) functional equivalence to summarize the above-mentioned types of equivalence [5,6].

The purpose of this study was to translate and culturally adapt the English ADDQOL into Chinese for use in Singapore with the universalist approach. Because the English ADDQOL was previously adapted in Singapore without any modification, the one used for adaptation in our study was actually the same as the original UK version.

As for the tests of construct validity, the following four a priori hypotheses were generated on the basis of literature review:

- I. Convergent and divergent validity
  1. An assumption that the “Present HRQOL” score will correlate moderately with the EuroQol five-dimensional questionnaire (EQ-5D) utility, six-dimensional health state short form (derived from short form 36 health survey) (SF-6D), and visual analogue scale scores [7,8].
  2. The ADDQOL mean weighted score will correlate moderately with “HRQOL without diabetes mellitus” and correlate weakly with the “Present HRQOL” score [9].
- II. Known-group validity
  1. Participants who are more depressed (the score in the mental health in SF-6D) will have poorer ADDQOL scores [10].
  2. Participants who have better family functioning (higher score in family function measure [FFM]) will have better ADDQOL mean weighted scores [11].

## Methods

### Study design and participants

The first part of the study was to use the universalist approach in translating and culturally adapting the English ADDQOL into a Chinese version. The second part of the study involved pilot test-

**Table 1 – Characteristics of participants completing the English or Chinese ADDQOL.**

	n (%) unless stated		P
	English (n = 42)	Chinese (n = 26)	
Age (y)			0.479
Mean ± SD	53.5 ± 9.64	55.8 ± 11.09	
Range	33–71	33–72	
Female	18 (45.0)	12 (46.2)	0.068
Chinese ethnicity	36 (85.7)	26 (100)	
Years of education			<0.05
≤6	4 (10)	22 (84.6)	
7–10	18 (45)	2 (7.7)	
≥11	18 (45)	2 (7.7)	
Employed	23 (54.8)	4 (15.4)	<0.01
Smoking	3 (7.1)	3 (11.5)	0.535
Presence of acute medical conditions*	23 (54.8)	15 (57.7)	0.813
Presence of chronic medical conditions other than DM†	27 (64.3)	14 (53.8)	0.393
Presence of DM complications‡	17 (40.5)	13 (50.0)	0.442
Housing type			<0.01
Public			
Lower cost	1 (2.4)	16 (61.5)	
Regular	32 (76.2)	6 (23.1)	
Private	9 (21.4)	4 (15.4)	
Type of diabetes			0.287
Type I	13 (31.0)	5 (19.2)	
Type II	29 (69.0)	21 (80.8)	
Mean family function score	63.5 ± 16.21	47.0 ± 17.46	<0.01
Mean EQ-5D utility	0.91 ± 0.15	0.85 ± 0.25	0.335
Mean SF-6D	0.82 ± 0.14	0.78 ± 0.16	0.306
Mean weighted ADDQOL	−3.38 ± 2.23	−3.97 ± 2.18	0.238
Mean converted ADDQOL	46.9 ± 18.56	42.0 ± 18.19	0.244

ADDQOL, Audit of Diabetes-Dependent Quality of Life; DM, diabetes mellitus; EQ-5D questionnaire, EuroQol five-dimensional questionnaire; SF-6D, six-dimensional health state short form (derived from short form 36 health survey).

\* Acute medical conditions included running a nose, sore throat or cough, vomiting or diarrhea, headache lasting more than 1 day, sleeping problems, and body injuries.

† Chronic medical conditions other than DM included hypertension, heart disease, stroke, asthma or other lung disease, cancer, rheumatism, back pain or other bone or muscle illness, mental illness, and other illness such as kidney problems on dialysis.

‡ DM complications included eye disease, foot problems, kidney disease, heart disease, stroke, erectile dysfunction, and neuropathy.

ing the adapted Chinese version and evaluation of its equivalence with the English version.

Conceptual, item, and operational equivalence was assessed in the first part by local literature review, expert judgment, and CD among target subjects. Semantic equivalence was studied according to the recommended translation procedure, which will be described in the translation part of the methodology. Two local bilingual (Chinese and English) clinical experts in diabetes were involved in the judgment. Five native consented Chinese-speaking diabetic patients were recruited for the CD during the whole process of the first part.

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