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Psychometric properties of the World Health Organization WHOQOL-BREF Quality of Life assessment in Singapore

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Abstract

Purpose

This study validated the World Health Organization Quality of Life (WHOQOL-BREF) questionnaire with 3400 respondents living in Singapore.

Methods

The ethnic composition was 76.1% Chinese, 12.3% Malay, 9.6% Indian, and 2% Others. The sample included adults with disabilities (28.9%), adults recovering from mental health issues (14%), and adults from the general population (57.1%). Questionnaires about health-related conditions, the effects of disability on everyday functioning (WHODAS 2.0), the WHOQOL-BREF, and add-on modules of QOL of people with disabilities (WHOQOL-DIS) and QOL of elders (WHOQOL-OLD) were administrated.

Results

Confirmatory factor analysis supported a construct of QOL made of four domains, revealing good construct validity. The four domains predicted overall QOL and health satisfaction. Good internal consistency was evidenced by high alpha coefficients for the physical (.79), psychological (.82), social relationships (.81), and environment (.83) domains. Convergent validity was shown by moderate correlations between the different questionnaires measuring QOL (WHOQOL-BREF, WHOQOL-DIS, and WHOQOL-OLD), and discriminant validity by a lower correlation between the WHOQOL-BREF and disability. Convergent and divergent validity were also indicated by higher correlations between similar constructs across the different measures, and lower correlations between dissimilar constructs across measures, respectively. Concurrent validity was supported by showing that individuals with chronic medical conditions had lower QOL than individuals without chronic medical conditions.

Conclusions

The results showed that the WHOQOL-BREF has sound psychometric properties and can be used to measure QOL in Singapore.

Quality of life (QOL) is an important holistic outcome of social service provision [1] and rehabilitation [2, 3]. Therefore, to gauge the effectiveness of an intervention in improving a person's QOL it is important to utilize a validated tool that will comprehensively measure the various aspects of life. While most measures of QOL consider how physical and mental health problems affect everyday life [4, 5], the World Health Organization's Quality of Life Instrument-abbreviated version (WHOQOL-BREF) goes beyond measuring medical outcomes and includes social and environmental aspects [6]. The WHOQOL-BREF has been used in Singapore to predict adherence to treatment, and to measure the impact of pathologies on QOL and intervention outcomes [7–11]. However, its psychometric properties have not been clearly established in Singapore yet, and although the WHOQOL-BREF has been established to have cross-culturally validity [12, 13], not all studies have successfully

validated the tool [14, 15]. It is critical to validate the tool in Singapore, as the employment of valid measures is necessary to attain valid research conclusions that will inform social service and rehabilitation programs. Thus, the current study evaluated the internal consistency and validity of the WHOQOL-BREF in Singapore. It examined what QOL means, its dimensions, and factors that affect it. A sample of 3400 adults with a wide range of age and health conditions were recruited. It was predicted that the WHOQOL-BREF would show good internal consistency and validity.

Method

Design and participants

The study adopted a stratified random sampling design according to geographical area, dwelling type, age, gender, and ethnicity that is representative of the Singapore population. The characteristics of participants are shown in Table 1.

Table 1 Characteristics of the participants

Characteristics	Total sample ($N = 3400$)
Age	
Mean (*SD*)	45.53 (16.23)
Range	18–95
Gender, *n* (%)	
Male	1833 (53.9)
Female	1567 (46.1)
Ethnicity, *n* (%)	
Chinese	2589 (76.1)
Malay	418 (12.3)
Indian	324 (9.6)
Others	69 (2.0)
Citizenship, *n* (%)	
Singapore citizens	3169 (93.2)
Permanent residents	231 (6.8)
Marital status, *n* (%)	
Single (never married)	1564 (46.0)
Married	1504 (44.2)
Partnered	5 (0.1)
Separated/divorced	180 (5.3)
Widowed	147 (4.3)
Education, *n* (%)	
Primary or less	669 (19.7)
Special education	420 (12.4)
Secondary	961 (28.3)
Pre-University or vocational	713 (21.0)
University or above	637 (18.8)
Population groups, *n* (%)	
Adults with no disabilities or mental health issues	1942 (57.1)
Adults with disabilities[a]	981 (28.9)
Adults recovering from mental health issues[b]	477 (14.0)

[a]51% of responses by proxy. [b]2% responses by proxy. Responses by proxy were provided by one parent (67.6%), a sibling (19.6%), a son or daughter (5.2%), spouse (3.4%), other relative (3.8%), or friend (0.4%)

Measures

Four instruments were used for this study.

<p align="center">***WHOQOL-BREF [6]***</p>

It comprises ~~of~~ two general items on the individual's overall QOL and health satisfaction. The other 24 items are used to compute the following domains: physical health, psychological health, social relationships, and environment.

<p align="center">***World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) [16]***</p>

This questionnaire employs 36 items to measure the effects of disability in everyday functioning on different domains (Table **2**).

Table 2 Descriptives, internal consistency, and Pearson's correlations between the WHOQOL-BREF, WHODAS 2.0, WHOQOL-DIS, and WHOQOL-OLD domains and total scores

Domains/facets	Descriptives		Internal consistency		Correlations with QOL[4]				
	M	*SD*	Cronbach's α[3]	Item-domain correlation range	Physical	Psychological	Social relationships	Environment	Overall QOL (item 1)
WHOQOL-BREF (*N* = 3400)									
Physical	65.554	17.082	.788	.371 − .696	–	–	–	–	–
Psychological	61.641	17.255	.823	.328 − .718	–	–	–	–	–
Social Relationships	61.298	21.096	.810	.620 − .724	–	–	–	–	–
Environment	63.153	15.709	.825	.534 − .574	–	–	–	–	–
WHODAS 2.0 (*n* = 1458)									
Cognition	35.894	27.163	.901	.664 − .774	− 0.323	− **0.476**	− 0.427	− 0.327	–
Mobility	29.818	30.036	.891	.638 − .794	− **0.440**	− 0.414	− 0.363	− 0.308	–
Self-care	24.340	28.289	.835	.465 − .818	− 0.323	− 0.420	− 0.463	− 0.313	–
Getting Along	34.336	26.915	.767	.453 − .783	− 0.545	− 0.366	− 0.317	− 0.348	–
Life activities: household[1]	43.694	35.121	.962	.870 − .935	− 0.421	− 0.405	− 0.356	− 0.259	
Life activities: work/school[2]	22.668	23.721	.911	.708 − .889	− 0.283	− 0.320	− 0.325	− 0.268	–
Social participation	38.467	23.961	.882	.570 − .705	− 0.590	− 0.525	− **0.460**	− 0.462	–
Total WHODAS 2.0	–	–	–	–	–	–	–	–	− .306
Total WHODAS 2.0 (without life activities: work/school)	–	–	–	–	–	–	–	–	− .304
WHOQOL-DIS (*n* = 1458)									
Discrimination	58.539	24.214	.540	.327 − .379	*.310*	*.266*	*.195*	*.257*	–
Autonomy	44.153	29.313	.825	.630 − .709	.291	.466	.446	.358	–
Inclusion	44.387	23.067	.854	.602 − .682	.448	.626	**.591**	.542	–
Total score WHOQOL-DIS	–	–	–	–	–	–	–	–	.405

WHOQOL-OLD (n = 1000)									
Sensory abilities	75.544	19.716	.823	.444 − .768	**.438**	.299	.258	.306	–
Autonomy	65.263	15.047	.699	.419 − .534	.460	.532	.422	.541	–
Past, present, and future activities	63.758	14.377	.764	.541 − .591	.517	**.667**	.541	.647	–
Social participation	63.594	13.456	.699	.375 − .631	.527	.590	**.508**	.607	–
Death and dying	72.500	23.100	.836	.566 − .766	*.138*	*.142*	*.145*	*.113*	–
Intimacy	63.469	20.427	.904	.721 − .792	.275	.433	.352	.399	–
Total Score WHOQOL-OLD	–	–	–	–	–	–	–	–	.453

[1] *Life activities: household* and *life activities: work/school* are both one domain, but they were separated because the *household* domain had no missing values and the *work/school* domain had 788 missing values

[2] Based on participants who were working (n = 670)

[3] Cronbach's alpha values ≥ .70 are considered adequate

[4] Absolute correlation coefficients equal or above .40 show good convergent validity, and lower values indicate discriminant validity. Correlation coefficients in bold indicate levels of association between similar constructs across different measures. Correlation coefficients in italics indicate levels of association between dissimilar constructs across different measures. All correlations $p < .01$

The World Health Organization's measure of the quality of life of people with disabilities (WHOQOL-DIS) [17]

This QOL module is specific to individuals with mental or physical disabilities. It contains one item asking about the impact of disability and 12 items that can be grouped into three domains (Table **2**).

The World Health Organization's measure of the quality of life for use with older adults (WHOQOL-OLD) [18]

This QOL module is specific to older adults. It consists of 24 items grouped into six facets (Table **2**).

Items of these measures were rated on 5-point Likert-scales, and scores were converted into scales ranging from 0 to 100 as indicated in their respective manuals, with higher numbers indicating better QOL (WHOQOL-BREF, WHOQOL-DIS, WHOQOL-OLD) and more disability (WHODAS 2.0). The measures above had been conceptualized and validated cross-culturally. The internal consistency of these measures was acceptable (Table **2**).

In addition to the QOL instruments, respondents were required to complete sections pertaining to demographic questions, health condition, and access and satisfaction of social service programs.

Procedure

The Singapore Department of Statistics provided to the National Council of Social Service (NCSS) de-identified addresses to contact potential participants from the general population. As there were no databases for persons with disabilities and mental health, NCSS worked with SG Enable, a dedicated referral, information, and grant administrator for persons with disabilities, and social service organizations providing services for persons with mental health issues. Permission was sought from their clients to participate in the study.

Questionnaires were delivered personally to those who expressed interest in the study. Participants read the information sheet and signed a consent form. Thereafter, participants completed the WHOQOL-BREF and the demographics questionnaire. Additionally, adults with disabilities and adults recovering from mental health issues completed the WHOQOL-DIS and WHODAS 2.0. Participants above 50 years of age from the general population completed the WHOQOL-OLD. The questionnaires were collected on the same day.

All the participants were provided with validated questionnaires in the language they preferred. Specifically, 2525 participants completed all the questionnaires in English, 734 in Chinese, and 19 in Malay. One hundred

and twenty-two people chose to respond to some questionnaires in one language and others in another language. Participants were offered S$20 vouchers as a token of appreciation.

Statistical analysis

Construct validity tested the fit of the WHOQOL-BREF four-domain model and was assessed using confirmatory factor analysis (CFA), and multiple regressions between the four domains and overall QOL (item 1), and health satisfaction (item 2). Internal consistency was assessed using Cronbach's alpha values. Convergent validity was tested with Pearson's correlations between the WHOQOL-BREF and other measures of QOL (WHOQOL-DIS, WHOQOL-OLD). Discriminant validity was assessed using a Pearson's correlation between the WHOQOL-BREF and a measure of disability (WHODAS 2.0). Convergent and discriminant validity were also measured by comparing correlation coefficients between similar and dissimilar ~~construct~~ constructs across the different measures. Concurrent validity was assessed using a Student's *t* test that compared the average of the WHOQOL-BREF scores between people with and without medical diseases.

Results

Construct validity

The items' distributions of scores were normally distributed (skewness values ranged between 1.035 and − 0.242; kurtosis values ranged between − 0.765 and 1.767; and the scores ranged between 1 and 5). AMOS version 21 was used to conduct CFA using maximum likelihood estimation. Cut-off values such as SRMR ≤ .08, RMSEA ≤ .08, CFI ≥ .90, and standardized loading estimates ≥ .50 were considered adequate. The data fit the hypothesized four-domain model after four error covariances were added to the model, $\chi^2(244)$ = 3962.404, $p < .001$, SRMR = .044, RMSEA = .067, CFI = .902. These error covariances had been identified in previous research [12, 13, 19–23]. Standardized regression coefficients were significant, $p < .001$, (Fig. 1).

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Fig. 1 Four-domain model and standardized regression coefficients

Multigroup invariance was asserted by dividing the sample between those who filled up all the questionnaires in English exclusively (n = 2525) and those who did not use English exclusively (n = 875). Multigroup invariance was tested using a cut-off ΔCFI criterion of ≤ .01 [24]. Invariance was found when first- and second-order loadings were constrained equal, $\chi^2(512)$ = 4466.802, $p < .001$, $\Delta\chi^2$ = 126.855, Δdf = 24, $p < .001$, CFI = .893, ΔCFI = .003. The results indicated that participants interpreted the items of the WHOQOL-BREF similarly regardless of the language used.

Good construct validity was also expected if the four domains could significantly predict overall QOL (item 1) and health satisfaction (item 2). The results showed that the four predictors explained 42% of the variance of overall QOL, R^2 = .419, $F(4, 3395)$ = 612.486, $p < .001$, and explained 40% of the variance of health satisfaction, R^2 = .395, $F(4, 3395)$ = 555.274, $p < .001$ (Table 3).

Table 3 Multiple regressions of the four‑domains of QOL on overall QOL and health satisfaction

Domains	*B* (slope)	SE	*β*	Partial correlation
Overall QOL				
(Constant)	9.319**	1.208	–	–
Physical	0.112**	0.024	.091	.078
Psychological	0.385**	0.028	.318	.233
Social Relationships	0.053*	0.019	.054	.047
Environment	0.341**	0.028	.257	.205
Health Satisfaction				
(Constant)	4.741**	1.333	–	–
Physical	0.454**	0.027	.343	.277
Psychological	0.276**	0.031	.210	.153

| Social Relationships | 0.068* | 0.021 | .063 | .054 |
| Environment | 0.124** | 0.031 | .086 | .069 |

*$p < .01$; **$p < .001$

Internal consistency

Cronbach's a values and item-domain correlations showed that all the measures' domains were consistent, except *discrimination* in the WHOQOL-DIS (Table **2**).

Convergent and discriminant validity

Positive and medium-~~size~~ sized correlations supported convergent validity between the three questionnaires of QOL (Table **2**). A lower (and negative) correlation between the WHOQOL-BREF and WHODAS 2.0, which assesses disability rather than QOL, indicated discriminant validity (Table **2**). Moreover, domains in the different measures that were conceptually related showed higher correlations than domains measuring different constructs, supporting convergent and discriminant validity, respectively. For example, the physical domain of the WHOQOL-BREF correlated moderately with mobility (WHODAS 2.0) and sensory abilities (WHOQOL-OLD); the psychological domain of the WHOQOL-BREF correlated moderately with cognition (WHODAS 2.0) and past, present, and future activities (WHOQOL-OLD); the social relationships domain of the WHOQOL-BREF correlated moderately with social participation (WHODAS 2.0), inclusion (WHOQOL-DIS), and social participation (WHOQOL-OLD). In contrast, no domain in the WHOQOL-BREF correlated with dissimilar constructs such as discrimination (WHOQOL-DIS), or death and dying (WHOQOL-OLD) (Table **2**).

Concurrent validity

Independent t tests confirmed that individuals without chronic diseases ($n = 2475$) had higher QOL than those with chronic medical diseases ($n = 925$), $p < .001$, Cohen's $d \geq .117$. The largest effect size was for the physical domain (Cohen's $d = .676$) (Fig. **2**).

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Fig. 2 Average QOL score (+ SE in error bars) for participants without and with chronic diseases. Persons with chronic medical diseases reported had been diagnosed with or received treatment for at least one of the following: diabetes, cancer, AIDS/HIV, hypertension and high blood pressure, heart conditions, chronic pain, ulcer and chronic inflamed bowel disease, respiratory, neurological, liver, kidney, skin conditions, or cholesterol. Physical, mental, and intellectual disability were not criteria of a chronic condition in the discriminant validity analysis. However, there was co-morbidity. Co-morbid cases in which the person reported both (e.g., diabetes and hearing impairment) were included as chronic conditions. However, if the person reported hearing impairment but not suffering from any chronic medical condition as the ones listed above, the person was considered as having a disability only

Discussion

The results showed that the WHOQOL-BREF is a measure with sound psychometric properties for use in Singapore. The WHOQOL-BREF showed high internal consistency, and the fit of the hypothesized four domains of QOL was acceptable. In addition, the pattern of weak and strong standardized regression coefficients was consistent with previous research [**13**, **20**, **21**]. Weak standardized regression coefficients were found in reversed items (i.e., pain, medication, and negative feelings), while some domains seemed to make more important contributions to QOL (e.g., activities, work, self-esteem, spirituality) than others. The contribution of these domains to QOL could be investigated in further research to inform possible interventions to enhance QOL.

The multigroup invariance analysis suggested preliminary evidence to support the use of validated non-English versions in Singapore. As only 26% of the participants used non-English questionnaires, further research is needed to confirm the construct validity of non-English WHOQOL-BREF questionnaires in Singapore.

Further analyses demonstrated that the psychological domain made the largest contribution to overall QOL,

followed by the environmental domain. Additionally, the domains that contributed the most to health satisfaction were the physical and psychological domains. These results mirrored previous research findings [20, 25] and suggest the importance of psychological well-being for overall QOL and health.

The results revealed that WHOQOL-BREF scores correlated positively with other measures of QOL, and negatively and to a less degree with functional difficulties. In Singapore, the results indicated that inclusion, satisfaction with personal achievements (past, present, and future), and social participation are important aspects of QOL for vulnerable groups. The findings suggest that community integration programs could provide new avenues for inclusion and social participation. However, as this is a cross-sectional study, it may have its limitations in gauging if these interventions will contribute to changes in QOL, as changes in QOL are better asserted in longitudinal studies.

The results showed that the WHOQOL-BREF is a valid tool. However, some studies have failed to validate it [14, 15]. Those studies recruited healthy young samples. In contrast, this study included those with varying age, health, and mental conditions. We believe that the WHOQOL-BREF structure fits better in samples that contain a wide range of age and health status, as the WHOQOL-BREF was initially developed and validated using large clinical and nonclinical non-clinical populations [12, 13].

To conclude, the WHOQOL-BREF has been validated in Singapore. It can be used as a baseline and outcome measure to evaluate interventions, assess service needs, and to inform treatment planning for a range of services that include health promotion, psychosocial services, public health, and welfare services.

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Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Human Research Ethics Committee of James Cook University (Approval Number H6762) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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