



Cross-Cultural Validation of the McGill Quality of Life Questionnaire-Revised (MQOL-R), Korean Version: A Focus on People at the End of Life

Kyung-Ah Kang, R.N., Ph.D. and Myung-Nam Lee, R.N., Ph.D.*

College of Nursing, Sahmyook University, Seoul,

*College of Nursing, Department of Nursing, Kangwon National University, Samcheok, Korea

Purpose: The purpose of this study was to confirm the factor structure of the McGill Quality of Life Questionnaire-Revised (MQOL-R) in the context of Korean culture and to verify its reliability and validity. **Methods:** The participants comprised terminal cancer patients aged 25 or older, and data from 164 participants were analyzed. The study was conducted in the following order: translation, expert review, reverse translation, preliminary investigation and interviews, and completion of the final version. Confirmatory factor analysis was applied to evaluate the validity of the instrument, and the Beck Depression Inventory, Korean version (K-BDI) was applied to confirm the criterion validity of the MQOL-R Korean version. The Cronbach's alpha coefficient, representing internal consistency, was measured to evaluate reliability. **Results:** Cronbach's alpha for all 14 questions was 0.862. The model fit indices for confirmatory factor analysis were within the acceptance criteria. The factor loadings of all four factors were over 0.50, and convergent validity and discriminant validity were confirmed. Regarding criterion validity, a negative correlation was found between the four factors of MQOL-R Korean version and the K-BDI. **Conclusion:** The MQOL-R Korean version, the reliability and validity of which were verified in this study, is a 15-item tool consisting of 14 items dealing with four physical, psychological, existential, and social factors and a single item evaluating the overall quality of life. The MQOL-R Korean version is an instrument that can more concisely and effectively measure the quality of life of patients with life-threatening diseases.

Key Words: Quality of life, Neoplasms, Palliative care, Reproducibility of results, Surveys and questionnaires

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Correspondence to
Myung-Nam Lee
ORCID:
<https://orcid.org/0000-0002-7272-752X>
E-mail: mnlee1009@kangwon.ac.kr

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INTRODUCTION

Terminally ill patients whose death is expected within a few months due to the exacerbation of their symptoms with no possibility of recovery [1] are often interested in disease management services and rehabilitation rather than active treatment, and are more interested in physical, psychosocial, and

spiritual aspects that help reduce their pain [2]. These patients with end-stage diseases are particularly interested in maintaining their quality of life through palliative care services that can reduce total pain [2]. Since the most important aspect of care for terminally ill patients is maximizing their quality of life by improving the quality of medical services provided to them [2], the evaluation of quality of life (QOL) is an area of

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great importance. Most existing QOL instruments for healthy adults or adults with specific diseases, such as cancer or heart disease, consist of many items, making the instruments difficult to apply to terminally ill patients who are physically vulnerable. Moreover, the instruments include items such as job performance and active exercise, which do not relate to the existential or spiritual aspects of QOL that are often of interest for individuals with terminal conditions [3]. In response to this problem, measurement instruments that include various aspects of QOL have been developed for individuals at the end of their lives due to terminal diseases. The most frequently used instrument among cancer patients is the European Organization for Research and Treatment of Cancer-Quality of Life Questionnaire (EORTC-QLQ-C15-PAL) [4], which is a shortened version of EORTC-QLQ-C30, a 30-item instrument developed for non-terminal cancer patients. However, a limitation of this instrument is that it is mainly composed of items measuring the physical aspect of QOL in terminally ill patients. In addition, although the Functional Assessment of Chronic Illness Therapy-Palliative Care (FACIT-PAL-14) [5] instrument, a reduced version of the Functional Assessment of Cancer Therapy scale (FACT-G), which consists of 46 items, was developed for terminally ill patients, the reliability and validity of the instrument have not been verified.

The McGill Quality of Life Questionnaire (MQOL) [6], an instrument developed in 1996 for patients with severe diseases at an early stage, is limited in measuring the QOL of patients at the end of their lives. In particular, it contains too many questions to be used for patients receiving palliative care, does not include items that measure existential and spiritual well-being, and is mainly focused on measuring negative aspects of QOL. However, after its development, the MQOL has been used in about 120 research articles and translated into the languages of 20 countries over the last 20 years, indicating the validity of the instrument was confirmed. The McGill Quality of Life Questionnaire-revised version (MQOL-R) [3] was developed to supplement the limitations of the original MQOL tool as an appropriately designed self-report questionnaire for terminally ill patients. The items were revised appropriately for terminally ill patients, repetitive questions were revised, and questions measuring existential and spiritual well-being were added. Thus, the instrument is composed of 15 items with a

total of four factors (physical, psychological, existential, and social). In addition, a question that measures overall QOL was added. For these reasons, the MQOL-R is considered a very useful instrument for evaluating the QOL of terminally ill patients in Korea. Therefore, it is necessary to check the fitness of the conceptual framework of the Korean version of the MQOL-R instrument and to comparatively analyze cultural differences. Based on this study, which was conducted to confirm the validity of the Korean version of the MQOL-R instrument, the instrument can be used as a useful assessment tool for improving the QOL of patients at the end of their lives due to life-threatening diseases.

This study aimed to confirm the reliability and validity of the MQOL-R instrument in the Korean cultural context. The following specific steps were carried out First, the factor composition of the Korean version of the MQOL-R was checked. Second, the reliability and validity of the Korean version of the MQOL-R were verified.

METHODS

1. Study design

This methodological study was conducted to verify the validity and reliability of the MQOL-R-Korean version (MQOL-R-K ver.) translated from the MQOL-R [3], a QOL measurement instrument for terminally ill patients.

2. Participants

To confirm the validity and reliability of the translated MQOL-R-K ver., adult patients with end-stage cancer were selected as participants. To reflect a variety of end-stage cancer patients, the diagnosis was not limited, and adults aged 25 and above who indicated that they understood the purpose of the study and gave written consent to participate in the survey were selected.

After this study was approved by the institutional review board (IRB 2018012HR) of the university where the first author was affiliated regarding ethical considerations, data collection began. The participants were end-stage cancer patients admitted to the hospice ward of nationally designated hospices, and their cooperation with data collection was requested

after the purpose and content of the study were explained. When the subjects gave oral consent to participate in the study, written consent forms and questionnaires were distributed to be completed by the participants. The participants were given 15 minutes to complete the survey, and although a total of 200 questionnaires were distributed, 164 (82.0%) questionnaires were finally used in the data analysis after 25 incomplete questionnaires were excluded and the data of 11 participants who did not satisfy the acceptance criteria of outliers in the normality test in confirmatory factor analysis (CFA) were deleted. In this study, CFA was applied to analyze the validity of the instrument, and the measurement variables, the number of factors, and factor loading should be collectively considered in the factor analysis. If the number of cases is 200 or greater, or the ratio of the number of cases to the measurement variables is 5:1 or greater, then the sample size was within the safety range [7]. Based on the grounds that a minimum of 100 cases is ideal, data from 164 patients were finally used for the analysis.

3. Study instruments

1) MQOL-R instrument

Developed by Cohen and colleagues in 2017, the MQOL-R [3] is the revised version of the MQOL instrument, a QOL questionnaire for terminally ill patients, based on years of usage in the field. It consists of four factors (physical, psychological, existential, and social), and a single item (A) that evaluates the overall QOL and is not included in the total. There are 15 questions in total, and in each question, “0” represents the worst situation, “10” is the best situation, and questions 1, 3~7, and 10 are calculated by inverse conversion. The total score ranges from 0 to 10 and is the average of the scores of the four factors (physical, psychological, existential, and social). Cronbach’s alpha of the instrument developed in 2017 was 0.94, and in this study, it was 0.862.

2) Beck depression inventory

To confirm the criterion validity of the MQOL-R-K ver., the Beck Depression Inventory Korean Version (K-BDI) was used [8]. Depression is a common emotional experience among patients with end-stage cancer [8,9], and depression is a concept that is inversely related to QOL [9]. The K-BDI in-

strument is most commonly used in the screening examination of depressive tendencies in normal people without pathological depression, and a 21-item self-report questionnaire with responses on a 4-point-scale was purchased for the analysis. The instrument was first validated and standardized by Rhee et al. in 1995 [8] in Korea, after which Lee and Song [10] showed that it had satisfactory internal consistency and inter-rater validity, as well as a moderate or higher relationship with other depression assessment scales. The Cronbach’s alpha of the K-BDI instrument was 0.834 in the patient group, 0.880 in the normal control group, and 0.867 in this study.

4. Translation and final item selection

The use of the MQOL-R in this study was officially approved by Cohen, the developer of the instrument via email. In accordance with the guideline suggested by the World Health Organization, this study was conducted in the following order: translation, review by experts, reverse translation, preliminary investigation and interview, and completion of the final draft [11] for the use of the Korean version of the instrument. The items were developed based on the conceptual framework of the MQOL-R (Figure 1).

First, two professors of nursing whose mother tongue is Korean and are fluent in both English and Korean and the researcher translated the English MQOL-R instrument into Korean. The instrument was translated with the purpose of conveying the original concept of the sentences in a way that did not feel like it was translated, and in a style that can be understood by anyone who had graduated from elementary school [11], with no difficult Chinese characters or parts that were hard to understand. Second, in the expert review process,

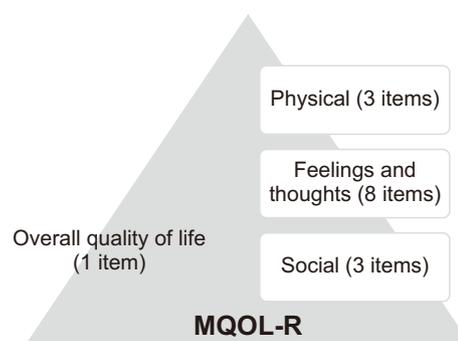


Figure 1. Conceptual framework. MQOL-R: McGill Quality of life questionnaire-revised.

three translators gathered to review the questions translated by each other, and through consultation, they completed the rough draft of the Korean version. Third, the validity of the content was verified by one physician, three nurses, and one social worker working at a hospice palliative care ward and revised according to the characteristics of terminally ill patients in Korea. The following is a summary of the revisions made after the verification of the content validity. The scale that asked about positive and negative characteristics in each item was simplified to “agree” and “disagree” in order to reflect Korean culture and the characteristics of terminally ill patients. The following is a summary of the content translated in reflection of the opinions of content validity according to the emotions of terminally ill patients in the Korean cultural context. The expression “I” was changed to “내” or “나” according to the context, consistency was maintained in the way questions were asked, “life” was translated to “삶” or “생활” according to the context of the questions on the respondent’s condition over the last two days, and “physically unable” was translated to “육체적 한계.” Next, five practice specialists measured the concordance between the translation and the original text (matching well, 5 points; not matching at all, 1 point) and the fitness of the content (very appropriate, 5 points; not appropriate at all, 1 point), and both concordance and fitness had a content validity index of 80% or greater. The range of translation concordance and content validity for each item was within 3~5. Reflecting the opinions of the panelists who participated in the evaluation of the concordance and content validity of the translation, a 5-point scale, rather than a 4-point scale, was selected for the specificity of the translation concordance and content validity evaluation. The revised questions were reverse-translated by a professor of English literature who is fluent in both Korean and English and did not receive any preliminary information on the original instrument. This choice was made because translation without preliminary information can prevent bias and result in unexpected meaningful translations [12]. Moreover, an American whose mother language is English compared the original instrument with the translated instrument to review the agreement in meaning. For questions that did not completely align, the questions translated into Korean were reviewed and revised again, and the translation was compared with the original instrument.

Fourth, using the draft of the questionnaire completed for the preliminary investigation, the researcher conducted a preliminary investigation among 10 participants one-on-one. The questionnaire was answered by the participants in a self-report format, and the time spent the subjects spent answering the questionnaire was measured. After the preliminary investigation and the responses were completed, the participants who answered the questionnaire were interviewed individually to see if there were questions that were difficult to answer. No problems were found in the translation and reverse-translation processes of the MQOL-R-K ver. instrument; therefore, the final MQOL-R-K ver. was completed.

5. Data analysis: verification of the validity and reliability of the instrument

The data in this study were analyzed using SPSS for Windows version 24.0 (IBM Corp., Armonk, NY, USA) in the following order.

- 1) For the general characteristics of the subjects, frequency, mean, and standard deviation were used.
- 2) Before verifying the construct validity using CFA, the normality of the data of the MQOL-R-K ver. was checked, and the following parameters were investigated: the correlation between item means, central tendency, kurtosis, the Kolmogorov-Smirnov test, and the Shapiro-Wilk test [13,14].
- 3) In CFA, the fitness of the model was checked using the χ^2 statistic (χ^2 /degrees of freedom [df]), standardized root mean square residual (SRMR), Tucker-Lewis index (TLI), comparative fit index (CFI), and root mean square error of approximation (RMSEA) [14,15].
- 4) To verify the validity of the measurement instrument, the fitness of the model based on the conceptual framework was confirmed, and the construct validity and divergent validity were investigated. CFA was performed to confirm the factor validity, and conformity with the factors that compose the MQOL-R-K ver., the discrimination between each factor, and the degree of correlation between the items that belonged to the factors was checked. To confirm convergent validity, the average variance extracted (AVE) of each factor was calculated to see if it was 0.05 or greater. For divergent validity, we investigated how each

factor was different from the others.

- 5) For criterion validity, correlations between the 14 items and the single item of MQOL-R-K ver. were investigated, and based on the hypothesis that there would be a significant negative correlation between the MQOL-R-K ver. and the K-BDI, a correlation analysis of those two instruments was performed.
- 6) To assess the reliability of the instrument, Cronbach's alpha, which indicates internal consistency, was measured.

RESULTS

1. General characteristics of subjects

The average age of the participants was 63 years (62.58 ± 13.74 years), and there were 90 male participants (54.9%). There were 117 married participants (71.3%) and 21 who were bereaved (12.8%), as well as 59 high school graduates (36.0%) and 45 middle school graduates (27.4%). Protestantism was the most common religion, with 55 participants (33.5%). Regarding monthly revenue, 62 (37.8%) participants earned 2 million KRW or less, and 51 (31.1%) participants earned 2~4 million KRW. The patients were diagnosed with primary cancer, and the most common cancer type was colorectal cancer in 29 patients (17.7%), followed by lung cancer in 20 (12.2%), stomach cancer in 18 (11.0%), pancreatic cancer in 18(11.0%), and liver cancer in 17 (10.4%). The time elapsed after being diagnosed with cancer was approximately 34 months (34.45 ± 33.88 months) (Table 1).

2. Verification of the reliability of the instrument

To evaluate the reliability of this instrument, Cronbach's alpha, which is a measure of internal consistency, was calculated (Table 2). An instrument is considered reliable if Cronbach's alpha is 0.70 or greater [16]. Cronbach's alpha for each factor was 0.591~0.936, and Cronbach's alpha of the 14 items in total was 0.862 (Table 2). The total correlation between each item of the MQOL-R-K ver. was 0.3 or greater, satisfying the conditions for CFA analysis.

3. Verification of the validity of the instrument

1) Normality test of the analysis data and confirmation of the instrument's conceptual structure

Normality testing of the data collected for CFA showed that the skewness was less than 1 in all items, and kurtosis was

Table 1. General Characteristics of Participants (N=164).

Variable	n (%)	M (SD)
Age (yr)	62.58 (13.74)	(31~90)
Gender		
Male	90 (54.9)	
Female	73 (44.5)	
Married		
Single	10 (6.1)	
Married	117 (71.3)	
Divorced	11 (6.7)	
Separated	3 (1.8)	
Bereaved	21 (12.8)	
Education		
Middle school graduation	45 (27.4)	
High school graduation	59 (36.0)	
University graduation	43 (26.2)	
Graduate school	6 (3.7)	
Religion		
Protestantism	55 (33.5)	
Catholicism	31 (18.9)	
Buddhism	31 (18.9)	
No religion	41 (25.0)	
Other	2 (1.2)	
Incomes (10,000 Korean won/month)		
<200	62 (37.8)	
200~400	51 (31.1)	
400~600	33 (18.9)	
>600	10 (5.7)	
Diagnosis		
Liver cancer	17 (10.4)	
Gallbladder cancer, Cholangiocarcinoma	11 (6.7)	
Gastric cancer	18 (11.0)	
Breast cancer	9 (5.5)	
Gynecological cancer	10 (6.1)	
Prostatic carcinoma	2 (1.2)	
Pancreas cancer	18 (11.0)	
Lung cancer	20 (12.2)	
Colorectal cancer	29 (17.7)	
Hematologic malignancy	3 (1.8)	
Head and neck cancer	4 (2.4)	
Esophageal cancer	3 (1.8)	
Other	20 (12.2)	
Elapsed time after diagnosis	34.45 (33.88)	(1~138)

1 or greater only in items 3 (-1.136) and 7 (-1.034). The z score was less than 3 in all 14 items. The factors showed positive correlations, except that no significant correlation was

observed between physical QOL and social QOL ($r=0.091$, $P=0.248$).

To evaluate the fitness of the conceptual framework of M-

Table 2. Descriptive Statistics of Factors, Each Factor's Reliability, and Corrected Item-Total Correlation (N=164).

Factor	Number of items	Range	Mean	SD	Cronbach's alpha
Overall quality of life	A (single item)	1.00~10.00	4.79	2.09	-
Factor 1 (Physical)	3 (1~3)	1.00~9.67	5.09	2.02	0.693
Factor 2 (Psychological)	4 (4~7)	1.00~10.00	6.25	2.50	0.936
Factor 3 (Existential)	4 (8~11)	2.00~10.00	5.39	1.60	0.591
Factor 4 (Social)	3 (12~14)	1.00~10.00	6.70	2.24	0.884
Total	14	1.71~9.57	5.86	1.52	0.862

Items	Corrected item-total correlations	Alpha if item deleted
A (single item): Considering all parts of my life (for example, physical, emotional, social, spiritual, and financial) over the past two days (48 hours) the quality of my life was excellent.	-	-
1. Over the past two days (48 hours) my physical symptoms (such as pain, nausea, tiredness and others) were a tremendous problem.	0.399	0.859
2. Over the past two days (48 hours) I felt physically well.	0.511	0.853
3. Over the past two days (48 hours), being physically unable to do the things I wanted was a tremendous problem.	0.461	0.857
4. Over the past two days (48 hours), I was extremely depressed.	0.715	0.842
5. Over the past two days (48 hours), I was extremely nervous or worried.	0.703	0.842
6. Over the past two days (48 hours), I always felt sad.	0.695	0.842
7. Over the past two days (48 hours), when I thought of the future, I was terrified.	0.631	0.846
8. Over the past two days (48 hours), my life was very purposeful and meaningful.	0.413	0.858
9. When I think about my whole life, I feel that in achieving life goals I have progressed to complete fulfillment.	0.402	0.859
10. Over the past two days (48 hours), I felt that the amount of control I had over my life was a tremendous problem.	0.549	0.851
11. Over the past two days (48 hours), I felt good about myself as a person.	0.363	0.860
12. Over the past two days (48 hours) communication with the people I care about was very easy.	0.520	0.853
13. Over the past two days (48 hours), I felt my relationships with the people I care about were very close.	0.449	0.856
14. Over the past two days (48 hours), I felt completely supported.	0.369	0.861

Table 3. Construct Validity of the MQOL-R-K ver. by Confirmatory Factor Analysis (N=164).

Factors	Items	Standardized estimates	SE	CR	P	AVE	Construct reliability
1. Physical	1	0.608	-	-	-	0.453	0.712
	2	0.707	0.155	6.420	<0.001		
	3	0.665	0.195	6.204	<0.001		
2. Psychological	4	0.904	-	-	-	0.769	0.930
	5	0.959	0.052	21.167	<0.001		
	6	0.908	0.059	18.602	<0.001		
	7	0.763	0.074	12.719	<0.001		
3. Existential	8	0.543	-	-	-	0.389	0.717
	9	0.506	0.194	4.939	<0.001		
	10	0.565	0.216	4.923	<0.001		
	11	0.648	0.209	5.381	<0.001		
4. Social	12	0.858	-	-	-	0.723	0.886
	13	0.939	0.074	14.760	<0.001		
	14	0.764	0.080	11.626	<0.001		

MQOL-R-K ver.: McGill quality of life questionnaire-revised-Korean version, AVE: Average variance extracted.

QOL-R, the standardized χ^2 statistic (χ^2/df) was applied, compensating for the non-ideal sample size. The overall fitness was satisfactory ($\chi^2/df = 2.463$). Additional indices of fitness were calculated in order to find further information on the robustness of the model. The fitness indices were close to the acceptable thresholds (RMSEA=0.095, CFI=0.923, and TLI=0.899). The standardized factors must be at least 0.50 to confirm the construct validity of each item, and this was the case for all items ($P<0.001$) (Table 3).

2) Construct and divergent validity

Factor 1, which is composed of physically related questions, contained three items, and the factor loading ranged from .608 to .707. Factor 2, which consisted of psychologically related questions, contained four items, and the factor loading ranged from .763 to .959. Factor 3, which was composed of existential questions, comprised 4 items, and the factor loading ranged from .506 to .648. Factor 4, which consisted of social questions, had three items, and the factor loading ranged from .764 to .939 (Table 3, Figure 2).

In this study, the construct reliability was .712 to 0.930, and the average variance extracted (AVE) was 0.389 to 0.769. Theoretically, if the construct reliability is 0.70 or greater, and the AVE is 0.50 or greater, the convergent validity of the items can be considered secure [17]. In this study, since only one factor (factor 3) had a low AVE (0.389), the convergent validity of the MQOL-R-K ver. was confirmed on the whole (Table 3, Figure 2).

The discriminant validity of an item reflects how different one factor actually is from other factors, and the AVE of each pair of two factors and the square of the correlation between the two factors were compared (Table 4). The correlation

coefficient of factor 1 and factor 2 was 0.537 ($P<0.001$), and the AVEs (0.453 and 0.769, respectively) were larger than the square of the correlation coefficient ($r^2=0.288$) of both factors. The correlation coefficient of factor 1 and factor 3 was 0.428 ($P<0.001$), and the AVEs (0.453 and 0.769, respectively) were larger than the square of the correlation coefficient ($r^2=0.180$) of both factors. The correlation coefficient of factor 1 and factor 4 was 0.091 ($P=0.248$), and the AVEs (0.453 and 0.723, respectively) were larger than the square of the correlation coefficient ($r^2=0.023$) of both these factors. The correlation coefficient of factor 1 and factor 4 was .422 ($P<0.001$), and the AVEs (0.769 and 0.389, respectively) were larger than the

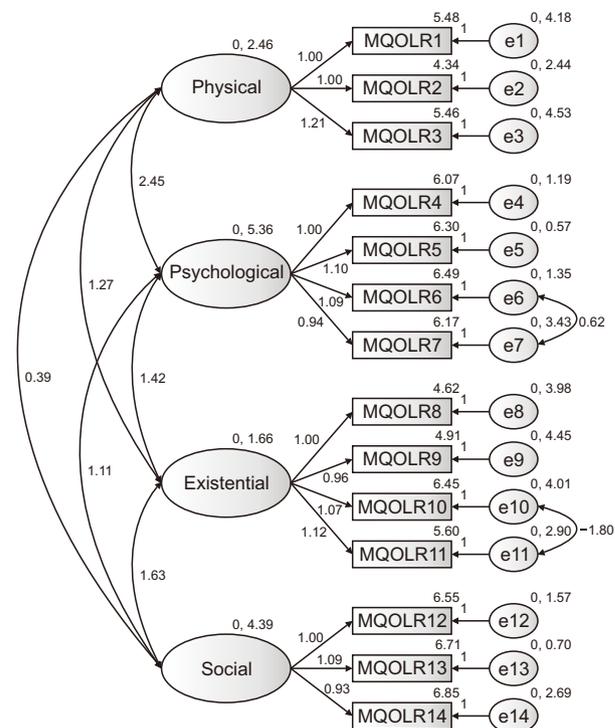


Figure 2. The results of confirmatory factor analysis. MQOLR: McGill Quality life Questionnaire Revised.

Table 4. Correlation Matrix of MQOL-R-K ver. (N=164).

Variables	Factor 1 (Physical)	Factor 2 (Psychological)	Factor 3 (Existential)	Factor 4 (Social)
AVE	0.453	0.769	0.389	0.723
	r (P)	r (P)	r (P)	r (P)
Factor 2 (Psychological)	0.537 (<0.001)*			
Factor 3 (Existential)	0.428 (<0.001)*	0.422 (<0.001)*		
Factor 4 (Social)	0.091 (0.248)*	0.221 (0.004)*	0.503 (<0.001)*	-

*Discriminant validity: Value along the diagonal values indicate the AVEs.

MQOL-R-K ver.: McGill quality of life questionnaire-revised-Korean version, AVE: average variance extracted.

square of the correlation coefficient ($r^2=0.178$) of both these factors. The correlation coefficient of factor 3 and factor 4 was 0.503 ($P<0.001$), and the AVEs (0.389 and 0.723, respectively) were larger than the square of the correlation coefficient ($r^2=0.253$) of both these factors. In conclusion, the discriminant validity of the items of all factors was confirmed (Table 4).

3) Criterion validity

There was a significant positive correlation between the 14 items of the four factors of the MQOL-R-K ver. and the single item (A) ($r=0.334$, $P<0.001$). The correlations between the 14 items of the four factors of the MQOL-R-K ver. and the K-BDI were also tested. A strongly negative correlation was found between the four factors (14 items) of the MQOL-R-K ver. and the K-BDI ($r=-0.654$, $P<0.001$). The physical, psychological, existential, and social factors of the MQOL-R-K ver. had negative correlations of -0.471 ($P<0.001$), -0.622 ($P<0.001$), -0.484 ($P<0.001$), and -0.233 ($P=0.002$), respectively, with the K-BDI.

4. Confirmation of the instrument's final Korean version

The MQOL-R-K ver. consists of 15 items in total: 14 items within four factors and one item that asks about the overall QOL (Supplementary File). Since the item that evaluates the overall QOL is a single item, it was not included in the total. Factor 1 (physical) is composed of three items, factor 2 (psychological) consists of four items, factor 3 (existential) consists of four items, and factor 4 (social) is composed of three items. The measurements are made on a 10-point scale, and for each item, "0" means the worst situation and "10" refers to the best situation. Items 1, 3~7, and 10 are reverse-scored. The total score is the average of the scores of the four factors (physical, psychological, existential, and social), and it ranges from 0 to 10.

DISCUSSION

This study was conducted to measure the level of QOL of terminally ill patients at the end of their lives, with the ultimate goal of improving their QOL, and to enable the use of the MQOL-R in Korea by verifying the reliability and validity of the Korean version of the MQOL-R instrument developed

herein. The MQOL [8] was developed for patients with severe diseases, and in 2017, a revised version of the MQOL was published for patients with life-threatening diseases [3].

Representative examples of QOL measurement instruments whose reliability and validity have been verified for patients from different cultures and countries to facilitate the objective comparison of the QOL of terminally ill patients and to provide evidence [18] are the EORTC-QLO [4,5], McMaster QOL scale [19], and MQOL [3,8]. According to an analysis of the QOL measurement instruments used in studies that measured the QOL of adult cancer patients in Korea over the last 10 years [1], the EORTC-QOL-C30 instrument, which was developed for terminal cancer patients, was used often [9,20,21], followed by three subsequent studies that measured QOL using the EORTC-QLQ-C15-PAL, which included a reduced number of items for cancer patients [22–24]. Nonetheless, the EORTC-QLQ-C15-PAL is focused on the physical characteristics of advanced cancer patients (general health conditions, physical function, emotional function, fatigue, nausea/vomiting, pain, dyspnea, insomnia, loss of appetite, and constipation). However, palliative care, human nature is understood as a totality of physical, psychosocial, and spiritual attributes [22]. Thus, as opposed to the MQOL-R, which measures the QOL of terminally ill patients from a holistic point of view, the results of studies using the EORTC-QLQ-C15-PAL are considered limited in explaining the level of QOL of terminally ill patients.

A Korean version of the McMaster Quality of Life Scale (MQLS) was developed [25] to measure multiple dimensions (physical, psychological, social, and spiritual factors) of hospice and palliative care patients, and its validity has been confirmed. Over the last 10 years, one study used the Korean version of the MQLS (K-MQLS) [26]. The K-MQLS consists of 32 items about four dimensions (physical, psychological, social, and spiritual). Specifically, there are 11 physical items, 20 non-physical items (five for emotion, two for recognition, three for energy, 2 for function, two for rest, four for role, and two for sociality), and one item on the overall QOL. Although the test-retest reliability, internal consistency, and concurrent validity of the K-MQLS, the largest limitation to the application of the instrument to patients in Korea is that 32 items are too many for terminally ill patients considering their physical

vulnerability. Although the MQOL-R-K ver. is composed of a total of 15 items, it measures all physical, psychological, existential, and social aspects and includes a single item that can measure the overall QOL. Thus, it is considered a concise instrument that is useful for measuring overall QOL. In addition, as it reflects the universal attribute of spirituality that exists in any human being regardless of religion or denomination by measuring the spiritual aspect as an existential factor [22], the present study makes a meaningful contribution by verifying the validity of the Korean version of the instrument.

Meanwhile, in the K-MQLS, the QOL score was highest for the physical items and the lowest in role [26]. In contrast, the MQOL-R-K ver. had the lowest scores for physical QOL and the highest for social QOL. A re-evaluation of the factors of QOL in repeated studies will be necessary in the future. Other than the above, two instruments were developed in Korea by Yun [27] and Lee [28], but no studies using those instruments have been reported over the last 10 years after their development. Therefore, this instrument developed herein, which can measure the QOL of terminally ill patients on a 14-item scale can be useful in the field of palliative care. As opposed to the EORTC-QLQ-C15-PAL [4] or K-MQLS [24], the MQOL-R-K ver., which was translated in this study and the reliability and validity of which have been verified, can evaluate the overall QOL of terminally ill patients and has the most concise evaluation items. Thus, it can be useful for evaluating the QOL of terminally ill patients in the field of palliative care.

Although one study measuring the QOL of cancer patients using the MQOL was reported in Korea [29], no study using the MQOL-R has been published. Since factor 1, the physical factor (three items), of MQOL-R-K ver. measures physical symptoms, physical well-being, and physical function, it well represents the physical attribute items in the EORTC-QLQ-C15-PAL [4] or K-MQLS [24]. The psychological factor (four items) has not changed from the original instrument (MQOL). The social factor (three items) mainly focuses on relationships. The existential factor was reduced to four items, including the spiritual attribute.

As with the MQOL-R-K ver., CFA was also used to confirm the factor structure of the MQOL-R [3]. In the analysis of reliability, the Cronbach's alpha of the MQOL-R-K ver. was 0.86, which was lower than the 0.94 of the MQOL-R, but

it satisfied the reference value. Similar results for the validity of the MQOL-R and MQOL-R-K ver. were found regarding the satisfaction of both the factor loading and CFA model fitness assessment criteria. In other words, as a model fitness factor, the CFI value (>0.94) of the sub-factors reported in the original MQOL-R study was similar to the CFI value (0.923) of this study, and the standardized factor loadings in this study were 0.5 or greater in all items (i.e., in the more appropriate range). The factor loading of each item in the MQOL-R was within a range from 0.53 to 0.89, which is similar to the results obtained herein for the MQOL-R-K ver. Based on the above results, the factor structure of the MQOL-R-K ver. was found to be similar to that of the MQOL-R. In that regard, the 15 items of the MQOL-R are considered to represent very common QOL characteristics and may be used worldwide.

The K-BDI, which was applied in this study for criterion validity, is an instrument standardized for the normal population, unlike the BDI, which was standardized for psychiatric patients [8]. Although cancer patients have high depressive tendencies, it is inappropriate to diagnose the depressive tendencies that cancer patients show as psychiatric depression. It was also suggested in a K-BDI study that a higher score on the scale does not necessarily support the diagnosis of depression [8]. The use of the K-BDI for criterion validity in this study is appropriate because the K-BDI was standardized for the normal population, and the participants in this study were non-psychiatric patients affected by a situational change in the form of end-stage cancer. There was a negative correlation between the MQOL-R-K ver. and the K-BDI. Future studies will be necessary to gather scientific evidence by repeatedly verifying the results of this study.

Hospice/palliative care helps patients with end-stage cancer who are expected to die soon to maintain human dignity and live their best possible lives. In order to maximize QOL during the rest of life, it is very meaningful to measure the QOL of patients with end-stage cancer [30]. A limitation of this study is that it failed to secure participants for exploratory factor analysis in order to verify the factor structure of the MQOL-R-K ver. because the researchers had a limited ability to obtain cooperation from terminally ill patients for the survey. A repeated verification study using exploratory factor analysis is suggested for the future. Moreover, although the validity of

this instrument was verified in adult cancer patients aged 25 and above, further studies are needed in other patient groups. Such studies will facilitate evidence-based management of the quality of care for terminally ill patients.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

ORCID

Kyung-Ah Kang, <https://orcid.org/0000-0002-3799-9554>

Myung-Nam Lee, <https://orcid.org/0000-0002-7272-752X>

AUTHOR'S CONTRIBUTIONS

Conception or design of the work: KAK. Data collection: KAK. Data analysis and interpretation: all authors. Drafting the article: all authors. Critical revision of the article: all authors. Final approval of the version to be published: all authors.

SUPPLEMENTARY MATERIALS

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