Psychometric Properties of the Vietnamese Catquest-9 Short Form Questionnaire

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SIGNIFICANCE: The Catquest-9 Short Form (SF) has good psychometric properties but was not available in Vietnamese. This study provides the Vietnamese Catquest-9SF and evidence supporting for its use in hospital settings along with clinical assessment to evaluate visual function.

PURPOSE: The purpose of this study was to evaluate the psychometric properties of the Vietnamese Catquest-9SF.

METHODS: Literate patients with unilateral/bilateral cataract, without severe systemic and ocular comorbidities, aged 50+ years, and scheduled for first-eye surgery were screened and recruited at the University of Medicine and Pharmacy at Ho Chi Minh City and Trung Vuong Hospital. Age, sex, and education were self-reported. The Catquest-9SF and the 25-item National Eye Institute Visual Function Questionnaire were used to assess vision-related quality of life (VRQOL). Best-corrected unilateral and bilateral log of the minimum angle of resolution (logMAR) visual acuity was measured, as was best-corrected Pelli-Robson contrast sensitivity. Rasch analysis was performed on the Vietnamese version of the Catquest-9SF. Criterion validity and convergent validity were also evaluated.

RESULTS: Andrich thresholds and response categories on each Catquest-9SF item were ordered, indicating that patients were able to discriminate VRQOL levels. Person separation index and reliability were 2.51 and 0.86, respectively, indicating that the Catquest-9SF was able to distinguish between patients with low- and high-vision difficulties. The tool was unidimensional, with all items fitting well within the construct. There was no evidence of differential item functioning by sex, age group, or cataract status. The tool also showed criterion validity, correlating significantly with visual acuity in the better eye (r = −0.46), the worse eye (r = −0.39), and both eyes (r = −0.44), and with contrast sensitivity for the better eye (r = 0.41), the worse eye (r = 0.32), and both eyes (r = 0.39). A strong correlation between the Catquest-9SF and the 25-item National Eye Institute Visual Function Questionnaire (r = 0.87) indicated convergent validity.

CONCLUSIONS: The Vietnamese Catquest-9SF is valid and psychometrically robust for assessing VRQOL among cataract patients.

Cataract, a progressive opacity of the ocular lens resulting in blurred vision, was the leading cause of blindness (12.6 million) and the second leading cause of moderate and severe visual impairment (52.6 million) worldwide in 2015.1 It is estimated that by 2020 the numbers for blindness and visual impairment caused by cataract will have increased to 57.1 million and 13.4 million, respectively.1 The number of Vietnamese people bilaterally blind from cataract in 2015 was estimated at 194,000.2 Cataract is also the main cause of bilateral severe and moderate visual impairment in Vietnam, accounting for 85.0 and 73.1% of these burdens, respectively.2 Although cataract surgery is reported to improve vision in most cases performed with a proper technique and standard protocols,3,4 surgical coverage (the proportion of those with a particular level of visual impairment from cataract on a population basis who have had surgery) varies wildly among provinces in Vietnam. For patients with visual acuity <3/60, despite the proportion of national surgical coverage of 74%, the coverage was less than 50% in less economically developed areas.2 For less strict (higher) vision cutoffs, coverage proportions were even lower, with a national coverage of 59% for visual acuity <6/60 and 37% of those with visual acuity <6/18.2 Although
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patients' perception of barriers was different among provinces in Vietnam, generally lack of affordability and accessibility and fear of poor surgical outcomes prevent patients from undergoing cataract surgery. As a result, the burden of unoperated cataract in Vietnam may be considerable and likely to keep increasing because of the aging of the population. Therefore, there is an urgent need to investigate the vision-related quality of life among cataract patients. However, few validated instruments exist in Vietnamese for this purpose.

One instrument that has been previously validated for use in Vietnam is the 25-item National Eye Institute Visual Function Questionnaire. Although comprehensive, the 25-item National Eye Institute Visual Function Questionnaire is time-consuming and not specifically designed to evaluate the impact of cataract on the vision-related quality of life. In contrast, the Catquest-9 Short Form comprises only nine items and is cataract specific. The original Swedish Catquest-9 Short Form has good psychometric properties and has been translated into multiple languages for use worldwide. However, a Vietnamese version of Catquest-9 Short Form has not yet been validated for use. Because it has been well accepted that clinical assessments such as visual acuity alone are not adequate to assess the full impact of cataract surgery, development and validation of the Vietnamese Catquest-9 Short Form to evaluate activities of daily living postoperatively are a priority. Therefore, this study aims to investigate the psychometric properties of the Vietnamese Catquest-9 Short Form in cataract patients recruited at two hospitals in Ho Chi Minh City, Vietnam.

METHODS

This cross-sectional study was conducted in the University Medical Center, University of Medicine and Pharmacy, and Trung Vuong Hospital in Ho Chi Minh City between April and November 2018. Patients were eligible to participate if they had age-related cataract in one eye or both eyes, were 50 years or older, were literate, and were scheduled to undergo first-eye cataract surgery. Those with severe systemic and ocular comorbidities were excluded, and there was no specific vision cutoff for enrollment.

Patients were recruited when they presented to the aforementioned facilities for preoperative eye examination and were scheduled for cataract surgery. Ophthalmologists referred patients to the research team who screened them against study selection criteria, provided information sheets, and invited those who were eligible to participate. If a patient agreed, written informed consent was collected. Ethics approval was obtained from the Ho Chi Minh University of Medicine and Pharmacy Ethics Committee (161/DHYD-HBÐH) and Trung Vuong Hospital (937/BVTV) before initiating recruitment.

Data Collection

Participants self-reported their age, sex, and education level. Unilateral and bilateral logs of the minimum angle of resolution (logMAR) visual acuity were measured on Snellen charts, following the hospital's standard protocol. Patients were asked to read letters on the chart under a proper lighting condition while wearing their corrective lenses if available. If a patient could not see the largest letters, the position that they could count fingers was recorded and used for calculating logMAR. Higher logMAR scores represented worse vision. Unilateral and bilateral contrast sensitivities with current lens correction if available were measured using a Pelli-Robson chart calibrated at 1.0 m in the hospital's eye examination room with proper lighting condition and were expressed in log units. A higher contrast sensitivity score represented better vision.

The National Eye Institute Visual Function Questionnaire consists of 25 items evaluating the effect of visual impairment on general health. Details on wording of the items and scoring are published elsewhere. The 25-item National Eye Institute Visual Function Questionnaire has been translated and validated for use in Vietnam, with the original subscale of “driving” being replaced with “riding a motorcycle,” as motorcycle is the most common means of personal transport in Vietnam. “Going to see movies, plays, or sports events” has also been replaced with “watching TV programs.”

The Catquest-9 Short Form comprises nine items measuring the difficulty of performing daily activities due to visual disability over the last 4 weeks. Two global assessment items ask about difficulties and satisfaction with the vision in general. The other seven items relate to difficulty with specific daily activities including the following: (1) “reading text in newspapers”; (2) “recognizing the faces of people you meet”; (3) “seeing the prices of goods when shopping”; (4) “seeing to walk on uneven surfaces, e.g., cobblestones”; (5) “seeing to do handicrafts, woodwork, etc.”; (6) “reading subtitles on TV”; and (7) “seeing to engage in an activity/hobby that you are interested in.” Two rating scales, each with five response options, are used. For eight items concerning difficulty, the responses are “yes, very great difficulty”; “yes, great difficulty”; “yes, some difficulty”; “no, no difficulty”; and “cannot decide.” For the single item related to satisfaction, the responses are “very dissatisfied,” “fairly dissatisfied,” “fairly satisfied,” “very satisfied,” and “cannot decide.” If a response was “cannot decide,” the item was repeated, and patients were asked to answer it again. If the response was still “cannot decide,” the next item was asked. For both rating scales, responses of “cannot decide” are considered as missing in the analysis.

The original Catquest-9 Short Form was independently translated into Vietnamese by two translators (KGT and QGT). The two translated versions were compared and discussed among the team to produce the initial draft Vietnamese version, which was then back-translated into English by another independent translator. The back-translated version was compared with the original English version by a native English-speaking ophthalmologist (NC). Discrepancies between these versions were discussed and negotiated to reach a consensus for the second Vietnamese translation. This version was finalized after being reviewed by an ophthalmologist (HVH) from the University Medical Center. The proposed final version was pilot tested among 20 cataract patients and showed a high internal consistency reliability of 0.91.

Statistical Methods

WINSTEPS software v4.3.2 was used to conduct Rasch analysis, a common technique to investigate psychometric properties of visual function and quality-of-life questionnaires. Rasch analysis transforms ordinal raw scores (assigned based on a response to an item) into a Rasch linear scale, which uses a unit known as logit (log-odds units). Item difficulty required to perform a task and person ability to perform that task are measured on the same linear scale. The method to estimate Rasch measures in WINSTEPS is joint maximum likelihood. The Andrich model for polytomous data with an individual rating scale for each question format was applied. The following psychometric properties of Catquest-9 Short Form were tested in Rasch analysis.

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First, the order of category thresholds was assessed. There are four response options for each question and thus three Andrich thresholds. Disordered thresholds can indicate a narrow interval between certain categories of the latent variable. Disordered categories can occur when the rating scale has more categories than participants can discriminate, or category definitions are not clear. Second, person separation index and reliability statistics were calculated to assess the ability of the items to discriminate person ability. A person separation <2.0 or reliability <0.8 implies that the tool in question may not be able to distinguish adequately between low and high performers. Third, targeting precision was checked to decide whether items were able to target a range of people with higher and lower abilities. A person-item map was produced to visualize the distribution of person ability in alignment with item difficulty. A well-targeted tool is supposed to have average person ability and item difficulty close to one another, that is, within 0.5 logits.

Fourth, item fit was assessed using two fit statistics: infit and outfit mean squares. Items have an expected value of 1.0 for both infit and outfit mean squares. However, if they fall between 0.5 and 1.5, they are considered to have good fit. Good fit means that an item fits well within a single underlying construct. In addition, principal component analysis of the residuals was used to assess unidimensionality of the Catquest-9 Short Form. This involved comparing the amount of variance explained empirically and by the model, and the amount of unexplained variance in the first contrast (the secondary dimension). Because simulation studies have shown that eigenvalues could reach 2.0 by chance, a tool is considered unidimensional if the first contrast has an eigenvalue <2.0.

Fifth, differential item functioning was assessed to determine whether there were differences in responding to an item between different groups. In this study, item difficulty was compared by sex (male vs. female), age (<65 vs. >65 years), and cataract status (one eye vs. both eyes). Differential item functioning contrast of <0.5 logit is considered negligible; 0.5 to 1.0 logit, minimal; and >1.0 logit, significant.

In addition, STATA v14 (StataCorp LP, College Station, TX) was used to evaluate the validity of the Catquest-9 Short Form. Criterion validity, the extent to which the instrument is correlated with standard outcome measures, was evaluated by computing the correlations between Catquest-9 Short Form scores and visual acuity and contrast sensitivity. Convergent validity, the extent to which the tool is correlated with another instrument measuring a similar construct, was evaluated by assessing the correlation between Catquest-9 Short Form and 25-item National Eye Institute Visual Function Questionnaire scores. Spearman correlation coefficients with P-values were reported.

RESULTS

Among 347 total participants, 62% were women and 50.4% were older than 65 years. Most (68.0%) had a primary school education or less, and only 13.5% had a high school degree (grade 12) or higher. Most participants had cataracts in both eyes (81.0%).

Fig. 1 presents category probability curves for three individual rating scales in Rasch analysis. For the scale of satisfaction with vision, there was no response for one for “very satisfied,” meaning that there were only two Andrich thresholds for this rating scale. For all three scales, Andrich thresholds were ordered, indicating that intervals between categories were appropriate. The categories were also ordered, indicating that participants were able to discriminate categories.
Person separation index and reliability were 2.51 and 0.86, respectively, indicating that the Catquest-9 Short Form was able to distinguish between patients with low and high difficulty due to vision impairment. A person-item map was given in Fig. 2 to evaluate whether the tool was able to target a range of patients with different levels of vision-related difficulty. A mean person measure of 0.06 logit was close to a mean item measure of zero. Items were spread quite evenly along the mean, therefore targeting both patients with low and high difficulty. The most difficult item was satisfaction with vision, and the easiest item was walking on uneven surfaces.

Table 1 shows item measures and infit and outfit mean squares for all items. Item measures ranged from −1.35 to 1.28. Infit mean squares were between 0.69 and 1.42, whereas outfit mean squares were between 0.69 and 1.33. These results indicate that all items fit well within a single underlying construct. Principal component analysis of the residuals showed that the amount of variance explained empirically (59.7%) and by the model (58.6%) was similar. The unexplained variance in the first contrast had an eigenvalue of 1.73 (7.7%), indicating that the Catquest-9 Short Form is unidimensional.

Differential item functioning by sex, age group, and cataract status is presented in Table 2. The Catquest-9 Short Form was almost free of differential item functioning, with absolute differences for items being from 0.06 to 0.40 logits between men and women, 0 to 0.36 logits between patients who were 65 years or younger and those older than 65 years, and 0.05 to 0.50 logits between patients with cataract in one eye and both eyes.

The Catquest-9 Short Form was found to be significantly correlated with logMAR visual acuity for the better eye ($r = -0.46$, $P < .001$), the worse eye ($r = -0.39$, $P < .001$), and both eyes ($r = -0.44$, $P < .001$). Correlations between the Catquest-9 Short Form and contrast sensitivity were also significant for the better eye ($r = 0.41$, $P < .001$), the worse eye ($r = 0.32$, $P < .001$), and both eyes ($r = 0.39$, $P < .001$). Finally, the Catquest-9 Short Form score was strongly correlated with the 25-item National Eye Institute Visual Function Questionnaire ($r = 0.87$, $P < .001$).

**DISCUSSION**

This study shows that the Vietnamese version of the Catquest-9 Short Form is valid and reliable. Andrich thresholds and response
categories were ordered, indicating that categories were well defined and that participants were able to discriminate between them. The tool had high reliability and was able to target a range of participants with various levels of vision-related difficulty. Items also fit well in a unidimensional construct, that is, vision-related difficulty in performing daily activities. The tool was free of differential item functioning for all items, indicating that responses to items did not differ by sex, age (≤65 vs. >65 years), and cataract status (one eye vs. both eyes). The tool also showed validity by significantly correlating with the 25-item National Eye Institute Visual Function Questionnaire and objective measures of visual acuity and contrast sensitivity.

The findings are generally consistent with those from other studies validating the Catquest-9 Short Form in Malaysia,8 Australia,9 Italy,10 the Netherlands,11 and Sweden.12 Person separation index and reliability were high and comparable with other studies.8,10,12 However, the Vietnamese version had better targeting (the difference between person ability and item difficulty was close to zero) than those in Sweden, Australia, Italy, and the Netherlands, although it was similar to those in Malaysia and China.8,10,24 The item answered positively by the fewest people was “satisfaction with vision,” consistently across the Vietnamese and other versions.8,12,24

Unlike the Chinese version, which had one misfit item,24 all nine items of the Vietnamese version fit well within a single construct. This finding is consistent with those from the other versions9-11 and supports the use of all nine questions as in the original tool. The unexplained variance in the first contrast that was used to assess unidimensionality in the principal component analysis was <2.0, also comparable with those in other versions.7,8,10 Although the size of differential item functioning was usually minimal, some versions in Australia,9 Sweden,12 and the Netherlands11 had items with differential item functioning. However, the Vietnamese version of the Catquest-9 Short Form was mostly differential item functioning–free, consistent with other studies in Italy, Malaysia, and China.9,10,24

The Vietnamese tool was weakly but significantly correlated with objective measures including visual acuity and contrast sensitivity, indicating that additional important information on patients’ vision-related quality of life or ability to perform daily activities from their perspective could be received using this tool. In addition, a strong correlation with the 25-item National Eye Institute Visual Function Questionnaire showed that the Vietnamese version of the Catquest-9 Short Form could be used to assess the vision-related quality of life not only among cataract patients but also among populations with other ocular diseases in circumstances where time is limited and a less comprehensive assessment is acceptable.

This is the first study validating the Vietnamese version of the Catquest-9 Short Form. Strengths of the study include the use of a standard translation protocol to culturally adapt the tool and a relatively large sample size. However, there are some limitations regarding generalizability of the study. First, participants were recruited on presentation to hospitals, so the findings may not be generalizable to those with limited access or inability to pay for hospital services. In addition, the study was conducted in only two hospitals in Ho Chi Minh City, and therefore, it is possible that the results may also not be generalizable to patients in other areas of Vietnam.

In conclusion, the Vietnamese Catquest-9 Short Form is valid and psychometrically robust for use to evaluate the vision-related quality of life among Vietnamese cataract patients. Because the tool is relatively short and easy to self-administer, it could be routinely used in hospital settings along with clinical assessment to evaluate patients’ visual function as part of the decision to recommend cataract surgery.
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