Multi-Center Validation of Catquest-9SF Visual Function Questionnaire in Ontario, Canada

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INTRODUCTION

- Visual acuity alone is not enough for assessment of patient appropriateness for cataract surgery and prioritization of patients on waiting lists as it does not consider factors such as contrast, brightness, and glare, which may affect visual function (1).
- The Catquest-9SF questionnaire was developed to evaluate patients' visual function as related to daily tasks and proved to be a psychometrically robust and reliable tool in various populations worldwide (2,3)

AIM

To investigate the psychometric performance and responsiveness of Catquest-9SF in patients referred for cataract surgery in Ontario, Canada.

METHODS

- Pooled analysis on prospective data collected for previous projects.
- Subjects were recruited from three tertiary care centers in Peel region, Hamilton, and Toronto, Ontario, Canada.
- Catquest-9SF was administered pre-operative and post-operatively to patients with cataract.
- Psychometric properties, including category threshold order, infit/outfit, precision, unidimensionality, targeting, and differential item functioning were tested using Rasch analysis with Winsteps software (v.4.4.4) (4).
- Responsiveness of questionnaire scores to cataract surgery was assessed.

Catquest-9SF Questionnaire		Response Options
7 daily-life activities items	Do you have difficulty with the following activities because of your vision?* C1. Reading text in newspapers C2. Recognizing faces of people you meet C3. Seeing prices of goods when shopping C4. Seeing to walk on uneven surfaces, eg cobblestones C5. Seeing to do handiwork, woodworking, etc. C6. Reading subtitles on television C7. Seeing to engage in an activity/hobby you are interested in	(1) Yes, very great difficulties (2) Yes, great difficulties (3) Yes, some difficulties (4) No, no difficulties (5) Cannot decide[#]
2 global assessment items	Ca. Do you find that your sight at present in some way causes you difficulty in your everyday life?	
	Cb. Are you satisfied or dissatisfied with your present vision?	(1) Very dissatisfied (2) Rather dissatisfied (3) Fairly satisfied (4) Very satisfied (5) Cannot decide[#]

Catquest-9SF Questionnaire Items and Response Options. [#]Treated as missing data.

RESULTS

Demographics (Table 1):
934 patients (mean age=71.6, 492[52.7%] female) completed the pre- and post-operative Catquest-9SF questionnaire.

Psychometric Properties (Table 2):
Catquest-9SF had ordered response thresholds, adequate precision, and confirmed unidimensionality. There was one item ('satisfaction with vision') misfitting (outfit value=1.51). There was mistargeting of -1.07 in pre-operative scores and mistargeting of -2.43 in both pre- and post-operative scores, meaning that tasks were relatively easy for respondent ability.

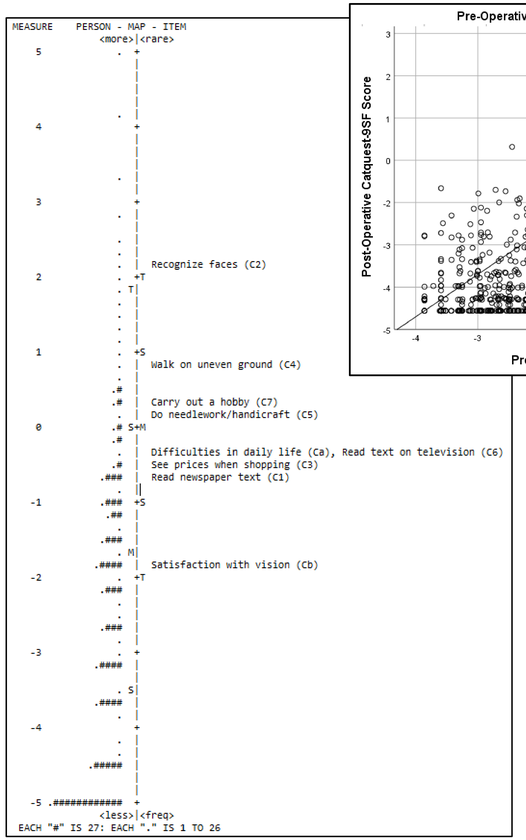
Parameter	Result
Total n	934
Age	n=919, missing=15
Median	72
Average (SD)	71.6 (8.80)
Range	39 to 100
Gender	n=934, missing=0
Female	492 (52.7%)
Male	442 (47.3%)
Education	N=791, missing=143
High school or less	387 (48.9%)
More than high school	404 (51.1%)
Pre-op CDVA (better eye)	n=934
Median	0.3
Average	0.29 (0.21)
Range	-0.1 to 2.8
Pre-op CDVA (worse eye)	n=934
Median	0.4
Average (SD)	0.58 (0.46)
Range	0 to 3
Post-op CDVA (better eye)	N=236, missing VA for at least one eye=698
Median	0.1
Average (SD)	0.154 (0.12)
Range	-0.1 to 0.7
Post-op CDVA (worse eye)	N=236, missing VA for at least one eye=698
Median	0.18
Average (SD)	0.296 (0.35)
Range	-0.1 to 3

Table 1. Participant demographics. CDVA: corrected distance visual acuity. SD: standard deviation.

Responsiveness to Cataract Surgery (Figure 2):
Of 934 subjects, 801(85.8%) reported improvement, 8(0.9%) reported no change, and 125(13.4%) had decreased visual function (Figure 2). The mean pre-operative score was -1.70±1.3 logits, and the mean post-operative score was -3.17±1.1 logits. The improvement of 1.47 logits was statistically significant($p<0.001$,paired 2-tailed t-test).

	Description	Ideal Result	Study Result	
Category Threshold Order	Are response options ordered correctly?	Response thresholds should be ordered. i.e. a person with greater visual disability consistently chooses from the greater difficulty categories, and vice versa.	Response thresholds were ordered	✓
Item Fit Statistics	Does the data match the model?	Infit and outfit range should be within 0.50-1.50, with values 1.5-2.0 being unproductive for measurement but not degrading.	Infit range: 0.75-1.29 Outfit range: 0.74-1.51 One item ('satisfaction with vision') misfitting (outfit value=1.51).	✓
Uni-dimensionality (PCA)	Does the questionnaire measure only a single construct – in this case, visual function?	The observed explained variance should be close to the value expected. Unexplained variance explained by the first contrast should be less than 2.0 eigenvalue units.	Observed = 60.4% Expected = 60.6%. The unexplained variance explained by the first contrast was 1.75 eigenvalue units.	✓
Precision	Can it discriminate between people with different levels of abilities?	Person separation index should be ≥2.0; Person reliability should be ≥0.80	Person separation index = 2.01; Person reliability = 0.80	✓
Targeting	Are the items too easy or too difficult?	Value should be between -1.00 and 1.00. Negative mistargeting means that respondents reported minimal difficulties with the questionnaire tasks.	Pre-operative scores only: -1.07 Pre- and post-operative scores: -2.43	!

Table 2. Results of Rasch Analysis assessing Psychometric properties of Catquest-9SF. Descriptions of each property and expected/acceptable results are outlined.
✓ Signifies acceptable result. ! Signifies result is out of acceptable range.



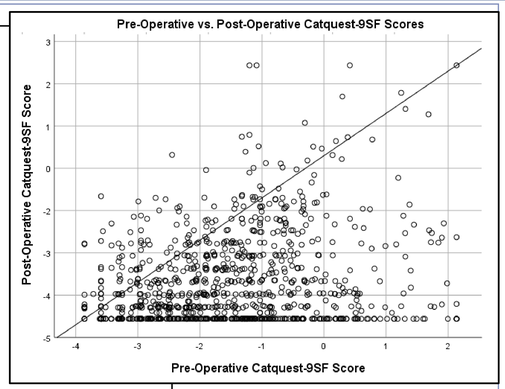


Figure 2: Scatterplot of pre-operative versus post-operative Catquest-9SF scores, in logits. Subjects who had improvement in visual function after cataract surgery fall under the diagonal line (a higher Catquest-9SF score represents poor visual function).

Figure 1. Person-item map for Catquest-9SF including combined pre- and post-operative scores. The left side of the vertical line shows respondent data while the right side shows positioning of items. Respondents with higher visual function and items with higher difficulty are positioned at the bottom of the line. Each '#' represents 2 respondents and each '.' represents 1 respondent. M: mean, S:1 standard deviation, T: 2 standard deviations. The scale is in logits.

CONCLUSIONS

- Catquest-9SF demonstrated excellent psychometric properties and is a valid and reliable tool for measuring visual function before and after cataract surgery in Ontario.
- There is some mistargeting which indicates that the tasks are easy to perform, which is consistent with findings in other populations.
- Future research should explore implementation of Catquest-9SF for clinical decision-making.

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