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ORIGINAL ARTICLE

Validation of the Visual Disability Questionnaire (VDQ) in India

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ABSTRACT

Purpose. To validate visual disability questionnaire (VDQ) in patients with low vision in India, and explore whether the two latent traits "importance" and "difficulty" associated with performance of daily activities are valid and independent constructs.

Methods. The VDQ consisting of 25 items was administered verbally to 137 subjects with low vision aged 16 to 89 years. Responses for each item were rated for importance and difficulty using a 5-category Likert scale. Rasch analysis was used to estimate interval measures of response ratings.

Results. Subjects could discriminate only three response categories for importance and difficulty. Content validity was demonstrated by good separation indices for importance (4.24 and 2.59 for the item and person parameters, respectively) and difficulty ratings (7.64 and 3.33, respectively). High reliability scores were recorded for importance (0.95 and 0.87) and difficulty ratings (0.98 and 0.92). The most important items were "grooming" (1.15 logits) and "reading newspaper" (0.97 logits). Although "threading a needle" was the least important item (−2.79 logits), it was the most difficult task (3.13 logits). The least difficult item was moving around in familiar places (−2.51 logits). A poor correlation was observed between the item measures ($r = -0.19$, $p = 0.34$) and also between person measures ($r = 0.18$, $p = 0.03$) of importance and difficulty.

Conclusions. The VDQ is a valid questionnaire with importance and difficulty ratings found to be independent constructs. This questionnaire could be used to prioritize the goals for rehabilitation intervention in patients with low vision.
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Key Words: visual impairment, low vision, daily activities, importance, difficulty and Rasch analysis

Disability is defined as the restriction or lack of ability to perform an activity in a manner or within a range considered normal for a human being.[1] In the context of vision loss, the term "visual disability" represents a consequence of visual impairment. Traditionally, vision functioning questionnaires have assessed the impact of visual impairment based on the level of difficulty on performance of a number of visual dependent activities.[2–17] Measuring visual disability is important to plan rehabilitation strategies and determine their effectiveness. However, low-vision rehabilitation may have a limited impact on an individual if the activities that the person is unable to perform are not considered important. Hence, it may be critical to determine a person's assessment of importance as well as difficulty with daily activities when measuring visual disability or designing rehabilitation. Such an approach has been introduced by Massof in low-vision research.[8,18] Massof et al. measured the two latent variables "value of living independently" and "visual ability for living independently" that define visual disability.[8,9,18] The two variables were shown to be valid and independent constructs. The need for rehabilitation to meet each goal in their questionnaire was represented by "rehabilitation demand," an algorithm derived for defining visual disability, that was made of the value and difficulty of achieving each goal independently.[8]

Similar research has not been carried out as yet in India where the prevalence of low vision is estimated to be 10.6 million.[19] The demands of ability to perform or preferences given to certain activities vary among the cultures. To optimally measure visual disability one needs to consider cultural variations and design a

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questionnaire suitable to a particular community. Although few vision function questionnaires have been developed for Indian population, only "difficulty" of performing the activities has been addressed.[3,10] Furthermore, these have not been developed using Item Response Theory models, specifically Rasch analysis.[20,21] Therefore, there is a need to develop a vision-specific questionnaire to explore the relationship between the two variables "importance" and "difficulty" associated with activities of daily living in Indian population using Rasch analysis.

The aims of our study were to (a) use Rasch analysis to validate a new visual disability questionnaire (VDQ) in low-vision patients in India, and (b) explore whether the two latent traits "importance" and "difficulty" associated with performance of daily activities are valid and independent constructs using the VDQ.

METHODS

Subjects

One hundred thirty-seven subjects were recruited for the study. All subjects were referred to Vision Rehabilitation Centres (VRC) at the L. V. Prasad Eye Institute (LVPEI), India, for management of low vision. The criteria for inclusion were ≥16 years of age, visual impairment in both eyes from any cause and an ability to respond to the questionnaire. Participants with other impairments (such as hearing loss or intellectual impairment) and no perception of light in both eyes (so as to avoid floor effects in case of difficulty items) were excluded from the study. The research adhered to the tenets of the Declaration of Helsinki. The purpose of the study was explained to each subject and an informed consent was obtained before the administration of the questionnaire.

The socio demographic data of the subjects were extracted from clinical records. Distance visual acuity (presenting and best corrected) was measured for each eye using a Bailey-Lovie[22] chart and was scored in logarithm of minimum angle of resolution (log MAR) units, using the per-letter method.[23]

Low-Vision Rehabilitation Program

The VRC constitutes of two centers namely, Meera and L. B. Deshpande Centre for Sight Enhancement and the P. R. K. Prasad Centre for Rehabilitation of the Blind and Visually Impaired. Comprehensive low-vision services are offered in these centers to all patients regardless of their economic status. Patients are referred to these services from various sub-specialties of the out-patient services of LVPEI after all other treatment options have been explored and no amount of medical or surgical treatment would restore a patient's vision. The multidisciplinary team of professionals provides following services:

- An optometrist manages the initial examination consisting of relevant history, vision assessment using log MAR charts, refraction and assessment for low-vision devices (LVDs).
- Following the assessment for LVDs, counseling is provided to cope with vision loss. After determining the suitability of the LVD to the task which the patient has difficulty with, training is provided. This is supplemented with written instructions in the use of LVDs.
- Rehabilitation professionals prescribe non-optical devices and suggest environmental modifications (lighting, etc.).
- Rehabilitation professionals also provide training in independent living skills such as orientation and mobility, personal skills, and money identification.
- Educational and vocational guidance is provided for those who need it.
- Information regarding social benefits such as concessions and pensions is provided for those who are entitled to them.
- Instructional computer training for using specialized screen reading and magnification software including JAWS, Magic, and Kurzveil are provided.
- Referrals for cross consultations with psychologists, physiotherapists, audiologists are made where necessary.
- Follow-up appointments are given to assess the changes with the rehabilitation skills imparted and provide further recommendations.

Development of Visual Disability Questionnaire

Our study consisted of two phases: (1) instrument development and (2) psychometric evaluation. The VDQ was developed using commonly accepted methods for the creation of self-reported instruments. The items included in the first draft of the instrument were identified using different sources and were developed in a series of steps. We initiated the process by conducting a literature review. The items identified from the first step are listed in Table 1. The most relevant instrument identified was the Indian-Visual Func-

TABLE 1.
List of items identified in step I from literature review

1. Climbing stairs
2. Recognizing bumps and holes in the road
3. Seeing if there are animals or vehicles when walking
4. Finding way in new places
5. Going to social functions
6. Going out at night
7. Finding way indoors
8. Seeing steps of bus
9. Recognizing people from distance
10. Recognizing face of a person standing near
11. Locking or unlocking
12. Searching for things at home
13. Seeing outside in bright sunlight
14. Adjusting from brightness to darkness
15. Differences in colours
16. Differences in coins or notes
17. Toileting
18. Eating
19. Seeing level in the container when pouring
20. Small print in news paper
21. Threading needle
22. Bus numbers
23. Seeing in poorly lit surroundings
24. Recognizing traffic signals
25. Noticing objects to side
26. Estimating distance of vehicles
27. Adjusting from darkness to brightness
28. Reaching an object
29. Noticing objects on floor

tioning Questionnaire (IND-VFQ),[3] a 33-item vision-related quality of life instrument developed for people with visual impairment in India. The IND-VFQ was validated using classical test theory and was reported to have acceptable psychometric properties in the target population.[3] We observed that the IND-VFQ did not include items related to performing near tasks especially reading and certain other common activities of daily living such as grooming, watching TV, etc. Furthermore as mentioned above, the response scale of the IND-VFQ did not address the "importance" of a task, and therefore the VDQ was developed to bridge this gap.

In the second step, we reviewed the records of adults with visual impairment referred to the VRC to identify the range of commonly reported vision-related effects on activities of daily living. The items identified were grooming, reading time, watching TV, signing documents, and finding way in familiar places. In the third step, we conducted three focus group discussions using a convenient sample. Participants of the focus groups were referred to VRC from various sub-specialities of the out-patient services of LVPEI. These participants were referred by an experienced clinical low-vision specialist (VKG) who was also the moderator of the focus groups. This moderator had prior experience in conducting focus group discussions as this technique was used in the development of the LVP-FVQ.[24] The moderator explained the purpose of the study to each group before the commencement. Each focus group was conducted according to a structured guide and the themes for the focus group were guided by the domains of the IND-VFQ. However, we allowed the participants to freely express any other difficulties with activities of daily living that they thought were not raised in the discussions. Then, the key questions asked during the focus group discussions and the semi-structured interviews focused on the importance and difficulty of each of the tasks—both of which are relevant during decisions to include or exclude the activity from the rehabilitation plan. Each focus group lasted for about 1 h. Eight patients participated in each of three focus groups for a total of 24 patients (60% male) ranging in age from 16 to 83 years. We did not audio-tape the focus group discussions but the moderator (VKG) made hand-written notes of the main themes that emerged from these discussions. The notes were read several times by two main authors (MM and VKG) to progressively bring out the main ideas, beliefs, and opinions expressed in the four targeted groups of participants. The additional items identified from this step were reading medicine labels and telephone numbers, crossing road, and matching clothes.

In the fourth step, using the results from the focus group discussions, review of literature and patient records at VRC, we created the first list of items containing 38 items. In the fifth step, we conducted interviews with different members of the multi-disciplinary vision rehabilitation team (such as orientation and mobility instructor, rehabilitation counselors, and optometrists with different levels of work experience) who based on their experience in planning rehabilitation strategies, further modified the list of items. Finally, a list of 28 items for a pilot questionnaire was developed.

Based on the results of the preliminary work, the pilot questionnaire was tested in a sample of 20 adults with visual impairment (65% male, age range, 18 to 80 years). Over half (54%) of these participants had retinal diseases as the major cause of low vision. This pilot questionnaire was administered to this sample with a request to add any other activities of daily living that were thought missing. In addition, they were also asked to gauge the level of relevance, difficulty, and comprehension of each item. These patients removed inappropriate items and added items to cover areas they considered important that were not already covered. The final version of the VDQ contained 25 items of which 10 were from IND-VFQ.

We followed the same procedure as Massof et al.[9] to administer the questionnaire. Each subject was initially asked "How important is it for you to (description of item)?" The response options were 0 (Not important), 1 (Slightly important), 2 (Moderately important), 3 (Very important), or 4 (Extremely important). If the answer was "Not important" for a particular item the interviewer moved to the subsequent item. If the answer was in the affirmative for an item, the subject was asked "How difficult is it for you (description of item)?" The response options were 0 (Not difficult), 1 (Slightly difficult), 2 (Moderately difficult), 3 (Very difficult), or 4 (Impossible). A "not applicable" response option was also provided and was treated as missing data during analysis. When the items were rated "0" for importance the difficulty ratings were scored as "missing." The method of asking importance rating first and then difficulty rating only for those items which are important avoids the rating of difficulty for the activities the subjects may not consider important in their daily living. For Rasch analysis, we reversed the rating scale (0 was taken to be 4, 1 as 3, 4 as 0, and there was no change for 2), so that the measure and logit would have the same polarity for both importance and difficulty ratings.

The questionnaire was translated into two local languages, i.e., Telugu and Hindi and back translated to English by different translators to ensure that the integral meaning of the items was not lost in the translation process. The questionnaire was administered by the first author (MM) using a face to face interview and proxy responses were not included.

Statistical Analysis

We used the same terminology coined by Massof et al.[8,9,18] to represent the item and person measures for importance and difficulty. The term "inherent social value" was used to represent the item measures of importance ratings and the term "required visual ability" was used to represent the item measures of difficulty ratings. The corresponding person measures were termed as "preference for independence" and "visual ability," respectively.

Interval measures of preferences given and visual ability for daily living activities were estimated from the ordinal ratings of importance and difficulty by performing a Rasch analysis (Wright and Masters[25]) on the matrix of ratings by the 137 subjects for the 25 items. An unconditional maximum-likelihood estimation routine (student version of Winsteps, ver. 3.57; Mesa Press, Chicago, IL) was used to perform the Rasch analysis.

Content validity was tested with the separation index, which is a measure of how broadly the person and items are distributed along the construct and is simply the ratio of the estimated true SD to the SE of the estimate. The reliability of separation is the ratio of the adjusted SD to the SD of the person or item measure distribution. The closer the reliability value is to 1.0, the less is the variability in the measurement distribution can be attributed to measurement error.

We calculated infit statistics to evaluate the construct validity. The infit is an information-weighted fit statistic that is more sen-

sitive to unexpected behavior that affects ratings of items near the subject's level. The mean-square (MNSQ) infit statistic is expected to be 1.0. Values substantially below 1.0 indicate dependency in the data, and values substantially above 1.0 indicate noise. For the infit statistic, the Z_{STD} is the MNSQ normalized to approximate a theoretical mean 0.0 and 1.0 SD. Infit Z_{STD} is evaluated against ± 2 SD. Values >2 SD indicate that the MNSQ exceed the model's expectation by more than 2 SD.

We also assessed Differential Item Functioning (DIF) which occurs when subjects with equal amount of the latent trait (importance or difficulty in this case) respond differently to a particular item. We assessed DIF for age, gender, level vision loss, duration of vision loss, and type of ocular comorbidity. We used the following criteria for DIF assessment: small or absent if the difference was <0.5 logits; 0.5 to 1 logit as minimal (but probably inconsequential) DIF; and >1.0 logit as notable DIF. If significant and meaningful DIF is found, it may indicate that the interpretation of the scale may differ by group and that the scale may be influenced by confounding factor(s).

We confirmed the unidimensionality of the questionnaire using principal component analysis (PCA) of the residuals to have evidence that the instrument is measuring a single underlying trait assumed by the model. The variance explained by the measures for the empirical calculation should be comparable to that of the model and should be more than 60% for an acceptable model.[26] Furthermore, the unexplained variance by the first contrast should be <3.0 eigenvalue units ($<5\%$) which is close to that seen with random data.

We hypothesized based on the previous literature[8,9,18] that the two variables, "importance" and "difficulty" are independent constructs and while measuring the disability both the variables should be considered. To investigate our hypothesis, we correlated the item measures and person measures of importance and difficulty ratings. A poor correlation is expected to support our hypothesis.

RESULTS

Participants

Table 2 summarizes the socio demographic characteristics in the study population. The VDQ was administered to 137 subjects. The mean ($\pm$SD) age of the subjects was 42.0 $\pm$ 17.7 years (range, 16 to 89) and 79.5% were male. The major causes of visual impairment were retinal diseases. The median $\pm$ SD presenting visual acuity in the better eye was 0.90 (20/160) $\pm$ 0.5 log MAR.

TABLE 2.
Socio demographics of the study population for VDQ (N = 137)

Mean age (y) ± SD	42.0 ± 17.7
Age range (y)	16–89
Gender, n (%)	
Male	109 (79.5)
Female	28 (20.5)
Level of education, n (%)	
Illiterate	27 (19.7)
<5 years of schooling	33 (24.1)
6–12 years of schooling	42 (30.6)
≥12 years	35 (25.6)
Socioeconomic status, n (%)	
Lower	33 (24.1)
Middle	72 (54.7)
Higher	29 (21.2)
Ocular comorbidity, n (%)	
Retinitis pigmentosa	25 (18.3)
Heredo-macular degeneration	25 (18.3)
Diabetic retinopathy	16 (11.7)
Glaucoma	15 (10.9)
Age-related macular degeneration	8 (5.8)
Other retinal disorders	14 (10.2)
Developmental disorders	9 (6.6)
Optic atrophy	6 (4.4)
Refractive errors	5 (3.6)
Corneal disorders	3 (2.2)
Albinism	3 (2.2)
Other diseases	8 (5.8)
Presenting visual acuity in the better eye, median ± SD	
LogMAR	0.90 ± 0.50
Snellen	20/160
Range	
LogMAR	0.10–1.80
Snellen	20/25–20/1200

Response Categories

The 5-rating categories on the VDQ were not utilized with the same frequency across all 137 patients leading to disordered category thresholds. The "moderately important" or equivalent response category (response category 2) for importance rating and "moderately difficult" or equivalent response category (response category 2) for difficulty rating was underutilized. It can be seen from Fig. 1A that this response category was not the most probable category that was likely chosen over the entire range. To improve the underutilization of this category, we collapsed categories 1 (slightly), 2 (moderately), and 3 (very) for both importance and difficultly ratings. The resulting response probability functions for the recoded data had well-defined peaks and were ordered (Fig. 1B).

Separation Indices

The separation indices for item measures were 4.24 and 7.64 with high separation reliabilities 0.95 and 0.98 for importance and difficulty ratings, respectively. Using these separation indices with the formula of Wright and Masters,[25] we determined that our sample had 6 and 11 statistically distinct levels of items for importance and difficulty. Person measures could be divided into 4 and 5 statistically distinct levels from separation indices of 2.59 and 3.33, respectively, for importance and difficulty ratings. High separation reliabilities were obtained even for item measures for importance (0.87) and difficulty (0.92) ratings.

Item Measures

Table 3 shows the item measures estimated from importance and difficulty ratings in logits and corresponding fit statistics. The activities with higher inherent social value were grooming (1.15

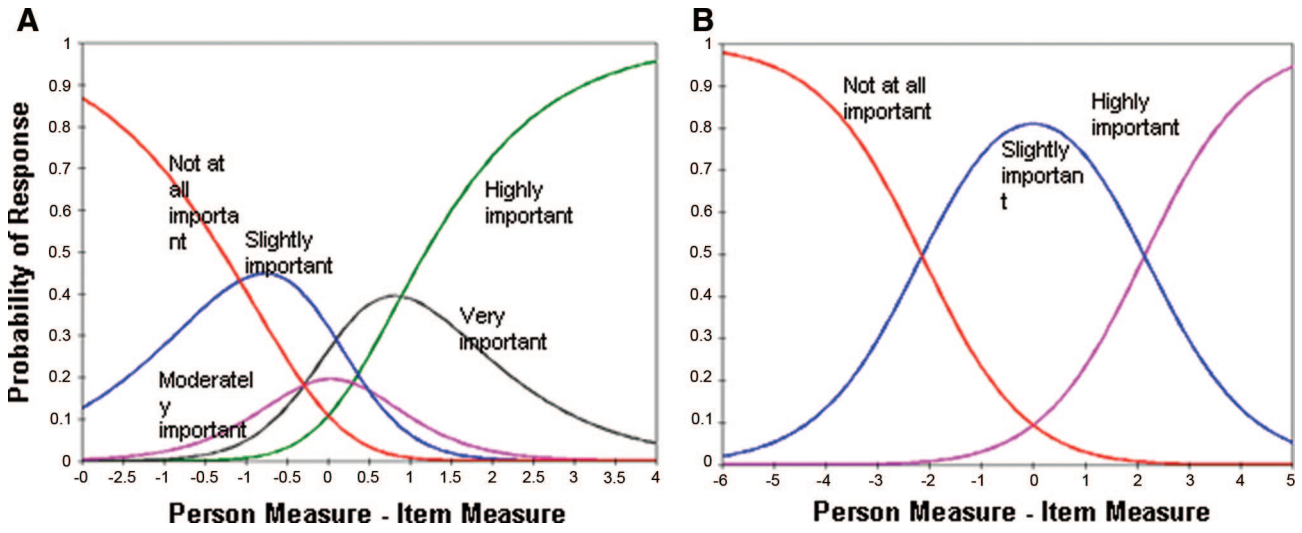

FIGURE 1.

A, Category probability curves showing disordered thresholds using five response categories of importance ratings. B, Category probability curves showing ordered thresholds after having collapsed the categories 1, 2, and 3 of importance ratings.

TABLE 3.
The item infit statistics and logit scores for importance and difficulty ratings

	Importance		Difficulty	
Items	Item logit	Infit Z_{STD}	Item logit	Infit Z_{STD}
Grooming	1.15	−1.9	−1.79	−1.1
Reading small print in newspaper	0.97	3.6	1.75	−0.7
Differentiating 1 and 2 re coins	0.94	−0.1	0.08	0.3
Reading medicine labels	0.77	−0.1	1.74	−0.4
Recognizing faces from near	0.68	−1.5	−1.47	0.9
Recognizing people from distance	0.67	−2.1	2.47	−0.2
Signing documents	0.60	−0.2	−0.82	−0.9
Crossing road	0.58	−2.5	0.00	−3.3
Finding way in familiar places	0.54	0.2	−2.51	0.3
Estimating distances	0.52	1.1	−0.44	1.5
Reading bus numbers and sign boards	0.52	−1.9	1.86	2.4
Reading telephone numbers	0.30	−1.1	0.92	0.5
Recognizing bumps & holes	0.13	−2.0	−0.36	−1.2
Seeing objects in bright sunlight	−0.08	−0.1	−0.19	2.0
Searching for things at home	−0.08	−1.0	−0.24	−1.8
Reading time from wrist watch	−0.19	1.0	−0.15	−0.3
Locking and unlocking door	−0.22	0.0	−2.00	1.0
Seeing level in container when pouring	−0.51	−0.9	−0.72	−0.4
Matching clothes	−0.53	1.7	−1.09	−0.2
Going out at night	−0.57	−0.6	0.26	2.3
Watching TV	−0.67	1.6	0.32	−2.4
Finding way in unfamiliar places	−0.73	−1.7	0.10	−0.6
Seeing objects in dimly lit areas	−0.87	0.9	0.46	0.3
Climbing stairs	−1.14	0.1	−0.32	−1.7
Threading a needle	−2.79	5.2	3.13	2.3

logits), reading small print in newspaper (0.97 logits), and coin identification (0.94 logits). Although threading a needle had the least inherent social value (−2.79 logits), it required the most visual ability (3.13 logits). The items that required least visual ability were finding way in familiar places (−2.51 logits), locking and unlocking (−2.00 logits) and grooming (−1.79 logits). Eighty-four percent of items for inherent social value and 80% of items for required visual ability fell within ±2 SD of expected values of infit Z_{STD}. The most misfitting item for inherent social value was threading a needle (infit Z_{STD} 5.2). Other misfitting items (infit Z_{STD} >2 SD) included reading newspaper, recognizing people from distance and crossing road. The misfitting items for required visual ability were crossing road, reading bus numbers, going out at night, watching TV, and threading a needle. Factors that may have

influenced subject ratings for these misfitting items could be gender roles (e.g., threading a needle) or behavioral adaptations to vision loss (e.g., watching TV). At this stage of development, we did not exclude misfitting items as the aim of our study was to develop a rehabilitation planning tool that will be helpful in setting rehabilitation priorities.

Person Measures

The person measures estimated from importance ($p = 0.33$, Kolmogorov-Smirnov Z-test) and difficulty ratings ($p = 0.32$, Kolmogorov-Smirnov Z-test) were not significantly different from a normal distribution. The value of independence had a mean ± SD person measure of -0.54 ± 1.24 (range, -4.81 to 1.72) logits indicating that the value that an average subject places on independent living is less than the average social value represented by this item set. Positive mean person measure indicates that the value an average subject places on independent living is greater than the average social value of the 25 items. The person measure distribution for visual ability had a mean ± SD of 0.34 ± 1.63 (range, -4.25 to 6.05) logits, a positive value, indicating that the average subject's perceived visual ability was greater than the average required visual abilities of the 25 items. If the mean person logit is negative, the average subject's perceived visual ability is less than the average required visual ability. Person-item maps of importance and difficulty ratings determined by Rasch analysis for the items in VDQ are shown in Figs. 2 and 3, respectively. The means of the items and persons are denoted by "M" and are close to each other for both importance and difficulty ratings. This indicates effective targeting of items to the subjects.

In our sample, 11 (8.0%) and 4 (2.9%) subjects did not fit the model for preference of independence and perceived visual ability. A retrospective review of records of these 15 misfitting subjects revealed that two subjects had advanced field loss but did not report any difficulty with mobility. This was in contrast to other subjects with similar advanced field loss who reported difficulty with mobility. There were no specific reasons found for other subjects. Exploratory elimination of these misfitting persons did not alter the estimation of item or person measures.

Differential Item Functioning

The VDQ demonstrated DIF by gender for 2 items of inherent social value. Threading a needle (1.91 logits) and matching clothes (0.81 logits) were rated more important by female subjects as compared with males. Two items showed DIF by gender for required visual ability. Female subjects rated reading bus numbers was more difficult (0.90 logits) and males rated grooming to be more difficult (0.63 logits). However, the VDQ was found to be free of DIF for both inherent social value and required visual ability by age, duration of vision loss, level of vision loss, and ocular comorbidity.

Unidimensionality

PCA of item residuals revealed that the variance explained by measures for the empirical calculation (41.3%) was comparable to that explained by the model (40.8%). The first contrast accounted for 6.7% of unexplained variance (2.9 eigenvalue units) which is close to that seen with random data. An eigenvalue of <3.0 suggests that the VDQ is unidimensional for the construct of importance. Three items that correlated with the first factor were recognizing bumps and holes in the road (0.62), matching clothes (± 0.58), and going out at night (± 0.50). Although our results suggest that the VDQ can be treated as unidimensional in nature, the low amount of variance explained by the PCA indicate that a multidimensional model may be more appropriate.

PCA of item residuals for required visual ability revealed that the variance explained by measures for the empirical calculation (85.2%) was comparable with that explained by the model (85.1%). The first contrast accounted for 1.9% of unexplained variance (3.3 eigenvalue units) which is close to the magnitude seen with random data. These findings suggest that the VDQ is unidimensional for the construct of difficulty.

Correlations Between Importance and Difficulty Parameters

A poor correlation was observed between the item measures ($r = -0.19$, $p = 0.34$) and also between person measures ($r = 0.18$, $p = 0.03$) of importance and difficulty. The low correlations demonstrate that the two variables "importance" and "difficulty" are two independent constructs.

DISCUSSION

The VDQ is one of the few questionnaires which rates the difficulty and importance of daily living activities in individuals with visual impairment in India or worldwide. Although questionnaires have been developed for an Indian population with low vision[3,10] none has assessed the "importance" of the activity. In clinical practice, the VDQ provides the low-vision practitioner with an opportunity to identify and prioritize the goals for rehabilitation for an individual patient so that the treatment plan can be tailored to suit the patient's needs. To date, there has been limited work undertaken in this critical area where most data have come from work done in developed countries. In this study, we demonstrated that the VDQ is the first scale to satisfy the requirements of a valid vision-specific questionnaire following its fit to the Rasch model for Indian adults. Our study shows that the response categories—slightly, moderately, and very important were used interchangeably by the subjects. This finding is similar to the work by Massof et al.[9] Although most previous studies[9,10,12,14,27–31] have collapsed the difficulty ratings to four categories, we had to collapse the categories to three.

In our sample, the most important item was related to self-care activities such as grooming. The other important items were reading newspaper and coin identification. The least important item was threading a needle. As expected, the most difficult items for our sample were those requiring high resolution such as threading a needle, recognizing people from distance, reading bus numbers, reading newspapers and medicine labels. The items least dependent on vision were finding way in familiar places, locking and unlocking, and grooming. Our findings are not dissimilar to those reported in developed[5,9] countries and provides further evidence that irrespective of the social, cultural, and geographical differences, these two variables should not be used interchangeably when it comes to rehabilitation for people with low vision.

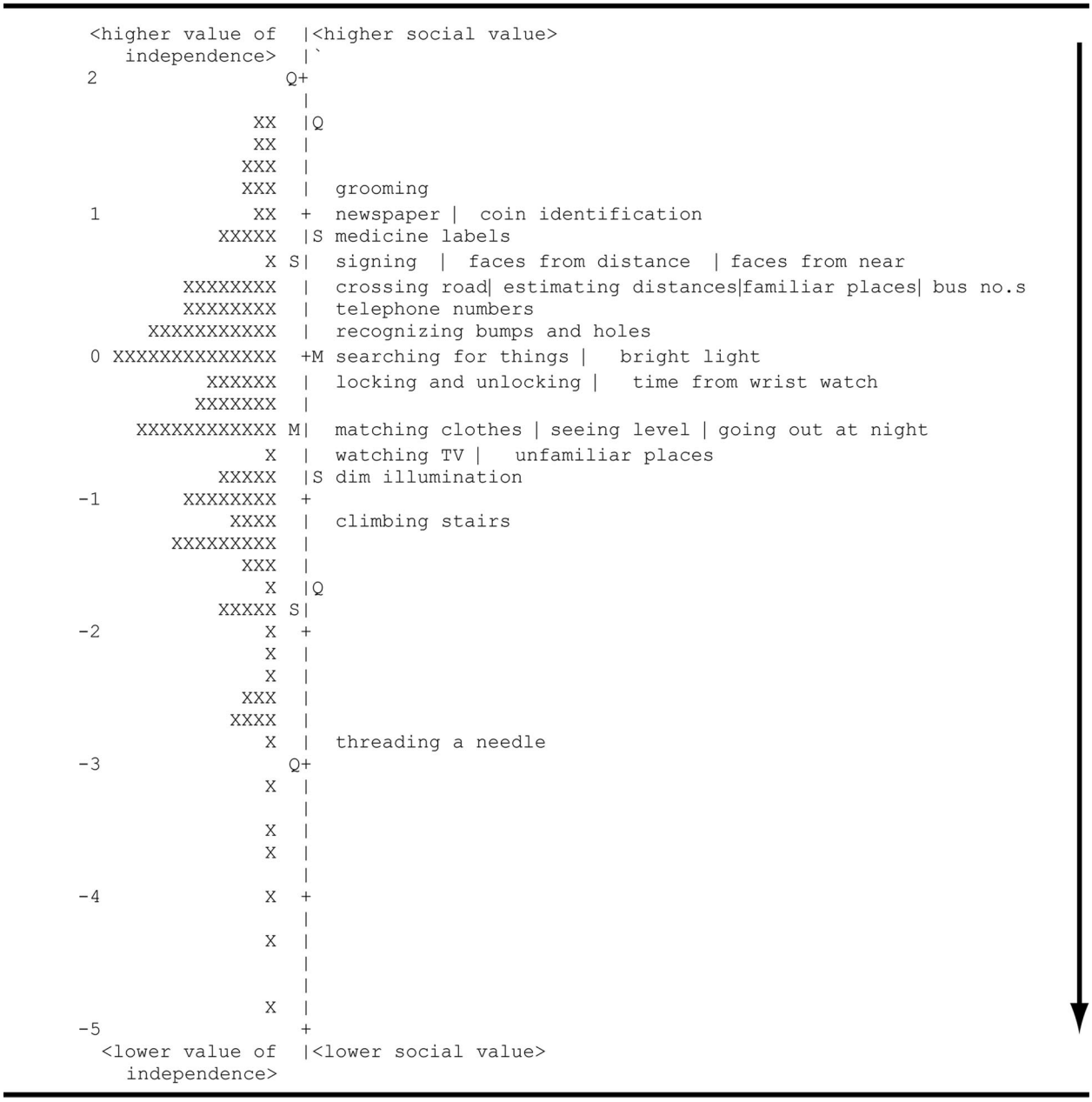

FIGURE 2.

Person-item location map for importance ratings of 25 items. To the left of the dashed line are the subjects, represented by X, and on the right are the items, denoted by their content. Subjects with higher preference for independence and items with higher inherent social value are near the top of the diagram, and subjects with lower preference for independence and items with lower inherent social value are near the bottom. M, mean; S, 1 SD from the mean; Q, 2 SD from the mean.

Our results indicate that most of our subjects would require low-vision rehabilitation for activities such as reading small print and recognizing faces as they had higher preference as well as reported to be more difficult activities by our subjects. However, low-vision rehabilitation may not be required for "grooming" that was rated as highly important but least difficult by most of our subjects. Similarly, the item "threading a needle" although rated as highly difficult by our sample, it was the least important activity indicating that such activities may not have high priorities in the rehabilitation plan for our sample. Our study emphasizes the need to include the variable "importance of an activity" while asking the "difficulty of an activity," because we would not label a person to be disabled if the only activities that are extremely difficult or impossible to perform were those he/she would never consider performing in his/her daily routine. Thus, VDQ helps to tailor rehabilitation programs to meet individual patient needs.

The commonly misfitting activities in the VDQ for importance and difficulty were threading a needle and crossing road. Such misfitting occurs due to several reasons of unexpected responses from the subjects. One common explanation for a misfitting item is that it does not represent the underlying constructs "importance" and "difficulty." However, this rationale appears unlikely because all the items within the VDQ are worded to include the "importance" and "difficulty" of a task. A second explanation for

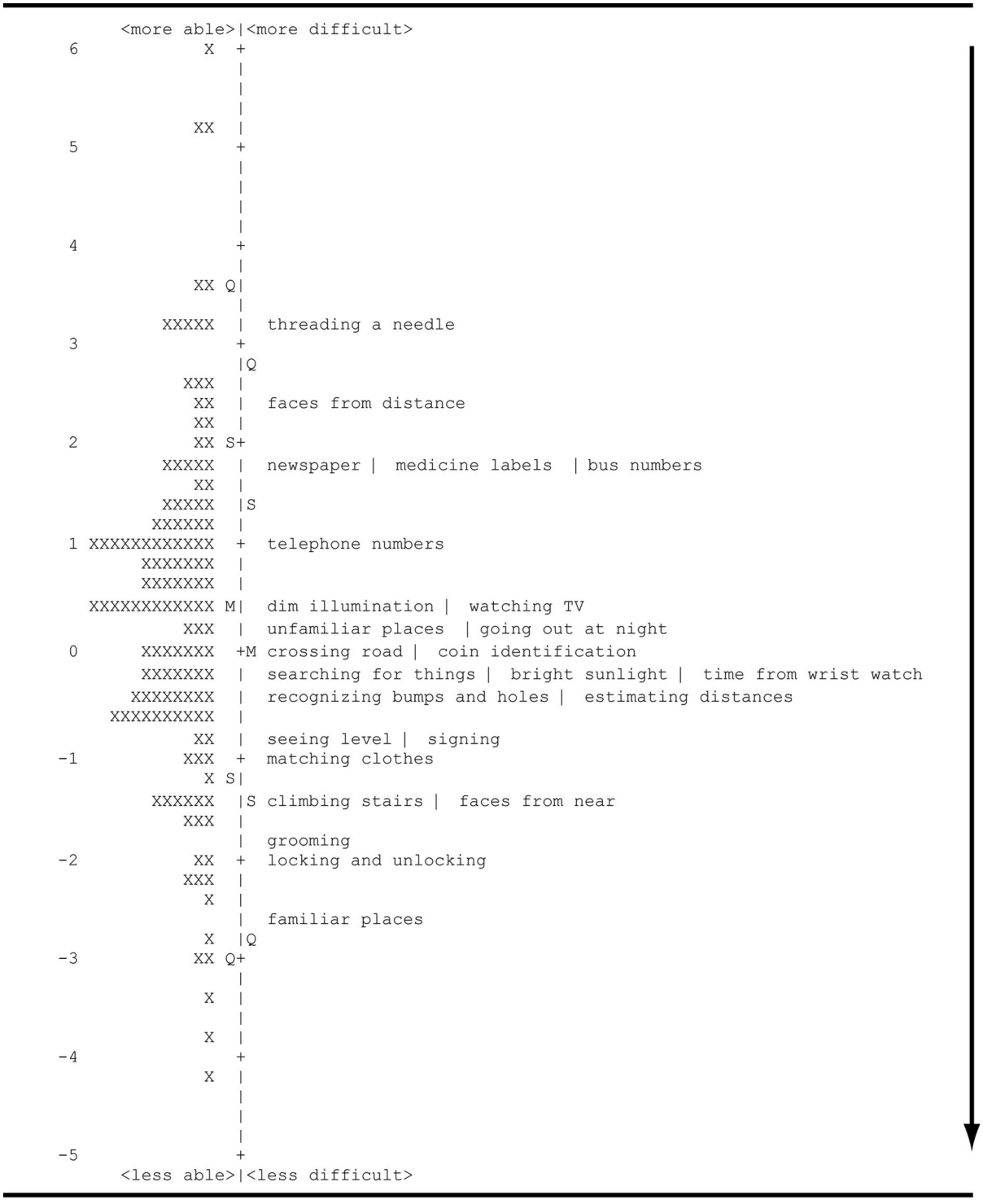

FIGURE 3.

Person-item location map for difficulty ratings of 25 items. To the left of the dashed line are the subjects, represented by X, and on the right are the items, denoted by their content. More able subjects and more difficult items are near the top of the diagram, and less able subjects and easier items are near the bottom. M, mean; S, 1 SD from the mean; Q, 2 SD from the mean.

an item misfit is that gender roles and individual adaptations for performing the activities may have contributed to variability in responses of these items. Ideally these misfitting items should be deleted but, as previously mentioned; we retained them in the VDQ as the main aim of our study is to develop a questionnaire that will be useful in prioritizing rehabilitation goals.

The content and construct validity in our study using Rasch calibrated measures were found to be good indicating the items in the questionnaire were well targeted to the population. The VDQ can, therefore, play a significant role in assessing the impact of vision loss as well as the effectiveness of rehabilitation outcomes in India. We found poor correlations between item and person mea-

sures of importance and difficulty supporting our hypothesis that they are independent constructs. Our results demonstrate that these two latent traits are not intuitively linked. In previous work by Massof et al.,[8,9] a significant correlation between item measures of importance but no significant correlation between the corresponding person measures.

Although the VDQ was largely free of DIF by age, duration of vision loss, level of vision, and ocular comorbidity there was some amount of DIF found in the VDQ by gender. Threading a needle and matching clothes are activities that are commonly performed by Indian women in their daily life. Similarly, men use public transport more frequently as they have to be able to commute to their workplace and therefore reported difficulty with this task. In future studies, we would consider deleting items that show DIF to obtain a stable structure for the VDQ. As mentioned earlier, though the "importance" of VDQ could have been conceptualized as a unidimensional construct, we could consider examining if a two-structure model fits the data better in our future studies involving the VDQ. We did not attempt it here as it was beyond the scope of our study.

A limitation of our study was the selection of the sample. There were a larger proportion of males (80%) than females. We could not recruit more females as the routine patient demographics of the VRC had similar gender balance. Another limitation was the selection of the convenience sample for the focus groups. We cannot generalize our results to the low-vision population in India as the current study sample is representative of a tertiary hospital population. Our results are also delimited to those with low vision but not to those totally blind as they were excluded from our study. Last, our final selection of the VDQ items was based on experts' opinion in the field of rehabilitation. A more comprehensive list of items could have potentially broadened the scope of VDQ in measuring visual disability in this sample.

In conclusion, the VDQ is the first questionnaire for people with low vision in India which considers both importance and difficulty in the performance of vision-specific activities when planning an individual rehabilitation plan. The scale has also substantial modern psychometric characteristics. The two latent traits "importance" and "difficulty" have found to be valid and independent constructs. Further studies in a representative sample of the low-vision population in India are needed to investigate test-retest reliabilities and validate the priority score which combines importance and difficulty ratings.

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