

# Validation of the Arabic Version of the Impact Visual Impairment on Children (IVI-C) Questionnaire on Children with Visual Impairment Using Rasch Analysis

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## ABSTRACT

**Introduction:** Visually impaired children are in need of special education and low vision services to maintain good Vision-Related Quality of Life (VRQoL). Visual impairment has long life implications for both children and their families. We aim to validate the Arabic Questionnaire version of the Impact Visual Impairment Children (IVI-C) on children with visual impairment children.

**Methods:** This cross sectional study included children aged between 8-18 years old with best corrected visual acuity <0.3 log MAR were recruited from low vision clinics at three capital hospitals in Riyadh city, Saudi Arabia. Visual acuity and contrast sensitivity were assessed. The English IVI-C Questionnaire was translated to Arabic language then translated back to English to guarantee the meaning of each item was consistent. Children were requested to answer each item of the translated Questionnaire using five responses scale. Rasch analysis was used to test the validity and reliability of the questionnaire.

**Results:** Person reliability (0.83) and separation (2.21) were improved with a mean difference of (0.43) between person and difficulty items. Cronbach alpha was (0.88) with a mean difference of (0.31) between person and difficulty items. The infit item was ranged from 1.23 to 0.75; and outfit item was ranged from 1.32 to 0.71, which indicated good psychometric properties of the validated questionnaire Skew and kurtosis values were within normal limits (-2.00 to +2.00).

**Discussion and implication for Practitioners:** The 14-items Arabic IVI-C questionnaire is valid, reliable and one-dimensional tool to assess vision-related quality of life for school age children with visual impairment.

**Keywords:** Arabic questionnaire; Children; IVI-C; Rasch analysis; Visual impairment

## INTRODUCTION

Children with visual impairment need special mode of education and low vision services to maintain good Vision-related Quality of Life (VRQoL). Visual impairment was defined as impaired visual functions following treatment associated with correction of refraction, visual acuity of 0.5 to 1.3 log MAR, field of vision  $\leq 10$  degrees from fixation point, with possible use of vision for performing a task [1,2]. Visual impairment prevalence was increased worldwide [3] due to many factors such as ethnicity, socioeconomic status, education, and lifestyle of different countries [4-6]. For instance, in Saudi Arabia (SA), it was found

that the most common causes of visual impairment among two third of male were atrophy of optic nerve (28.9%), retinitis pigmentosa (26%) and diabetic retinopathy (15.7%). It also reported positive consanguinity was one of the main causes of visual impairment [7].

Low vision rehabilitation requires cooperation, active participation, and co-management of the entire rehabilitation program [8] to help patients with visual impairment to achieve better VRQoL [9]. Vision-RQoL can be assessed based on the World Health Organization definition of Quality of Life (QoL) including physical activities, social relations, emotional,

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independence and spiritual well-being, which can be influenced by visual impairment and treatment [10,11]

Children with visual impairment suffer from lifelong entanglements including development, schooling, and families concern [12,13]. The measurement of VRQoL in visually impaired children is needed for recognizing the impacts of living culture and visual disability [14]. There are many questionnaires in the literature assess VRQoL in children with visually impairment [14-17]. Most of questionnaires were designed to assess functional vision requirements for children [13] or QoL from parents/caregiver perspective [18]. Other questionnaires did not investigate the effect of visual impairment of children on their ability in school performance and routine daily activity. The IVI-C [17] questionnaire is considered a precise psychometric properties tool that can be used to assess many domains such as distance vision, reading, mobility, social, emotional and physical activities in daily life [10].

Vision-RQoL was accessed in children with visual impairment in various countries including Thailand [19], China [20], Germany [21], India [22], and Australia [23] using valid and reliable different translations of the IVI-C questionnaire. However, VRQoL in Arabic speaker children with visual impairment was not accessed due to unavailability of Arabic valid tool. There is a demand to validate a tool to assess VRQoL of Arabic speaker children with visual impairment from their perspective to understand their problems in education, social relation, physical activities, and visual function. Thus, the aim of this study was to validate Arabic Version of IVI-C questionnaire on school aged children with visual impairment, which enable to assess VRQoL of Arabic speaker's children with visual impairments and consider any problem in addition to the treatment plan.

## METHODS

This cross sectional study included children with visual impairment aged between 8 to 18 years old from both genders were enrolled from low vision besides pediatric ophthalmology clinics at three capital hospitals: King Khalid Eye Specialist Hospital (KKESH), King Abdul-Aziz University Hospital (KAUH) and Eye Consultants center (ECC) in Riyadh city, Saudi Arabia.

Children with Best Corrected Visual Acuity (BCVA)  $<0.3$  log MAR in better eye who understood and talk Arabic language were included. Children with cognitive, hearing or speech disability were excluded. Visual Acuity (VA) and contrast sensitivity were assessed for all subjects by LogMAR and Pelli-Robson contrast charts, respectively. Demographic information including age and gender were collected.

The study was approved by College of applied Medical Sciences research ethics committee at King Saud University. Parents of participated children had to sign informed consent after

clarification of the nature and possible study consequences according to Helsinki Declaration.

## Instrument

**IVI-C Questionnaire:** The IVI-C questionnaire is considered a vision-precise pediatric QoL questionnaire validated in English by Cochrane and colleagues [23]. The questionnaire is a psychometric tool that contains [24] items with many domains of VRQoL. In this study, the English version of IVI-C Questionnaire was translated to Arabic then back to English language by bilingual speaker to warranty the meaning of each item was consistent. Written approval was obtained from the principal investigator (Prof. Keeffe) to use to the questionnaire and translate it to Arabic language. Item number 3 was removed from the translated Arabic version questionnaire in order to adapt to culture and lifestyle of the country as there is no public transport such as buses in SA. Therefore, 23-item IVI-C Arabic questionnaire was used considering single rating scale for all the items. Children were asked to answer each item of the Arabic IVI-C Questionnaire using five responses scale (always, almost always, sometimes, almost never, never). Responses were scored from 1 to 5 based on children's perspective of difficulty in doing activities.

**Statistical analysis:** Rasch analysis (Win steps program, version 4.2) was applied for testing the validity and reliability of the questionnaire. The guidance criteria reported by Pesudovs et al. [24] was followed for the validation.

## RESULTS

Sixty visually impaired children were included. Misunderstanding of translated Arabic questions of the IVIC was not reported. Participated children understood the translated content of the questionnaire without any problems, which elucidated the strength of translated questionnaire.

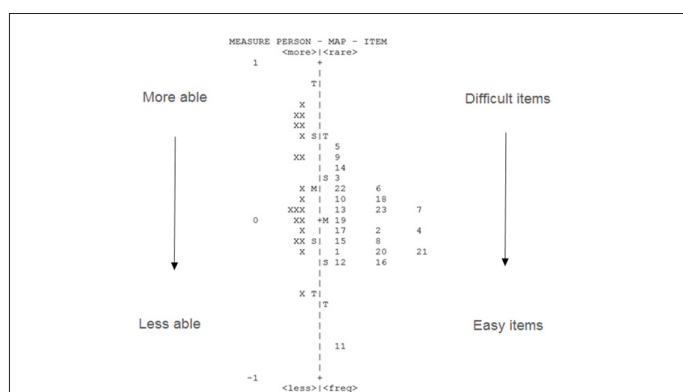
Table 1 showed the features of participants. The Person-item map revealed good matching between item difficulties and children's abilities. Person separation (2.21), reliability (0.83) and Cronbach alpha (0.87) with mean difference 0.43 between person and items were detected. Skew and kurtosis values were limited to -1.00 to +2.00. The infit item was ranged from 1.70 to 0.51; and outfit item was ranged from 2.15 to 0.55, which indicated presence of misfitted items (no. 3, 11, 15, 16, 21 and 23). These most misfitted items were discarded and then Rasch analysis was repeated, the most misfitting item of the remaining ones were removed and Rasch analysis was repeated on the remaining 17-item of IVI-C questionnaire. This improved the measurements of person separation (2.33) and reliability (0.84) and Cronbach alpha (0.88) however, three items (no. 12, 13 and 20) were misfitted so they have been removed resulting in 14 items.

**Table 1:** Demographic and vision measurements of the participants.

Participants (n=60)	
<b>Gender</b>	
Boys	32 (53.33%)
Girls	28 (46.66%)
Age (Mean ± SD)	12.13 ± 3.24 years
<b>Ocular condition</b>	
Congenital	40 (66.66%)
Juvenile/degenerative	20(33.33%)
<b>Low vision aids used</b>	
Optical and non-optical	3(5%)
Optical only (spectacles)	37(60.66%)
Non-optical only	-
None	20(33.33%)
<b>VA better eye number (%) VAD</b>	
≤ 0.3 LogMAR	0(0%)
>0.3 ≤ 0.9 LogMAR	42(70%)
>0.9 ≤ 1.6 LogMAR	14(23.33%)
>1.6 ≤ 2.6 LogMAR	4(6.66%)

**Abbreviation:** SD: Standard Deviation, VA: Visual Acuity, VAD: Visual Acuity at Distance

Rasch analysis revealed proper matching between children abilities and item difficulties through Person-item map for 14-item IVLC. Person separation (2.43), reliability (0.86) and Cronbach alpha (0.88) with mean difference of 0.31 between person and items were recorded (Figure 1). The infit item was ranged from 1.23 to 0.75; and outfit item was ranged from 1.32 to 0.71, which indicated good psychometric properties of the validated questionnaire (Table 2). Skew and kurtosis values were considered of normal limits (-2.00 to +2.00).



**Figure 1:** Item map of the Arabic 23-item IVLC questionnaire on 20 subjects. Items are represented by item number shown on the right. On the left of the dashed line are the participants, denoted by 'x' ("x"=1 subject). The map shows each item and participant location (the cumulative logit value for the item as a whole) on the logit scale as revealed by the degree of difficulty and participants' perception of ability, respectively. The map also shows the matching between children abilities and item difficulties. Participants with greater VRQOL are near the top of the diagram, and participants with lower VRQOL are near the bottom. Items that are more difficult in subjects with visual impairment are near the bottom of the diagram, and items near the top are those that participants find easier. The scale is in logit units (1 to-1).

**Note:** M=mean, S=1 SD from the mean, and T=2 SDs from the mean

**Table 2:** Final Validated 14-item of the Arabic version IVLC questionnaire.

Item	MnSq infit (ZSTD)	MnSq outfit (ZSTD)	Item measure (SE)
1. Do you find it difficult to go down stairs or to step off the footpath?	1.07(0.5)	0.92(-0.30)	-0.13 ± 0.31
2. Are you confident to make your own way to school?	0.88(-0.6)	0.77(-1.0)	-0.46 ± 0.13
4. Are you confident that you can move around safely in places you don't know in the daytime?	1.12(0.7)	1.01(0.1)	-0.44 ± 0.13
5. Are you confident that you can move around safely in places you don't know at nighttime?	0.96(-0.2)	0.86(-0.7)	0.07 ± 0.12
6. Can you find your friends in the playground at lunch and play time?	1.22(1.3)	1.13(0.7)	0.27 ± 0.12
7. When you are in a room, can you recognize people you know before they speak to you?	0.94(-0.3)	1.02(0.2)	-0.14 ± 0.12
8. Can you take part in games or sports that you want to play with your friends?	0.90(-0.5)	0.88(-0.6)	0.13 ± 0.12
9. Do you get the chance to go to activities other than sport (such as social groups)?	1.23(1.5)	1.32(1.5)	0.61 ± 0.12
10. Has your eyesight stopped you from doing the things that you want to do?	0.75(-1.6)	0.71(-1.6)	0.10 ± 0.12
14. Do you get frustrated?	1.15(0.9)	1.19(1.0)	0.11 ± 0.12
17. In the classroom, do you get all the same information as other students?	0.87(-0.7)	0.84(-0.7)	-0.33 ± 0.13
18. Do you get all the information at the same time as the other students?	0.87(-0.7)	1.05(0.3)	-0.20 ± 0.12
19. Do you get enough time in school to complete the work set by the teacher?	1.18(1.1)	1.17(0.9)	0.34 ± 0.12
22. Do people tell you that you can't do the things that you want to do?	0.92(-0.4)	0.99(0.0)	0.25 ± 0.12

**Note:** MNSq: Mean Square Fit Statistic, ZSTD: fit statistic standardized as a z-score, SE: standard error. Items in bold are misfitted and need to be removed from the scale

Principle Component Analysis (PCA) of residuals depending on factor number one was utilized to compare two subcategories of positive and negative loading >0.3. No significant differences between person estimates of Rasch scaled of the translated questionnaire and both positive and negative subsets, demonstrating unidimensional construct. Five-item positive (no 5, 8, 10, 14 and 19; P=0.51) and six-item negative subset (no 2, 4, 9, 17, 18 and 22; P=0.36) were specified.

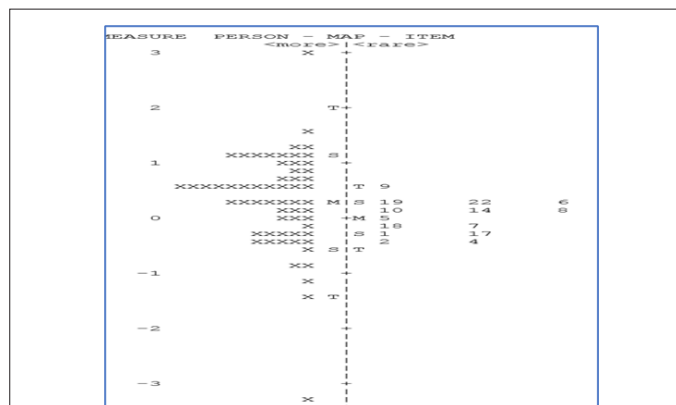
**DISCUSSION**

The study aimed to validate the Arabic IVI-C questionnaire version on school-aged Arabic speaker’s children with visual impairment. The contents of the translated Arabic questions of IVI-C were clear and understood by all children, indicating that the translated questions are matching to Arabian culture.

In the present study, removing the misfitted items enhanced the validity of the Arabic IVI-C questionnaire and increased person separation. Similarly, Gothwal et al. [25] found that deleting the misfitted items (mobility-related items) from the Indian 24-item IVI-C questionnaire improved the validity with resultant good person separation which allowed its use for assessment of VRQoL among Indian visually impaired children. However, another study by Gothwal et al. [25] conducted in South Australia found that visual function and QoL questionnaire was not a valid QoL measurement even after removing the misfitted items in which person separation was not improved.

In the present study, the final 14-item Arabic version IVI-C questionnaire include different domains such as visual function, social interaction, school/specialist instruction and vision impairment peer interaction. Item-person map of 14-item IVI-C questionnaire (Figure 2) revealed that item no. 9 was the most difficult for children with visual impairment, assessing physical activity. However, Cochrane et al. [23] reported that in the 24-item of the IVI-C questionnaire, item no. 3&5 were the most difficult items for Australian children with visual impairment which assess self-esteem and confident. Gothwal et al. [25] found that the most difficult items in Indian version of the IVI-C questionnaire were item number 11 followed by item number 23 that assess confidence and family well-being.

The present study found that the easiest items are item no. 2 and 4 that assess self-esteem (Figure 2). Indeed, this item can also assess mobility in addition to self-esteem as the content of the question is about moving, which could be understood and was concerned by children with visual impairment. In contrast, Cochrane et al. [23] reported items no 1&16 were the easiest assessing the mobility ability and school/specialist instruction domains respectively. Similarly, Gothwal et al. [25] reported that the easiest items for Indian children with visual impairments were item no. 1 in addition to item no. 17, assessing school/specialist instruction domains.



**Figure 2:** The Person-item map for the 14-item IVI-C and 60 participants. Items are denoted by item number shown on the right. On the left of the dashed line are the participants, represented by x (“x”=1 subject). The map shows each item and participant location (the cumulative logit value for the item as a whole) on the logit scale as determined by the degree of difficulty and participants’ perception of ability, respectively. The map shows good matching between children abilities and item difficulties. Subjects with greater VRQoL are near the top of the diagram, and participants with lower VRQoL are near the bottom. Items that are more difficult in participants with visual impairment are near the bottom of the diagram, and items near the top are those that participants find easier. Skew and kurtosis values of items scale were within normal limits (-2.00 to +2.00), Skew and kurtosis values of persons scale were exceeded the normal limit (-3.00 to +3.00 due to a person with high ability was at the top of the scale and another person at the bottom of the scale with least ability). Note: M= mean, S=1 SD from the mean, and T=2 SDs from the mean

Based on our data, only three participated children with visual impairment used low vision aids (i.e. telescope and magnifier) (Table 1), which suggested the demands of low vision aids for these population. Future research is recommended to compare VRQoL between children with visual impairment and controls using the validated Arabic 14-item IVI-C questionnaire.

**CONCLUSION**

The 14-item Arabic version of IVI-C questionnaire is a valid, reliable and unidimensional method that can be used by clinicians and researchers to assess VRQoL in Arabic speakers visually impaired children. The Arabic IVI-C questionnaire includes several VRQoL domains including visual functions, social interaction, self-esteem, accessed school/specialist instruction, and vision impairment peer interaction.

**CONFLICTS /COMPETING INTERESTS**

The authors state no possible conflicts of interest with respect to the authorship, or publication of this article

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**DISCLOSURE**

This study has no financial or proprietary interests.

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