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

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Outline

- Low vision
- The IVI-C Questionnaire
- Pilot study
- Main study
- Discussion
- Conclusion

Low Vision

A person with low vision is the one who has impairment of visual functioning even after treatment and/or standard refractive correction, and has a visual acuity of less than 6/18 to light perception, or a visual field of less than 10 degree from the point of fixation, but who uses, or is potentially able to use, vision for planning and/or execution of a task. [1,2]

Vision-related quality of life (VRQoL)

Aspect of quality of life

- Social interaction
- Physical activity
- Self-esteem
- Happiness
- Emotional wellbeing
- School performance [3]

Background

- The IVI_C questionnaire is psychometric tool contains many aspects of VRQoL that concern children with low vision including:

  - ❖ Social interaction
  - ❖ Academic performance
  - ❖ Mobility
  - ❖ Daily functioning
  - ❖ Depression
  - ❖ Life stress
  - ❖ Satisfaction. [4]

- The IVI-C questionnaire was translated to many languages and validated in many countries such as China [5], Germany [6] , India [7], and Australia[8] using different translation.
- However, VRQoL in Saudi children with visual impaired was not accessed as there is no Arabic valid tool in the literature that can be used.

Aim

- To test the validity and reliability of the Arabic version of the IVI_C questionnaire on school-aged children with visual impairment in SA.

Hypothesis

- The Arabic version of the IVI_C questionnaire is reliable and valid tool which can be used to assess VRQoL on school aged children with vision impairment in SA.

- This hypothesis was based on previous studies which validated the IVI-C in many languages such Mandarin, Deutsch and Telugu for children with visual impairment.

Methodology

- **Ethics approval:** KSU-CAMS and IRB of KKESH
- **Study design:** Cross sectional study
- **Recruitment:** Low vision clinic at KKESH, KAUH and eye consultant clinic, Riyadh (March 2017-March 2018).
- **Subject:** School aged children (8 to 18 years) with visual impairment from both gender.
- **Inclusion criteria:** Children's visual acuity < 0.3 logMAR with BCVA.
- **Exclusion criteria:** Children with cognitive, hearing or speech disability.
- **Visual examination**: VA (Log MAR chart), CS (Pelli-Robson chart).
- **Sample size:** for Rasch analysis, 69 to 115 subjects.
- **Translation the IVI-C questionnaire**: Arabic/English, back translated to Arabic.

IVI-C questionnaire

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The questions are all about how things are for you **because of your eyesight.**

Q.		always	almost always	sometimes	almost never	never	no, for other reasons
1	Do you find it difficult to go down stairs or to step off the footpath?	0	1	2	3	4	8
2	Are you confident to make your own way to school?	4	3	2	1	0	8
3	Are you confident to use public transport (such as buses, trains, ferries) by yourself?	4	3	2	1	0	8
4	Are you confident in places you don't know?	4	3	2	1	0	8
5	Are you confident that you can move around safely in places you don't know in the daytime?	4	3	2	1	0	8
6	Are you confident that you can move around safely in places you don't know at night-time?	4	3	2	1	0	8
7	Can you find your friends in the playground at lunch and play time?	4	3	2	1	0	8
8	When you are in a room, can you recognise people you know before they speak to you?	4	3	2	1	0	8
9	Can you take part in games or sports that you want to play with your friends?	4	3	2	1	0	8
10	Do you get the chance to go to activities other than sport (such as social groups)?	4	3	2	1	0	8
11	Has your eyesight stopped you from doing the things that you want to do?	0	1	2	3	4	8
12	Do other students help you when you ask them for help?	4	3	2	1	0	8

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The questions are all about how things are for you **because of your eyesight.**

Q.		always	almost always	sometimes	almost never	never	no, for other reasons
13	Do other students help you to join in with them?	4	3	2	1	0	8
14	Do you find it hard to join in with other students?	0	1	2	3	4	8
15	Do you get frustrated?	0	1	2	3	4	8
16	Do other students understand your special needs?	4	3	2	1	0	8
17	Do your teachers understand your special needs?	4	3	2	1	0	8
18	In the classroom, do you get all the same information as other students?	4	3	2	1	0	8
19	Do you get all the information at the same time as the other students?	4	3	2	1	0	8
20	Do you get enough time in school to complete the work set by the teacher?	4	3	2	1	0	8
21	When you are in the classroom, are you confident about asking for help you need?	4	3	2	1	0	8
22	When you ask for help, do people understand how much help you need?	4	3	2	1	0	8
23	Do people tell you that you can't do the things that you want to do?	0	1	2	3	4	8
24	Do people stop you from doing the things you want to do?	0	1	2	3	4	8

Rasch analysis (Winsteps)

The criteria to guide validation of the questionnaire was followed as:

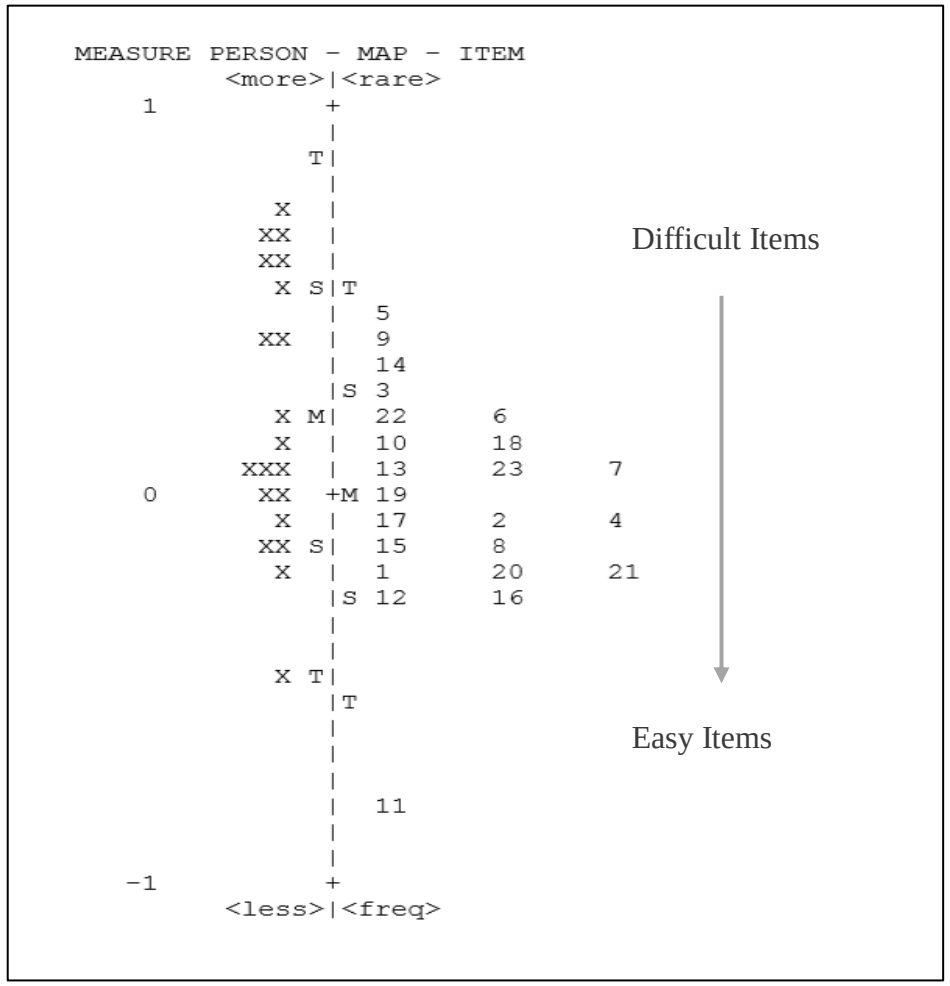
1. Infit mean outside 0.7 to 1.30
2. Outfit mean outside 0.70 to 1.30
3. Item with mean furthest from subject mean
4. High proportion of missing data (>50%)
5. Ceiling effect a high proportion of responses in item end response category (>50%)
6. Items with markedly different standard deviation of item scores to other items
7. Items that do not demonstrate a normal distribution, as identified using histogram plots, tests of normality such as Kolmogorovian or Shapiro-Wilk, or Skewness and Kurtosis values outside -2.00 to +2.00. [9]

Pilot study

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

	Vision-Impaired Group (n=20)
Gender	
Boys	12 (60%)
Girls	8 (40%)
Age (Mean ± SD)	13.5 ± 3.12 years
Ocular Condition	
Congenital	16 (80%)
Juvenile/degenerative	4 (20%)
None	-
Low Vision Aids Used	
Optical and non-optical	3(15%)
Optical only	14(70%)
Non-optical only	-
None	3(15%)
	VA better eye number (%)
VAD	
≤ 0.3 LogMAR	0(0%)
> 0.3 ≤ 0.9 LogMAR	10(50%)
> 0.9 ≤ 1.6 LogMAR	7(35%)
> 1.6 ≤ 2.6 LogMAR	3(15%)
VAN	
≤ 0.3 LogMAR	5(25%)
> 0.3 ≤ 0.6 LogMAR	4(25%)
> 0.6 ≤ 1.1 LogMAR	11(55%)
CS	
Low	7(35%)
Moderate	11(55%)
Normal	2(10%)

Item- map of 23-items IVI-C questionnaire



Person map of the 23-item IVI_C questionnaire

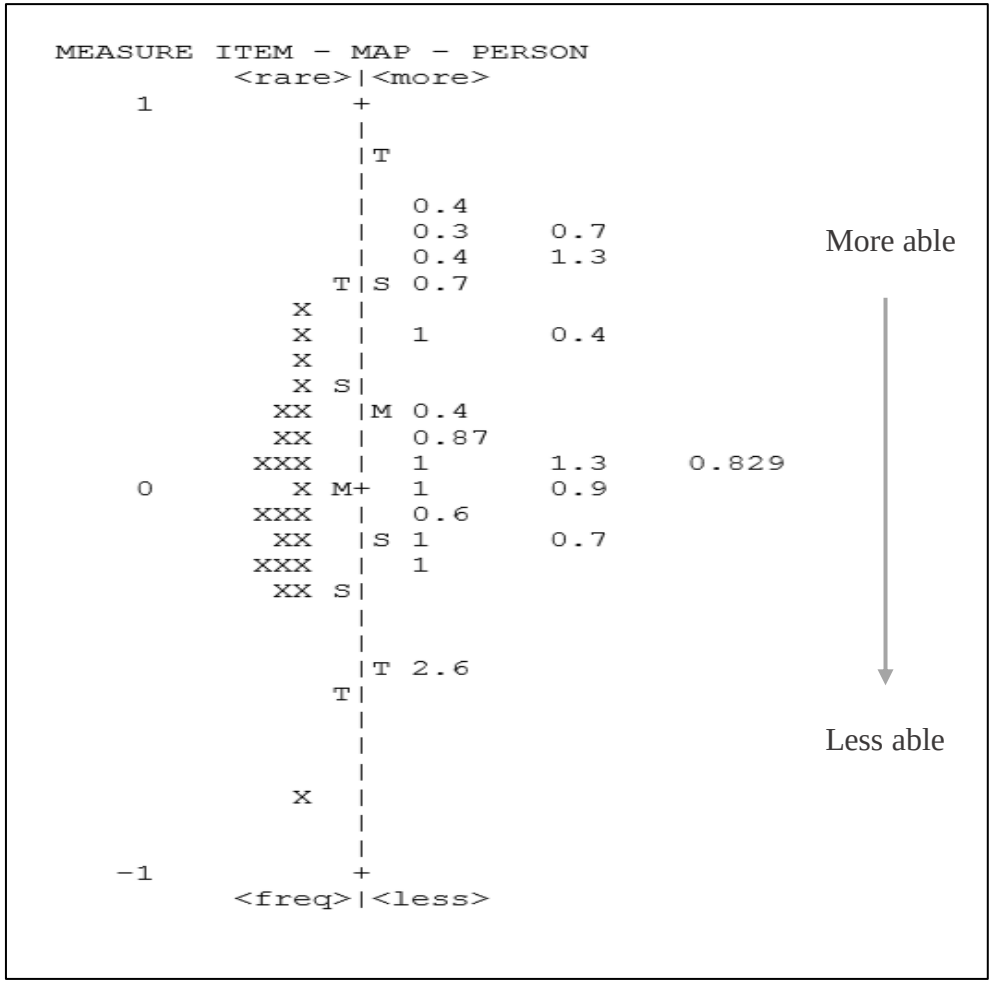


Figure 1: The Person-item map for the 23-item IVI-C showed good matching between children's abilities and item difficulties. Skew and kurtosis values were within normal limits (-1.00 to +1.00). **Person separation =1.72**, person reliability = 0.75; The Cronbach alpha =0.79, The mean difference between person and items = 0.20.

Table 2: Descriptive statistics, Rasch fit statistics of the 23-item of IVI_C questionnaire

Items	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(0.3)	0.95(-0.1)	-0.20±0.17
2. Are you confident to make your own way to school?	1.20(0.8)	1.20(0.8)	-0.08±0.17
3. Are you confident in places you don't know?	**0.63(-1.7)**	**0.61(1.7)**	0.27±0.16
4. Are you confident that you can move around safely in places you don't know in the daytime?	1.00(0.1)	0.95(-0.1)	-0.06±0.17
5. Are you confident that you can move around safely in places you don't know at nighttime?	0.90(-0.3)	0.87(-0.4)	0.46±0.17
6. Can you find your friends in the playground at lunch and play time?	**1.57(2.1)**	**1.52(1.9)**	o.22±0.16
7. When you are in a room, can you recognize people you know before they speak to you?	0.86(-0.5)	0.82(-0.7)	0.08±0.16
8. Can you take part in games or sports that you want to play with your friends?	0.84(-0.6)	0.82(-0.6)	-0.11±0.17
9. Do you get the chance to go to activities other than sport (such as social groups)?	**1.63(2.2)**	**1.59(1.9)**	0.41±0.17
10. Has your eyesight stopped you from doing the things that you want to do?	0.73(-1.2)	0.71(-1.2)	0.11±0.16
11. Do other students help you when you ask them for help?	1.25(0.7)	1.35(0.8)	-0.78±0.24
12. Do other students help you to join in with them?	1.11(0.5)	0.96(0.0)	-0.29±0.18
13. Do you find it hard to join in with other students?	**0.60(-1.9)**	**0.62(-1.7)**	0.08±0.16
14. Do you get frustrated?	1.17(0.8)	1.18(0.7)	0.32±0.17
15. Do other students understand your special needs?	1.30(1.2)	1.27(1.0)	-0.11±0.17
16. Do your teachers understand your special needs?	**1.59(2.00)**	**1.71(1.9)**	-0.26±0.18
17. In the classroom, do you get all the same information as other students?	0.74(-1.1)	0.76(-0.9)	-0.08±0.17
18. Do you get all the information at the same time as the other students?	0.85(-0.6)	0.83(-0.6)	0.11±0.16
19. Do you get enough time in school to complete the work set by the teacher?	0.94(-0.2)	0.89(-0.3)	0.00±0.17
20. When you are in the classroom, are you confident about asking for help you need?	0.99(0.1)	1.01(0.1)	-0.17±0.17
21. When you ask for help, do people understand how much help you need?	1.21(0.9)	1.17(0.6)	-0.20±0.17
22. Do people tell you that you can't do the things that you want to do?	0.68(-1.4)	0.70(-1.2)	0.22±0.16
23. Do people stop you from doing the things you want to do?	**0.39(-3.3)**	**0.41(-2.9)**	0.08±0.16

MNSq: mean square fit statistic, ZSTD: fit statistic standardised as a z-score, SE: standard error.

Category probability curve of the scale

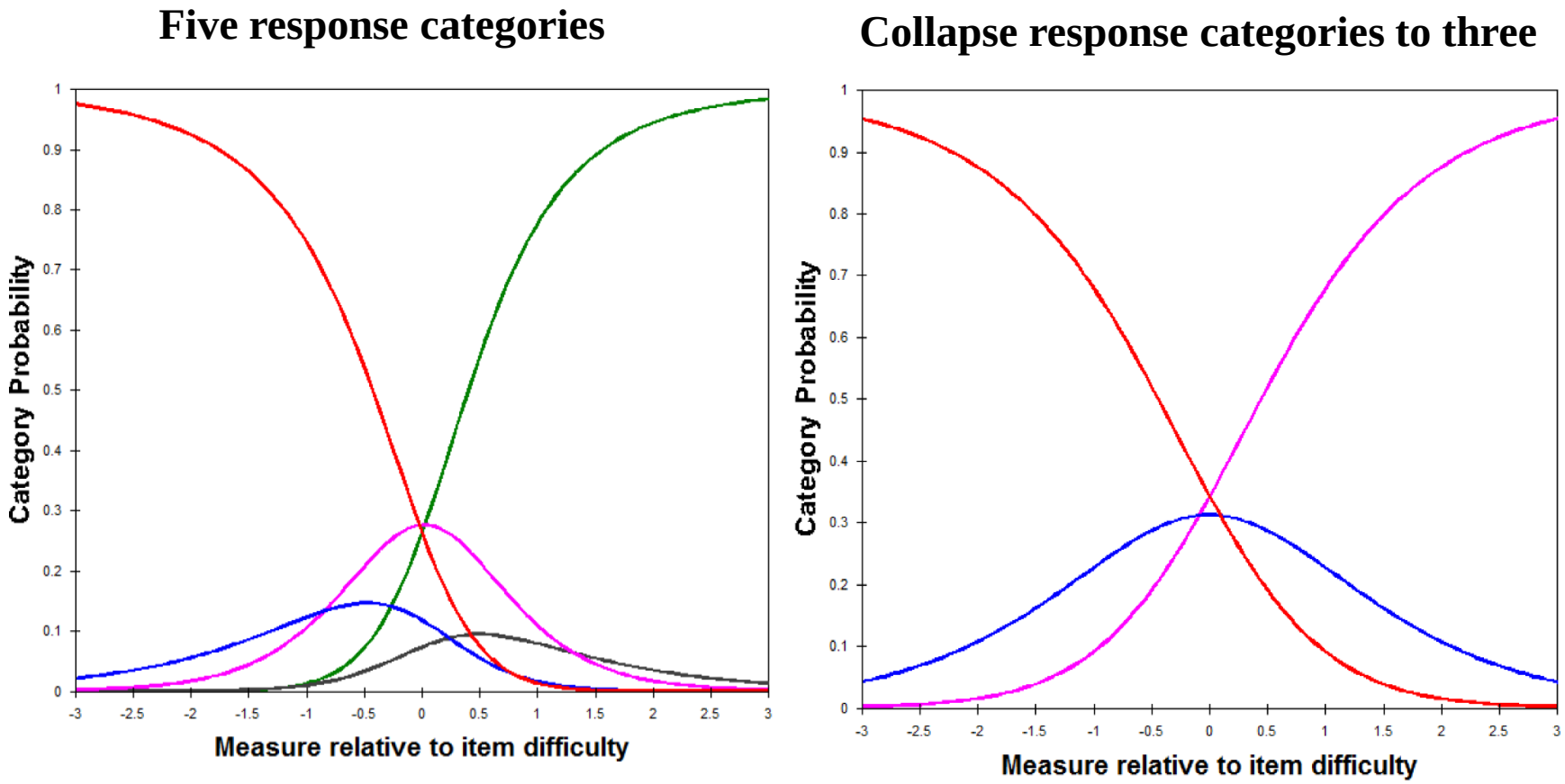


Figure 2. Category probability curve showing disordered thresholds for item number 1 of the IVI-C questionnaire. 0, never; 1, almost never; 2, sometimes; 3, almost always; 4, always. Category probability curve showing the ordered thresholds for the same item after category collapse. 0, never; 1 sometimes; 2, always.

Collapsing the response categories and removing the misfitted items

- The 19- items Arabic version IVI-C questionnaire showed good infit and outfit mean.
- Person separation 2.00 (border line acceptable), person reliability 0.80.

- The 19-item of the Arabic version IVI-C questionnaire is valid and reliable tool on school aged children with vision impaired in SA.

- These items include several VRQoL domains such as accessed school/specialist instruction, social interaction, family, community and vision impairment peer interaction.

Main Study

- **Table 3: Demographic and vision measurements of the participants**

	Vision-Impaired Group (n=60)
Gender	
Boys	32 (53.33%)
Girls	28 (46.66%)
Age (Mean ± SD)	12.13 ± 3.24 years
Ocular Condition	
Congenital	40 (66.66%)
Juvenile/degenerative	20(33.33%)
None	-
Low Vision Aids Used	
Optical and non-optical	3(5%)
Optical only (spectacles)	37(60.66%)
Non-optical only	-
None	20(33.33%)
	VA better eye number (%)
VAD	
≤ 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%)

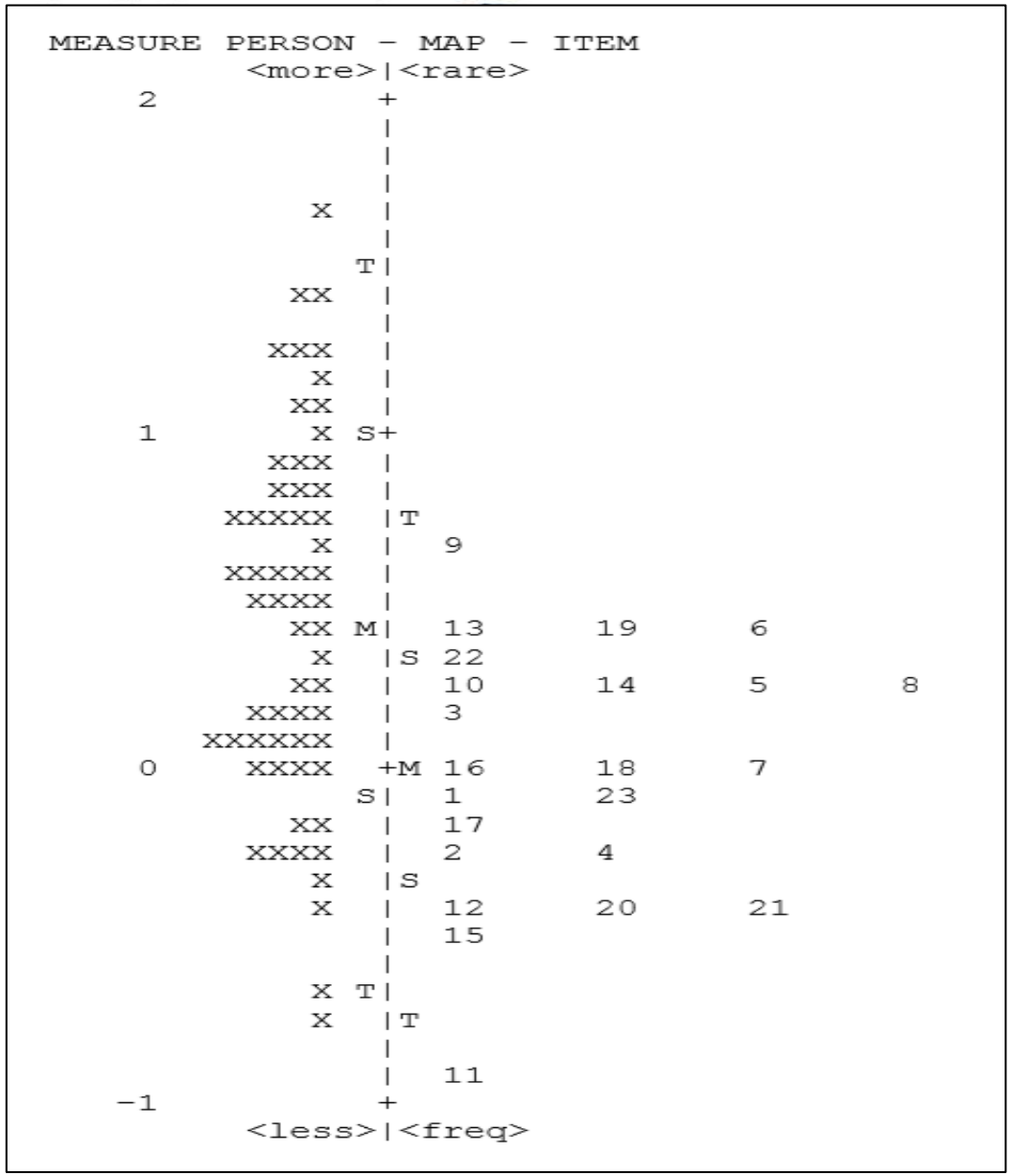


Figure 3. The Person-item map for the 23-item IVI-C showed good matching between children's abilities and item difficulties. Skew and kurtosis values were within normal limits (-1.00 to +2.00). **Person separation =2.21**, person reliability = 0.83; The Cronbach alpha =0.87, The mean difference between person and items = 0.43.

Table 4: Descriptive statistics, Rasch fit statistics of the 23-item of IVI_C questionnaire

Items	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?	1.21(1.2)	1.09(0.5)	-0.12±0.12
2. Are you confident to make your own way to school?	0.98(0.0)	0.92(-0.3)	-0.25±0.12
3. Are you confident in places you don't know?	**0.59(-0.3)**	**0.56(-0.3)**	0.17±0.11
4. Are you confident that you can move around safely in places you don't know in the daytime?	1.08(0.5)	1.07(0.4)	-0.230.12
5. Are you confident that you can move around safely in places you don't know at nighttime?	0.97(-0.1)	0.93(-0.4)	0.21±0.11
6. Can you find your friends in the playground at lunch and play time?	1.19(1.2)	1.13(0.8)	0.83±0.11
7. When you are in a room, can you recognize people you know before they speak to you?	0.78(-1.4)	0.72(-1.7)	0.03±0.11
8. Can you take part in games or sports that you want to play with your friends?	0.84(-1.0)	0.85(-0.9)	0.26±0.11
9. Do you get the chance to go to activities other than sport (such as social groups)?	1.11(0.7)	1.14(0.9)	0.68±0.11
10. Has your eyesight stopped you from doing the things that you want to do?	0.80(-1.3)	0.77(-1.4)	0.24±0.11
11. Do other students help you when you ask them for help?	**1.41(1.6)**	**1.62(1.9)**	-0.92±0.16
12. Do other students help you to join in with them?	1.21(1.1)	1.11(0.5)	-0.40±0.13
13. Do you find it hard to join in with other students?	0.68(-2.3)	0.67(-2.2)	0.45±0.11
14. Do you get frustrated?	1.08(0.5)	1.06(0.4)	0.25±0.11
15. Do other students understand your special needs?	**1.57(2.6)**	**1.49(1.9)**	-0.52±0.13
16. Do your teachers understand your special needs?	**1.71(3.7)**	**2.15(4.9)**	-0.1±0.12
17. In the classroom, do you get all the same information as other students?	0.70(-2.0)	0.68(-1.8)	-0.13±0.12
18. Do you get all the information at the same time as the other students?	0.73(-1.8)	0.71(-1.8)	-0.02±0.12
19. Do you get enough time in school to complete the work set by the teacher?	1.06(0.5)	1.09(0.6)	0.45±0.11
20. When you are in the classroom, are you confident about asking for help you need?	1.21(1.1)	1.24(1.1)	-0.43±0.13
21. When you ask for help, do people understand how much help you need?	**1.23(1.2)**	**1.57(2.3)**	-0.40±0.13
22. Do people tell you that you can't do the things that you want to do?	0.76(-1.7)	0.74(-1.7)	0.37±0.11
23. Do people stop you from doing the things you want to do?	**0.51(-2.5)**	**0.51(-3.6)**	-0.06±0.12

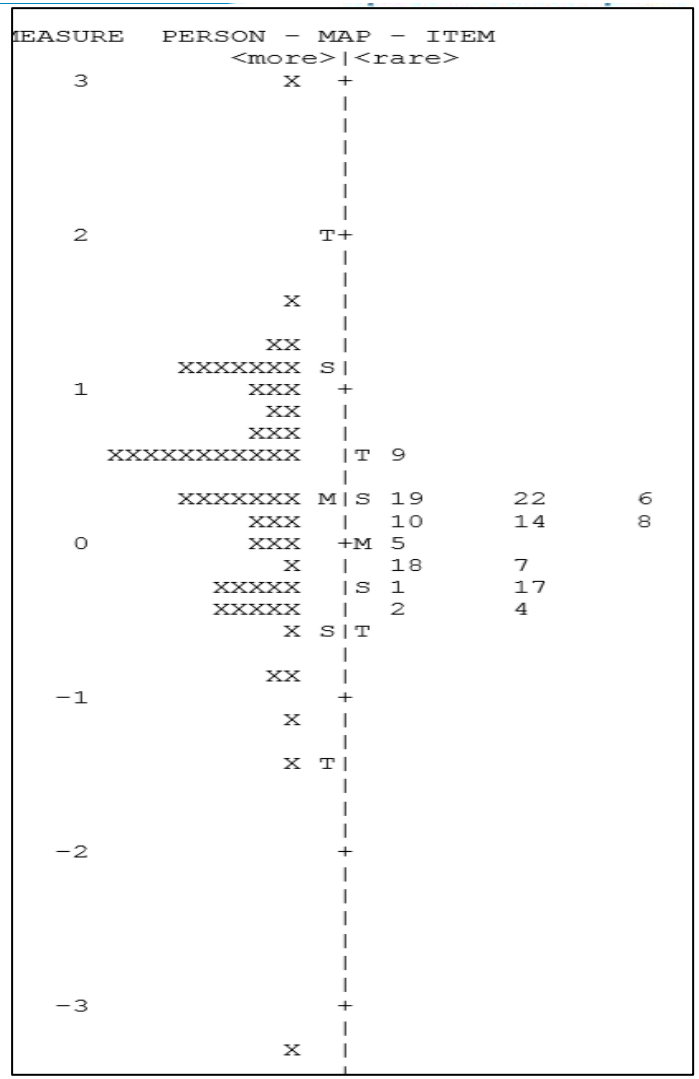
MNSq: mean square fit statistic, ZSTD: fit statistic standardised as a z-score, SE: standard error.

Results of the 17-item of IVI-C questionnaire

The person separation	2.33
The person reliability	0.84
The Cronbach alpha	0.88
The mean difference between person and items	0.37

- There are three misfitted items (no. 12, 13, 20)

Item- map of the final 14-item of the IVI-C questionnaire



MEAN	32.9	14.0	.31	.28	.98	-.2	.99	-.2
P.SD	12.1	.0	.87	.13	.59	1.7	.62	1.7
S.SD	12.2	.0	.88	.13	.60	1.7	.63	1.7
MAX.	55.0	14.0	3.05	.99	2.82	3.8	3.36	4.4
MIN.	1.0	14.0	-3.28	.22	.23	-3.5	.23	-3.4

REAL RMSE .33 TRUE SD .81 SEPARATION 2.43 PERSON RELIABILITY .86
MODEL RMSE .31 TRUE SD .82 SEPARATION 2.63 PERSON RELIABILITY .87
S.E. OF PERSON MEAN = .11

PERSON RAW SCORE-TO-MEASURE CORRELATION = .95
CRONBACH ALPHA (KR-20) PERSON RAW SCORE "TEST" RELIABILITY = .88 SEM = 4.11

SUMMARY OF 14 MEASURED ITEM

TOTAL			MODEL		INFIT		OUTFIT	
SCORE	COUNT	MEASURE	S.E.	MNSQ	ZSTD	MNSQ	ZSTD	
MEAN	141.1	60.0	.00	.12	1.00	.0	.99	.0
P.SD	20.8	.0	.31	.00	.15	.9	.17	.8
S.SD	21.5	.0	.32	.00	.15	.9	.17	.8
MAX.	171.0	60.0	.61	.13	1.23	1.4	1.32	1.5
MIN.	99.0	60.0	-.46	.12	.75	-1.6	.71	-1.6

REAL RMSE .13 TRUE SD .28 SEPARATION 2.22 ITEM RELIABILITY .83
MODEL RMSE .12 TRUE SD .28 SEPARATION 2.31 ITEM RELIABILITY .84
S.E. OF ITEM MEAN = .09

Figure 4. The Person-item map for the 14-item IVI-C showed good matching between children's abilities and item difficulties. Skew and kurtosis values were outside normal limits (-2.00 to +2.00).

Final Validated 14-item of the Arabic version IVI-C 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

MNSq: mean square fit statistic, ZSTD: fit statistic standardised as a z-score, SE: standard error.

Discussion

- The aim of this study was to validate the Arabic version of the IVI_C questionnaire on school-aged children with visual impairment in SA.
- Our result showed that the **final 14-items** was reliable and valid tool and can be used to assess VRQoL on school aged children with visual impairment in SA.
- In this study, removing the misfitted items and collapsing the response categories enhanced the validity of the Arabic version of the IVI-C questionnaire and increased person separation.
- Similarly, Gothwal et al. (2013)[7] found that deleting the misfitted items from the Indian version of 24-item IVI_C questionnaire, improved the validity and resulted in 17-item IVI_C with good person separation (2.04).
- However, Gothwal et al. (2009) [10] found that the visual function and QoL questionnaire was invalid measure among South Australia population even after removing the misfitted items as the person separation did not improve.

Discussion

- Item no. 9 (*Do you get the chance to go to activities other than sport (such as social groups?)* was the most difficult item for children with visual impairment, which assess physical activity.

- Items no. 2 (*Are you confident to make your own way to school?)*
- and Item no. 4 (*Are you confident that you can move around safely in places you don't know in the daytime?)* were easiest items, which assess self-esteem (Figure 4).

- Cochrane et al. (2011) [8] reported that, the easiest items were:

Item no 1 "*Do you find it difficult to go down stairs or to step off the Footpath*" which assess the mobility ability.

Item no 16 "*Do your teachers understand your special needs"* which assess the school/specialist instruction domains.

- Gothwal et al. (2013) [7] found that the easiest items for Indian children with visual impairment were similar to Cochrane et al. study.

- Cochrane et al. (2011) [8] reported that, the most difficult items were:

Item no 5 "*Are you confident that you can move around safely in place that you don't know at night time?*" which assess self-esteem and confident and

Item no 3 *"Are you confident in place that you don't know "* which assess self-esteem and confident aspect.

- Gothwal et al. (2013) [7] found that self-esteem, confident, family well-being (items no. 10 & 22) were difficult for Indian children with visual impairment.

- Based on our data, only 7 participated children with visual impairment out of 60 participated children were used low vision aids (i.e. telescope and magnifier) which suggested the need of low vision aids for children with visual impairment. This depends on the severity of their VA, which can be assessed by low vision specialists.

Conclusion

- The 14-item of the Arabic version of IVI-C questionnaire is valid and reliable tool on school aged children with vision impairment in SA, which can be used to assess VRQOL in children with visual impairment in Arabian countries.

- These items include several VRQoL domains such as accessed school/specialist instruction, social interaction, family, community and vision impairment peer interaction.

Future research

To compare VRQOL between children with visual impairment and controls.

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Thank You

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