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validity and reliability multiple intelligent item using rasch measurement model

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Abstract

This study was undertaken to produce empirical evidence of validity and reliability of the item using a survey questionnaire Multiple Intelligences (MI) analyzed using Rasch Model for polythomus data aided by Winstep software.The questionnaire was conducted on 179 students from Selangor with MI instruments @ e-MyMICA.The results showed that all the PTMEA Corr is in positive values, where an item is able to distinguish between the ability of respondents. Based on the MNSQ infit and outfit range is 0.60-1.4 Statistical data obtained show that out 81 items 12 items from the instrument suggested to be omitted.
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Keywords: Multiple Intelligences; Rasch measurement model; item analysis; Validity; reliability.

1. Introduction

Rasch model of measurement has proved that the MI Questionnaire has a level of validity and reliability to be used in the measurement of MI Questionnaire. Adequacy is defined in terms of disparity of the parameters (Fisher, 1934) and is considered a special relation to the separation of individual and item parameters in the Rasch model (Masters & Wright, 1984). Rasch Measurement Model is a measurement model that is formed as a result of the consideration that takes into account the ability or the ability of the candidate or the respondent who answered questionnaires, tests or instruments and the difficulty of each test item or items (Rasch, 1980).

The study of the validity and reliability of the instrument is very important to maintain the accuracy of the questionnaire from defect. According to Howard and Henry (1988) consistency means that when the same item is tested several times on the same subject at different time intervals, the score results or the answers given are approximately the same. In short, the reliability is only possible to provide consistency validity.

The purpose of this study was to determine the item reliability to construct MI. This study was undertaken to produce empirical evidence of validity and reliability of MI Questionnaire using Rasch Measurement Model.

The objective of the study are as follows: (1) identify the validity of Multiple Intelligences Test item instrument using Rasch Measurement Model, (2) identify reliability Multiple Intelligences Test item instrument using Rasch measurement model, (3) identify the adequacy of the separation index of the Multiple Intelligences Test item

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instrument, (4) identify the point measure correlation in the construct of Multiple Intelligences test instruments which are in the acceptable range, (5) identify the fit items in the construction of the items Multiple Intelligences Test instruments within the acceptable range.

2. Methodology

This study used a survey technique with a set of questionnaire adapted from the Multiple Intelligences Checklist for Adult (MICA) by Amstrong (1994) and the Curriculum Development Centre (2003). The questionnaire contains 81 items five-point Likert scale representing only nine domains of MI . The samples of the study are based on the random selection of samples using e-MyMICA. Data were analyzed using SPSS for Windows Version 11.0. Then the data was collected and analyzed based on polithomus data Rasch model by using computer applications, WINSTEPS (Linacre).

3. Findings

3.1. Realibility and Separation Index

Table 1: Reliability Analysis and Separation of Multiple Intelligences Index

Construct	ID Item	Item Measure		Person Measure	
		Reliability	Separation (standard error)	Reliability	Separation (standard error)
Logic Mathematic	lm1 – lm9	0.97	5.46	0.74	1.69
Visual Linguistic	vl1 – vl9	0.97	5.48	0.62	1.28
Visual Space	vr1 – vr9	0.95	4.38	0.84	1.85
Muzic	mz1 – mz9	0.98	6.94	0.65	1.37
Body Kinesthetic	kb1 – kb9	0.99	8.22	0.71	1.56
Interpersonal	ie1 – ie9	0.95	4.28	0.78	1.88
Intrapersonal	ia1 – ia9	0.93	3.58	0.75	1.72
Naturalist	na1 – na9	0.98	7.99	0.78	1.89
Spirituality	kr1 – kr9	0.99	8.80	0.74	1.70

In order to determine the reliability of MI Test item instrument using Rasch measurement model and to what extent the adequacy of separation index item instrument of the MI Test, Table 1 shows the statistics generated by Rasch analysis of MI. The statistics shown indicate how Rasch model conform to item separation index and person separation index and the item reliability and person reliability.

Rasch analysis produces individual separation index and items. Individual isolation index indicates the number of strata capabilities identified in the sample group. The item separation index shows the separation of item difficulty level. The value of individual isolation and the item which is more than the value of 2 is considered as good (Linarce 2005). The value of separation index > 2.0 is grade measurement system caused by only one or two observations, the value of between 1.5 to 2.0 is not productive for the development of measurement but not demeaning, values between 0.5 to 1.5 and the productivity measurement < 0.5 is less productive for measurement, but do not lower the grade thus eliminates confusion and isolation of a high reliability coefficients (Linarce 2005).The reliability value of > 0.8 were accepted as high value while the value of reliability between 0.6 to 0.8 and the value which is less than 0.6 is not acceptable for reliability (Bond & Fox, 2001).

Table 1 shows that the separation person measure index for the constructs are as follow Logic Mathematic(LM):1.69, Visual Space(VR):1.85, Body Kinesthetic(KB):1.56, Interpersonal(IE):1.88, Intrapersonal(IA):1.72, Naturalist(NA):1.89 and Spiritually (KR):1.70. Individual separation index for all that

constructs indicate that the number of strata which measured the ability of individuals are on 2 standard errors. Meanwhile the separation person measure index for the constructs are as follow: Visual Linguistics (VL):1.28 and Music(MZ):1.37. Person measure separation index for VL and MZ indicates the number of strata that measured the ability of individuals on 1 standard errors.

Separation item measure index for the constructs are LM:5.46, VL:5.48,VR:4.38, MZ:6.94, KB:8.22, IE:4.28, IA:3.58,NA:7.99 and KR:8.80 are good.All the separation of item are good item and this in accordance with the proposed Linarce (2005) which states the separation of > 2 is good.

According with Bond & Fox (2001) where the value reliability which is more than 0.8 is acceptable and has strong value while value less than 0.8 less acceptable. The reliability person measure for the constructs are such; LM:0.74, VL:0.62, MZ:1.56, KB:0.71, IE:0.78, IA:0.75,NA:0.78 and KR:0.74. All these constructs have the reliability person measures < 0.8 which is less acceptable. However the reliability person measure for the construct is VR:0.84 is the value of > 0.8 is acceptable and strong values. Reliability item measure for the constructs are as follow; LM:0.97, VL:0.97,VR:0.95, MZ:0.98, KB:0.99, IE:0.95, IA:0.93,NA:0.98 and KR:0.99. The values of reliability person measure of these constructs are acceptable and considered strong because they are > 0.8.

This study concentrates only on the separation of items. The value of the item separation refers to the number of strata of item difficulties obtained in the test set used. As shown in Table 1 the value indicate that the items develop are well spread and the items are on the logit scale with high reliability. The value of the separation index of all respondents and item constructs are well in lined with the recommendations by Linarce (2005) which states that the separation value index of > 2 is good.

3.2. Item Polarity

Table 2 shows the valueof PTMEA Corr in the MI test instruments as generated by Rasch analysis of MI. According to Rasch Measurement Model, the validity of a questionnaire can be identified by referring to the analysis of the output program. The main output to be referred to is the polarity item so as to find a correlation coefficient of measurement-point which is known as *point-measure correlation Coefficient* (PTMEA Corr).

A high PTMEA Corr means that an item is able to distinguish between the ability of respondents. A negative value or zero indicates that the link for the item response or respondent is in conflict with the variable or construct (Linacre 2003).Table 2 shows that each PTMEA Corr is more than 0.38. Therefore, it can be concluded that the items will contribute to the measurement of MI respondents. This can discriminate or differentiate between different types of intelligence held by the respondents.

Table 2: Analysis of Multiple Intelligences PTMEA

Construct	LM	VL	VR	MZ	KB	IE	IA	NA	KR
Item 1	0.53	0.56	0.58	0.55	0.65	0.71	0.61	0.55	0.66
Item 2	0.56	0.75	0.71	**0.38**	0.65	0.73	0.40	0.61	0.51
Item 3	0.55	0.70	0.71	0.53	0.58	0.54	0.66	0.66	0.49
Item 4	0.65	0.55	0.55	0.59	0.59	0.53	**0.77**	0.69	0.66
Item 5	0.43	0.57	0.60	0.61	0.55	0.70	**0.77**	0.68	0.68
Item 6	0.58	0.56	0.65	0.45	0.54	0.50	0.64	0.57	0.63
Item 7	0.60	0.61	0.61	0.46	0.43	0.59	0.58	0.62	0.72
Item 8	0.65	0.58	0.64	0.45	0.60	0.70	0.58	0.58	0.55
Item 9	0.55	0.61	0.67	0.71	0.44	0.68	0.39	0.53	0.47

3.3. Item Fit and Item Misfit

Table 3: List of misfit items that need to be addressed or dropped based on the analysis PTMEA, Infit, outfit for the item of MI.

Type constructs	Item Misfit	Removed the items proposed			Total Item	Item Omit	Permanent items
		PTMEA	infit	outfit			
Logic Mathematical	lm2	0.56	1.44	1.43	9	2	7

	lm8	0.65	0.58	0.60			
Visual Linguistics	vl5	0.57	1.44	1.46	9	2	7
	vl8	0.58	0.68	0.40			
Visual Space	vr1	0.58	1.42	1.48	9	2	7
	vr5	0.60	1.43	1.26			
Music	mz6	0.45	1.46	1.42	9	2	7
	mz9	0.71	0.54	0.54			
Kinesthetic body	kb6	0.54	1.48	1.47	9	1	8
Interpersonal	-	-	-	-	9	-	9
Intrapersonal	ia2	0.40	1.57	1.59	9	1	8
Naturalist	-	-	-	-	9	-	9
Spirituality	kr2	0.51	1.40	1.44	9	2	7
	kr3	0.49	1.38	1.45			
				Total item construct =	81	12	69

Table 3 shows the appropriate item fit of MI test instrument as generated by Rasch analysis.Rash model analysis estimates the degree of suitability of items measuring a latent variable.The construct validity of MI is derived from the study of each item. Infit mean square value and mean square outfit of each item and respondents were calculated. According to Wright and Linacre (1992), the total mean square infit and outfit mean square of each item and the respondent must be located within 0.6 to 1.5, while Bond and Fox (2007) claimed that the mean square of two infits and outfit of each item and the respondent must be located within 0.6 to 1.4. If an individual item does not meet this requirement, then it will be considered for elimination.For the purpose of this research,the researcher used the total mean square infit and the outfit in the range proposed by Bond and Fox (2007).

The analysis showed that the mean square infit item is 0.54 to 1.57 and outfit mean square value of the item is 0.40 to 1.59 for all constructs. It can be concluded that there are 12 items to be removed as seen in the table 3, it was found that two constructs removed from the constructs Mathematical Logic (lm2 and lm8), Verbal Linguistics (vl5 and vl8), Visual Spatial (vr1 and vr5), Spirituality (kr2 and kr3) and Music (mz6 and mz9), while one construct from kinesthetic body (kb6) and intrapersonal (ia2). 12 items should be removed because all of infit and outfit mean square radius is outside the range 0.6 to 1.4 proposed by Bond and Fox (2007). Meanwhile for the interpersonal and naturalist constructs no items that needs to be removed as the infit and outfit mean square is in the range of 0.6 to 1.4 as proposed by Bond and Fox (2007).

4. Dicussion

Through findings of this study, researchers found that young students have yet to achieve the National Education Philosophy which is to produce an integrated human potential. Assessment system should be developed so that it will not only assess the verbal-linguistic intelligence and logic-mathematics, but also includes all the potential and capabilities of individuals.

By using the Rasch measurement model, researchers have obtained high reliability value to the reliability test. Reliability test items and respondents also indicate that the set of the questionnaires is valid and reliable to measure MI. In addition, questionnaires were administered with care and in comfort time of the respondents.Thus there is no mismatch of items and respondents (over 50% fit) found during the process of data analysis. One of the advantages of Rasch modeling method is the ability to identify the misfitness of items and respondents. For example, students who are very intelligent should be able to answer questions easily. This method can identify the difficulty level of items and the ability of the respondents (Bond & Fox 2007). Thus the results obtained related to the reliability and construct validity of this questionnaire is acceptable to answer the research questions.

5. Summary / Conclusion

High validity and reliability value of each item in the questionnaire is important. There is a need to ensure the accuracy of the data collection and data entry because they contribute to the validity and reliability of the

results. Previous researchers have tested the questionnaire's validity and reliability, it should undergo another pilot testing as the inferences obtained are only suitable for the purpose and specific sample of study, especially if they are analyzed using Classical Test Theory and True Score Test (TTST) and the index of the high reliability of the respondents and structurable item in the hierarchy by the level of difficulty of items showed that the MI questionnaire study are reliable and valid.

The findings of this study support previous research that individuals have different intelligences. It is recommended that it is necessary to apply the element of MI in teaching and learning in schools and in institutions of higher learning, thus developing an intelligence assessment which only assess the overall IQ that encompasses all human potential, as inherent in the current education system.

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