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ELDERLY SATISFACTION TOWARDS THE INTEGRATED HEALTH POST (ES-IHP) QUESTIONNAIRES: VALIDATION USING RASCH MODELING

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ABSTRACT

Integrated Health Post for the elderly (Posbindu) has been carried out to improve the health status of the elderly, but Posbindu's utilization is still unsatisfactory. Satisfaction of the elderly towards the health care provided at the Posbindu contributed to their adherence. So far there is no instrument to measure the level of elderly satisfaction. The objectives of the study were to develop and assess the validity and reliability of the elderly satisfaction towards the integrated health post questionnaire using Rasch modeling. A cross-sectional study was carried out on 202 elderly from 16 Posbindu in Bandung, Indonesia. This study was performed from August to December 2019. The questionnaire was developed from a qualitative study, consisted of 36 items that covered the satisfaction concepts of structure, process, and output. Nine analytic tests were carried out, namely, the person fit order, person reliability, Cronbach's alpha, item reliability, item fit order, separation, the Wright map analysis, rating scale, and the differential item functioning as implemented by the Winstep version 3.73 software. Overall, the questionnaire demonstrated promising results. The overall value of person reliability was 0.93 with Cronbach's alpha of 0.96 and the value of item reliability was 0.94. However, 3 items were misfits and should be considered to be revised or removed. Further studies involving various regions in Indonesia should be carried out before this questionnaire is used in Indonesia.

Keywords: Elderly, ES-IHP, integrated health post, Rasch modeling

INTRODUCTION

Indonesia as one of the most populated countries in the world faces a change in its population structure. It is estimated that there will be an increase in the proportion of >65 years old population from 6.9% in 2019 to 10.3% in 2035.¹ In response to the aging population, the Indonesian Ministry of Health, through decree number 25/2016, developed a National Action Plan for the welfare of the elderly. It is clearly stated that the government motivates the empowerment of the community to build community support groups/integrated health posts so that the elderly will stay healthy, independent, and productive.² In the year 2019, there are 59,804 integrated health posts for the elderly (*Posbindu*), spread in the 34 provinces in Indonesia, most of them located in the 3 provinces in Java island, namely West Java, Central Java, and East Java.³ The utilization of the *Posbindu* is not as expected. In many areas in Indonesia, the percentage of utilization is far less than the national target.^{4,5} Many studies had been carried out to identify the factors that contributed to the underutilization of the *Posbindu*. Most of them discovered that the main factors were the lack of the elderly's knowledge towards the health care provided at the *Posbindu*, minimum family support, and the role of the community volunteers/cadres.^{4,5}

The perception of the elderly towards the health care provided at the *Posbindu* influences the level of satisfaction towards the quality of the health care. Low satisfaction causes the low motivation of the elderly to come to the *Posbindu*.⁶ Satisfaction makes the elderly eager to come to the *Posbindu*.⁷ The gap between patients' expectations and health care performance results in satisfaction or dissatisfaction.⁸ A study by Yusri et al discovered that there was a correlation between satisfaction and loyalty.⁹ A qualitative study conducted in Bandung West Java by Azana et. al, identified factors that contributed to the elderly's satisfaction towards the health care provided at the *Posbindu*.¹⁰ Those factors consisted of 32 categories divided into 6 subthemes and 3 themes.¹⁰

To motivate the elderly to come to the *Posbindu*, actions based on quantitative evidence need to be measured. Before measuring the elderly's satisfaction, the development and validation of a questionnaire based on the study of Azana et.al. should be carried out. So far, no questionnaire has been developed to measure the elderly's satisfaction towards the health care provided at the *Posbindu*. Rasch modeling as a psychometric technique, which was first developed by the Danish mathematician Georg Rasch in 1960, offers researchers to investigate the weakness, strength, and quality of an instrument, based on Item Response Theory.^{11,12} The objectives of the

study were to develop and validate the elderly's satisfaction towards health care provided at the *Posbindu* (ES-IHP) questionnaire using Rasch modeling.

METHODS

This study was conducted in two steps, namely the development and the validation of the questionnaire. The ES-IHP questionnaire was set based on a qualitative study in Bandung City, West Java.¹⁰ The concepts consisted of 3 main themes (structure, process, and input). The structure concept consisted of 3 subthemes, namely accessibility, facilities, and human resources. The process concept consisted of behavior and communication of the cadres; behavior and communication of the health providers; and health consultation and treatment. The output concept had no subtheme.¹⁰ The researchers set up positive and negative statements based on the concepts and consisted of 36 items (18 positive and 18 negative items). Each item was scored with a Likert scale from 1 to 4 (strongly disagree, disagree, agree, strongly agree). A pre-testing study was conducted on 10 elderly as the target population and was performed twice. Each pre-testing consisted of 5 elderly. The inclusion criteria were as follows: 1) ≥60 years old; 2) visited the *Posbindu* in the last one year; 3) communicate well; 4) speak and write the Indonesian language; 5) had no dementia after being tested using *Mini-Mental State Examination* (MMSE), values of 23 or above for those with education up to high school, and 25 or above for those who underwent higher education.¹³ and 6) willing to participate in this study. The aim of the pre-testing was to obtain information from the elderly whether they understood the phrase of all items without changing the initial meaning of the corresponding statements, as well as to receive inputs for improving the statements phrase.

The validation process was carried out to 202 participants from 17 *Posbindus*. The *Posbindu* were selected using random sampling by a computer. Based on the Monte Carlo simulation, the minimum sample size required is ≥175 samples to meet the goodness of fit and the statistical power as a function of the sample. The higher the number of samples, the higher the acceptance of the fit model¹⁴, but in Rasch modeling, with a confidence interval of 95-99% and item calibration stability of ±1logit, the minimum sample size can be only 30-50 samples.¹⁵ A total of 10 interviewers were trained to collect the data from the *Posbindu*. From every *Posbindu*, the elderly who met the inclusion criteria were selected using consecutive sampling. This study had received ethical clearance from the Ethics Committee of Universitas Padjadjaran Bandung, Indonesia,

No.513/UN6.KEP/EC/2019. The demographic characteristics of the participants were presented in percentages. Reliability and validity testing of the questionnaire was conducted using Rasch modeling using Winsteps software version 3.73. First, the person fit measure was tested to detect participants with inappropriate response patterns compared to their true satisfaction perception.^{11,16} The next step was to analyze the Person reliability and Item reliability tests. The value of those tests are <0.67: low; 0.67-0.80: sufficient; 0.81-0.90: good; 0.91-0.94: very good; >0.94: excellent.¹⁵ Instrument reliability is measured by Cronbach's alpha. The value of the Cronbach's alpha: <0.5: low; 0.5-0.6: moderate; 0.6-0.7: good; 0.7-0.8: high; >0.8: very high.¹⁵ Other testing were conducted in this study were item-fit order, unidimensional testing, the Wright map analysis, rating scale, and the differential item functioning.

The item-fit order determines whether each statement works well to take measurements or not. The item fit level was analyzed from the value of the outfit mean-square (MNSQ), outfit z-standardized (ZSTD), and point-measure correlation (Pt-measure Corr). If the statement items on the three criteria are not fulfilled, the statement items are not good enough.¹⁵ Unidimensional testing shows the validity of the instrument. This testing uses principal component analysis. The validity of the instrument is if there was at least 20% of the raw variance explained by measure. Furthermore, the raw variance value unexplained by measure does not exceed 15%.¹⁵ The Wright map analysis (person-item map) illustrates the distribution of participants' abilities and the distribution of statement difficulty levels.¹⁵ In measuring the validity of ratings on the answer choices, the rating scale analysis was conducted. If it shows successive improvements, the options given are valid for the participant.¹⁵ The last testing was the differential item functioning (DIF) test. This test is useful to find out whether there are statements containing bias based on the participant's characteristics. A statement contains a bias if the probability value is below 5%.¹⁵

RESULTS

On the first pre-testing study, only 4 of 5 elderly (one person could not come to the place where the pre-testing was conducted because she was sick) attended this meeting. All of them were housewives and had only elementary education. Three of them aged between 60-70 years old and only one person aged 86 years old. Two of them had MMSE scores of 30 and the other two persons had MMSE scores of 24 and 25, respectively. One of the researchers distributed the questionnaire and asked the elderly to read it slowly. They mentioned that they did not understand the

meaning of all of the negative items. Moreover, they suggested that the font size of the questionnaire should be bigger so that they could read them easily although they wore glasses and an item should be put on one page, not cut into two sentences and written on the next page. After the researchers revised it according to the inputs by the elderly at the first pre-testing, a second pre-testing was conducted one week later. It was carried out to another 5 elderly from the same *Posbindu* with a similar process as in the first pre-testing. The demographic characteristics of this group were similar to the first group. They were all housewives and had only elementary education. Four of them aged between 60-70 years old and only one person aged 79 years old. Two of them had MMSE scores of 28 and the other three persons had MMSE scores of 24, 25, and 27, respectively. The elderly had no difficulty reading and understanding all items. Based on the pre-testing study, the final ES-IHP questionnaire consisted of 36 items without negative items, 13 items of the structure consisted of 7 items of accessibility, 3 items of facilities, and 3 items of human resources; 19 items of the process consisted of 5 items of behavior and communication of the cadres; 5 items of behavior and communication of the health providers, and 9 items of health consultation and treatment; and 4 items of output.

The first step in conducting the Rasch modeling was to perform the person fit measure. This test aimed to detect participants with inappropriate response patterns compared to their true satisfaction perception. This study revealed that there were 127 participants with inappropriate (non-eligible) and 75 participants with appropriate response patterns (eligible). Its socio-demographic characteristics were described in Table 1. Among the 75 participants, most of them were 60-69 years old, female, had low education, and had no occupation. Regarding living arrangements, they were widows/widowers who live with other members of the family. Still, some participants lived alone although the percentage was low. Most of the participants attended the *Posbindu* regularly and came alone to the location. The health conditions of the participants were asked if they had health conditions that had already been diagnosed by a doctor or just as symptoms. This study revealed that the health conditions varied from no disease/symptom to more than two diseases/symptoms. Hypertension, Diabetes mellitus, and Osteoarthritis were the most health conditions that occurred.

The participants who had inappropriate response patterns (non-eligible) were excluded from the validation test. The person and item reliability; item fit order; Wright map analysis, unidimensionality, rating scale and, DIF were tested. Table 2 revealed the person reliability

yielded 0.93, indicated that the participant's consistency in answering the questions was very good, except the person reliability of the output yielded 0.64 and 0.76. The Cronbach Alpha was very high, indicating that the internal consistency was very good as well. The item reliability was 0.94, indicating that the quality of the items was very good, especially the quality of the structure items. Moreover, the separation values were high. Unidimensionality indicated by the raw variance explained by measures yielded a percentage of more than 50%, however, there was one raw unexplained variance that more than 15% was on the output items.

The item fit order statistics revealed that 3 items were misconceived by the participants (Table 3). Those were 1A7: "I am willing to pay for the medical examination at *Posbindu*", 1C13: "doctor presents at the *Posbindu*", and 2C31: "providing medicine".

The Wright map/person-item map (Figure 1) showed the person's ability ranged from 7.20 logits (person number 009) to -0.23 logits (person number 141). Person number 009 was the participant who has the highest ability to answer the items, but this person is an outlier. In contrast, participant number 141 has the lowest ability to answer the items. Furthermore, more than 50% of the participants could not answer 2 items (1C13 and 2C31). These two items were also outliers. All the participants could answer 20 items easily (from 1A1 to 1A6; 1B8 and 1B9; 1C11 and 1C12; from 2A14 to 2A17; 2B20, 2B21, 2B23; 2C25; 3A34 and 3A36). The item difficulty ranged from 3.49 logits (item number 2C31) to -1.75 logits (item number 1A6). Item number 2C31 was an item that had the most difficult to answer and item number 1A6 was the item that had the easiest to answer.

Each item of the ES-IHP questionnaire was scored with a Likert scale from 1 to 4 (strongly disagree, disagree, agree, strongly agree). The four-point Likert were adequate (Table 3) since the calibrations were properly ordered. The value of the infit and outfit MNSQ was less than 2.00.

Differential Item Functioning (DIF) map of the eight demographic characteristics was analyzed. Figures 2 showed that gender, living arrangements, and come alone or escorted to the *Posbindu* had no bias. On the other hand, 5 from 8 demographic characteristics had a probability below 5 %. The bias was located at the accessibility items (1A4 and 1A7), facilities items (1B10), and consultation and treatment items (from 2C29 to 2C32).

Table 1. Demographic characteristics of the study sample.

Characteristics (n=202)		Eligibility		Total (n,%)	p-value
		Non-eligible (127) (n,%)	Eligible (75) (n,%)		
Age (years)	60-69	80 (63.5)	46 (36.5)	126	.814 ^a
	≥70	47 (61.8)	29 (38.2)	76	
Gender	Male	12 (60.0)	8 (40.0)	20	.779 ^a
	Female	115 (63.2)	67 (36.8)	182	
Education	Below and Equal to Elementary	83 (61.9)	51 (38.1)	134	.988 ^b
	Yunior and Senior High	34 (59.6)	23 (40.4)	57	
	Under and Post graduate	10 (90.9)	1 (9.1)	11	
Occupation	No	106 (62.0)	65 (38.0)	171	.346 ^a
	Yes	21 (67.7)	10 (32.3)	31	
Living Arrangements	Alone	5 (45.5)	6 (54.5)	11	.522 ^b
	With spouse	17 (60.7)	11 (39.3)	28	
	With spouse and other members of the family	31 (60.8)	20 (39.3)	51	
	With other members of the family	73 (65.8)	38 (34.2)	111	
	Others	1 (100.0)	0 (0.0)	1	
Attendance frequency	Irregular	42 (72.4)	16 (27.6)	58	.075 ^a
	Regular	85 (59.0)	59 (41.0)	144	
Alone escorted	or Alone	119 (62.6)	71 (37.4)	190	.779 ^a
	Escorted	8 (66.7)	4 (33.3)	12	
MMSE SCORE	Median	28	28	.289 ^c	
	Minimum	24	23		
	Maximum	30	30		
Diseases/ Symptoms	No disease/symptom	26 (66.7)	13 (33.3)	39	.941 ^a
	One disease/symptoms	50 (61.0)	32 (39.0)	82	
	Two diseases/symptoms	40 (62.5)	24 (37.5)	64	
	More than two diseases/symptoms	11 (64.7)	6 (35.3)	17	

Notes: ^a: Chi-Square test; ^b: Kolmogorov-Smirnov test; MMSE: Mini-Mental State Examination; ^c: Mann-Whitney test

Table 2. Person and item reliability, Cronbach's alpha, separation, raw variance explained, and unexplained variance.

No	Reliability and validity	Structure	Process	Output	Total ES-IHP
1	Person reliability				.93
	Non extreme	.80	.89	.64	
	Separation	2.96	4.16	2.12	
	Extreme and nonextreme	.82	.89	.76	
	Separation	3.14	4.07	2.71	5.36
	Cronbach's alpha	.89	.94	.86	.96
2	Item reliability (nonextreme)	.97	.94	.94	.94
	Separation	7.35	5.61	5.76	5.80
3	Validity				
	Raw variance explained by measures	55.9%	54.0%	59.4%	52.1%
	Raw unexplained variance (total)	None	None	One Found (16.7%)	None

Note: ES-IHP: Elderly Satisfaction-Integrated Health Post Questionnaire

Table 3. Item Fit Order (n=75)

Number	Items		Total Score	Measure	Model S.E.	INFIT		OUTFIT		PT-MEASURE		EXACT MATCH	
						MNSQ	ZSTD	MNSQ	ZSTD	CORR.	EXP.	OBS%	EXP%
	Structure												
1A1	Accessibility	The location of the <i>Posbindu</i> is near	266	-.73	.27	.96	-.1	1.09	.4	J .59	.63	76.0	76.3
1A2		<i>Posbindu</i> is easy to reach	269	-.95	.27	.84	-.8	.78	-.5	P .62	.61	80.0	76.2
1A3		Services in <i>Posbindu</i> are carried out once a month	272	-1.18	.28	.61	-2.3	.64	-.8	L .70	.59	85.3	77.0
1A4		<i>Posbindu</i> 's opening days are appropriate	265	-.66	.26	.80	-1.0	.97	.0	K.65	.63	77.3	76.3
1A5		<i>Posbindu</i> which is done in the morning according to my wishes	271	-1.10	.28	.81	-1.0	.90	-.1	N.65	.60	76.0	76.8
1A6		The medical examination at <i>Posbindu</i> is free of charge	279	-1.75	.30	.72	-1.6	.49	-1.0	m.63	.53	82.7	78.9
1A7		I am willing to pay for the medical examination at <i>Posbindu</i>	222	1.59	.20	1.96	4.9	2.43	6.5	B.20	.70	38.7	60.3
1B8	Facilities	The room is clean;	260	-.33	.26	.54	-2.7	.53	-1.9	f.77	.65	88.0	75.8
1B9		The room is comfortable	263	-.53	.26	.55	-2.7	.74	-.8	o.75	.64	90.7	76.1
1B10		Medical equipment provided	251	.22	.24	.74	-1.4	.74	-1.1	q.74	.67	81.3	72.9
1C11	Human Resources	Cadres of the <i>Posbindu</i> are appropriate and adequate	262	-.46	.26	.52	-2.9	.46	-2.2	e.78	.64	89.3	76.1
1C12		Midwives/nurses present at the <i>Posbindu</i>	262	-.46	.26	.58	-2.4	.59	-1.5	i.73	.64	86.7	76.1
1C13		The doctor presents at the <i>Posbindu</i>	187	2.90	.19	2.07	5.5	2.21	5.8	C.35	.74	34.7	58.7
	Process												
2A14	Behaviour and communication of the cadres	Cadres arrive on time	260	-.33	.26	.59	-2.4	.52	-2.0	h.78	.65	85.3	75.8
2A15		Cadres are patient	269	-.95	.27	.40	-4.0	.30	-2.5	c.81	.61	90.7	76.2
2A16		Cadres are friendly	271	-1.10	.28	.42	-3.9	.31	-2.3	d.79	.60	94.7	76.8
2A17		Cadres are responsive/helpful	271	-1.10	.28	.57	-2.6	.43	-1.7	g.73	.60	89.3	76.8
2A18		Understood the explanation given by the cadres	256	-.07	.25	.73	-1.4	.58	-1.8	n.79	.66	84.0	74.9

2B19	Behaviour and communication of the health providers	The health providers arrive on time	254	.05	.24	1.17	.9	1.47	1.8	F.61	.67	81.3	74.3
2B20		The health providers are patient	266	-.73	.27	.38	-4.1	.29	-2.8	b.82	.63	89.3	76.3
2B21		The health providers are friendly	266	-.73	.27	.38	-4.1	.29	-2.8	a .82	.63	89.3	76.3
2B22		The health providers introduce him/herself	234	1.08	.21	1.70	3.5	1.77	3.6	D .50	.69	58.7	65.5
2B23		Understand the advice given by midwives/ nurse /doctors	259	-.26	.25	.61	-2.2	.60	-1.6	k .78	.65	81.3	75.6
2C24	Health consultation and treatment	Don't have to wait very long the get the health services	237	.94	.22	1.45	2.4	1.67	3.1	E .46	.68	60.0	67.0
2C25		The health providers ask about complaints/ symptoms	258	-.20	.25	.82	-.9	.66	-1.3	Q .75	.66	81.3	75.4
2C26		The health providers explain about the disease	254	.05	.24	.91	-.4	.74	-1.1	M .75	.67	80.0	74.3
2C27		The health providers explain the appropriate nutrition needed	253	.11	.24	.79	-1.1	.63	-1.7	r .79	.67	82.7	73.9
2C28		The health providers explain the healthy behavior	239	.85	.22	1.12	.7	.93	-.3	I .82	.68	74.7	67.7
2C29		The health providers describe the consequences that can arise if the disease is not controlled	231	1.22	.21	.81	-1.2	.78	-1.3	R .82	.69	73.3	64.3
2C30		The health providers ask about medicine that is routinely consumed	236	.99	.22	1.14	.8	1.05	.3	H .73	.69	73.3	66.4
2C31		Providing medicine	171	3.49	.19	3.99	9.9	4.00	9.9	A .20	.76	26.7	60.6
2C32		Explains about referrals	237	.94	.22	1.32	1.7	1.25	1.3	G .68	.68	68.0	67.0
3A33	Output	Knowing the disease	243	.65	.23	.96	-.1	.90	-.4	L .73	.68	70.7	69.2
3A34		Disease controlled	262	-.46	.26	.60	-2.3	.59	-1.5	j .76	.64	86.7	76.1
3A35		Understand a healthy diet	250	.28	.24	.74	-1.4	.64	-1.7	p .80	.67	76.0	72.6
3A36		Want to stay healthy	273	-1.26	.28	.87	-.6	.71	-.6	O .63	.58	82.7	77.2
MEAN			252.2	.0	.25	.95	-.6	.94	-.1			76.9	72.7
SD			22.4	1.11	.03	.65	2.9	.72	2.7			15.5	5.4

Notes:S.E: Standard Error; MNSQ: Mean Square; ZSTD: z-standardized; PT-Measure: Point-Measure; CORR: Correlation; EXP: Expected; OBS: Observed.

Figure 1. Wright Map Analysis

Table 3. Rating Scale of the ES-IHPQ (n=75)

SCORE	OBSERVED		OBSVD	SAMPLE	INFIT	OUTFIT	ANDRICH	CATEGORY
	COUNT	%	AVRGE	EXPECT	MNSQ	MNSQ	THRESHOLD	MEASURE
1	52	2	-1.00	-1.58	1.49	1.58	NONE	(-3.40)
2	217	8	.56	.12	1.38	1.53	-2.15	-1.44
3	1131	42	1.56	1.81	.93	.67	-.71	1.11
4	1300	48	4.41	4.29	.90	.86	2.86	(3.98)

Notes: OBSVD AVRGE: Observed Average; MNSQ: Mean Square

Figure 2. Differential Item Functioning (DIF) Map according to age, gender, education, occupation, living arrangements, attendance frequency, alone/escorted, and diseases/symptoms

DISCUSSION

The ES-IHP questionnaire is a new questionnaire, developed to measure the satisfaction level of the elderly towards the health care provided by the *Posbindu*. The result can be used as inputs for improving the quality of *Posbindu*. A range of statistical analyses to test the reliability and validity of a questionnaire are used in many research¹⁷, one of them is Rasch modeling. The Rasch modeling converts the nonlinear raw data to a linear scale.¹⁶ Moreover, Rasch modeling allows detecting the misconception response of the participants (person fit order), items that misfits (item fit order), person reliability, item reliability, validity, and difficult or easy items to be answered by the participants (Wright-map analysis).¹⁶ Rasch modeling can evaluate the proper rating scale use in a questionnaire and allow the detection of bias responses according to various participants' characteristics.¹⁶

This study revealed that there were 127 of 202 participants who had inappropriate responses according to the person fit order test. Boone and Noltemeyer detected several causes of the inappropriate responses, among others, the misfitting participants differ in some way from the target population of interest, there is a pattern of selecting random answers or guessing, the item misunderstood, and the item measures the trait in a different way than originally intended.¹¹ In this study, the Chi-square test or Kolmogorov-Smirnov test was carried out to detect the cause of the inappropriate responses based on the characteristics of the participants. The test revealed that there was no difference in the characteristics variables between the misfit and fit groups, so it is not yet known the cause of this inappropriate answer.

After the misfit participants were excluded, other statistical tests in Rasch modeling were conducted. The item fit order test showed that there were 3 items that misfits. Those were 1A7: "I am willing to pay for the medical examination

at *Posbindu*”, 1C13: “doctor presents at the *Posbindu*, and 2C31: “providing medicine”. The *Posbindu* is established by the local community themselves and operated by cadres/community volunteers from the same community, free of charge.¹⁸ The purpose of *Posbindu* is to provide promotive and preventive health services according to the needs of the elderly¹⁹ and is not allowed to provide medicine. If the elderly need medicine, the health providers refer them to the Public Health Center (*Puskesmas*). The health provider present is usually a nurse or midwife, rarely a doctor. Therefore, these three items become a misfit. This may be the reasons for an inappropriate response.

Various reliability testing was conducted in this study such as person reliability, item reliability, separation, and Cronbach's alpha.²⁰ Those tests revealed a high result. These findings describe that there was consistency in the answers of the participants and each item had adequate quality, except the three items that have been mentioned before. This internal consistency showed that the items in each category measured the same concept and also showed the interrelation of the statements.²¹ The validity of the ES-IHP questionnaire measured by the unidimensional test, showed a promising result. The raw variance values explained by measure revealed more than 20% and only 1 of the raw unexplained variance values more than 15% in the output category. If unidimensionality is not achieved, there is no point to compute a total measure and “compare” respondents or items.²⁰ The result of the reliability and validity test proves that the ES-IHP questionnaire consistently measures the same concept, show the interrelation of the statements, and measure what should be measured.²¹

Person-item or Wright Map analysis, which is named in honor of the University of Chicago's Benjamin Wright, describes both person measures and item measures on the same linear scale.¹⁶ It provides information on the hierarchy of the ability level of the participants and item difficulties.^{16,22} The higher the logit value of the person measure, the higher the person's ability, and the lower the logit value, the lower the person's ability. On the other hand, the higher the logit value of the item measure, the difficult the item to be answered, and the lower the logit value the easy the item to be answered.^{16,22} The Wright Map analysis provides also the person and items located outside the map (outliers). Outliers are observations that are different from the majority of other cases in a sample.²³ This study revealed item number 1C13: “doctor presents at the *Posbindu*” and 2C31: “providing medicine” were outliers.

In developing the items in the ES-IHP questionnaire, the researchers had already made 18 negative-phrased statements of 36

statements. The objectives to set up negative-phrased statements are to keep respondents attentive to not repeat choosing the same answer as the previous choice for all the remaining items.²⁰ The first pre-testing study discovered that all of the respondents did not understand the meaning of all of the negative-phrased items, therefore the researchers revised the negative-phrased items to positive-phrased items. Even though there were no negative-phrased items, the item fit order test only discovered 3 items that were not fit in the model. Moreover, the result of the Rating Scale test yielded encouraging results. Although the Likert scale measures increase monotonically from the lowest rating point to the highest rating point, the Infit and Outfit mean squares are less than 2, but it is found that not all the thresholds were at least 1,4 logits greater than the last.^{11,24} The participants had no difficulties discriminating among categories from strongly disagree, disagree, agree, to strongly agree.

Differential Item Functioning (DIF) is a technique to identify bias in item response according to some characteristics of the participants.²⁰ DIF simply means that an item measures a trait in a different way for the two or more compared groups.²⁰ This study discovered that some items had bias according to the characteristics of the respondents. The potential biases can be caused by variations of the participants' characteristics or the use of the language in the questionnaire. An item that produced DIF is not necessarily unfair to various subgroups of respondents, because sometimes the language or the vocabulary used in the questionnaire is more easily understood by one group as opposed to another.²⁰

Rasch modeling has been used widely to test the validity and reliability of a questionnaire. The application of the Rasch modeling allows researchers to conduct a detailed analysis of the items and participants; to use parametric statistics since the categorical data are transformed in numerical data (logits); and to explain the meaning of the differences among groups of participants using items.^{11,25}

The Rasch analysis of the ES-IHP questionnaire seems to be satisfactory, but there are still various limitations. In this study, the sample came from one district and may not represent the Indonesian general population. Studies in various districts should be carried out in the future.

CONCLUSION

In conclusion, the ES-IHP questionnaire demonstrates good results using the Rasch modeling, however, there are three items (IA7, IC13, and 2C31) that should be considered to be excluded from the questionnaire.

Conflict of interest

The authors affirm no conflict of interest in this study.

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