

# The Validity and Reliability of School Readiness Measurement Tool in Weekly Iron Folic Acid Supplementation Program

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## ABSTRACT

The efforts to reduce the prevalence of anemia among adolescent girls is a public health concern in developing countries. Schools play significant roles in weekly iron-folic acid supplementation (WIFAS) program and readiness to implement it is essential in addressing the disorder. The study on the validity and reliability of school readiness measurement tool is rare. Using cross sectional design this study aim to assess the instrument's validity and reliability developed to assess school readiness in the implementation of the WIFAS and increase the compliance of the female-students adopting the program using RASCH model. The Mini-step software was used to assess the items' functions from reliability and occlusion aspects in 75 respondents, polarity and their suitability to measure constructs and standardized residual correlations. The Cronbach alpha value was 0.98, person reliability 0.76 and reliability items 0.7. In general, the reliability of the respondents was quite high. The PTMEA value corrects all positive items, meaning they might all be used to measure constructs. Besides, there were no items which had to be changed or omitted

**Keywords:** *anaemia, adolescent girl, school readiness, rasch model, validity and reliability*

## 1. INTRODUCTION

Efforts to reduce the prevalence of iron nutrition anemia in female adolescents needs to be facilitated. More than 25% of adolescents girl in developing countries suffer from anemia This condition has an impact on health status and often lead to early death and decreased economic productivity.[2]

Indonesia is one of the developing countries with anemia prevention and control program for adolescents girl and women in childbearing age.(3) This program is meant to reduce maternal mortality and adolescent girl health. Basically, anemia programs are given through schools and in collaboration with the Ministry of Education through health units in learning institutions[4]

Schools spearhead the WIFAS program and play an important role in its implementation to school going girl adolescents. However, not all schools have the same capacity in the implementation of the program. Organizational readiness for innovation (new policies,

programs or practices) is needed for successful implementation

Kelly & Stanley, 2014 describe community readiness as a level where the public is willing and prepared to take action on a problem.[6] Several studies have assessed the importance of identifying the level of readiness of a community and established that adopting a strategy to community readiness is useful in attaining the desired level of a prevention effort.[7] [8]

There are various methods of measuring the level of readiness, though reports on validity and reliability of approaches for measuring community preparedness are still rare.[9–11]. This study was meant to assess the validity and reliability of measurement instruments developed to assess school readiness in implementing the program for iron-folic acid supplementation in female adolescents and increasing their adherence to IFA using the Rasch measurement model. This tool refers to the community readiness

model instrument developed by the Tri-Ethnic Center for Prevention Research Colorado University using five dimensions of community readiness model. [12]

**2. METHOD**

The study used a quantitative design approach with 75 respondents consisting of teachers and school principals. According to Johanson and Brook (2015), the minimum samples of a pilot study aimed at preliminary studies or scale development should be 30 samples. Therefore the samples of this study have exceeded the minimum number needed to measure the validity and reliability of instruments to advance research or examine development scale.[13]. Data were analyzed using the Ministeps application with the Rasch measurement model.

According to Bond and Fox 2006, the Rasch model is effective in testing the validity and reliability of an instrument [14]. It is often used to test the reliability and indexation of items, detect the polarity of items that measure constructs, suitability (fit items), determine the correlation of residual standardization items, determine the level of difficulty of the item and the ability of the respondent, identify the differences in the function of the instrument (dIF functioning - differential items), define the structure of the function of the scale measurement category, and find the construct of unidimensionality.

The Rasch model is used to determine the interaction between respondents and items simultaneously. A data value is not seen in the raw score, rather a logit value reflecting the probability of selecting an item in a group of respondents is indicated. This is used in anticipation of the raw score of the Likert rating in the form of ordinal which do not have the same interval between scores. The use of the Rasch model for politomical data was developed by Andrich based on two basic theorems, the level of ability / individual agreement and the difficulty level of items to be approved.[15] Psychometric devices used in this study

include reliability at the instrument level (item and respondent), the validity of respondents and items, and unidimensionality of the instruments.

According Sumintono and Widhiarso (2014) a criterion was used to check the suitability of items not suitable (outlier or misfit) and included [16]

- a. The value of received outfit mean square (Mnsq):  $0.5 < MNSQ < 1.5$
- b. The standard (Zstd) z outfit value received:  $-2.0 < ZSTD < +2$
- c. Measure correlation point (Pt mean corr):  $0.4 < pt \text{ corr measure} < 0.85$

School readiness instruments used 5 dimensions consisting of awareness on adolescents anemia problems and adherence to intake of iron folic acid (IFA), school climate and its effects on WIFAS, knowledge on efforts to increase compliance, the resources needed to support the implementation of the program, commitment from school leaders to improve compliance in using WIFAS.

**School Readiness Instrument**

The school readiness instrument was developed from a community readiness model (CRM). It was used to analyze the readiness to implement a weekly iron-folic acid supplementation (WIFAS) program. The CRM instruments consist of 5 dimensions of community, including community awareness of problems, climate, knowledge on efforts to overcome problems, availability of resources, and leadership support [12].

In this study, the readiness instrument developed from CRM consisted of 5 dimensions, including the awareness on anemia problems and adherence to WIFAS program, the efforts to increase girl students' adherence, the required resources for implementation, and leadership support. These five construct dimensions were measured by 16 question items (see table 1)

Table 1 Item Instrumen

NO	Item symbol	Item statement
1	SMK	Girl student's adherence problem scale
2	PWS	School community knowledge on anemia
3	JITDS	Availability of adolescent girl's anemia information data source type at school
4	DKS	
5	SDK	Girl student's adherence to WIFAS data at school
6	WYMK	
7	SWSTDMK	The data source of girl student's adherence
		School community awareness on adherence problems
	UWMK	Attitude toward efforts to improving adherence to WIFAS
8	SDS	School community effort to improve girl students' adherence to consume WIFAS
9	SPPS	School resources availability (time, venue, money) to support WIFAS program
10	PBJ	School principal's concern scale at anemia and girl student's adherence to WIFAS problem

11	PUPKMTHD	School principal's responsibility
12	DDP	School principal belief on school effort to improve girl student's adherence to consume WIFAS
13	KDDP	Health District Office's support
14	DDKM	Adequacy of health district office support
15	KDDKM	Education office/ Religion Ministry support
16		Adequacy of Education office/ Religion Ministry support

This study used the Rasch model approach to identify the validity and reliability of school readiness in implementing weekly iron-folic acid supplementation (WIFAS) measurement tool (instrument). This study used 4 instrument testing, including (i) determine item reliability and isolation items, (ii) detect polarity that measures constructs based on Point Correlation Measure (PTMEA CORR) and fit statistics, (iii) the value of the MNSQ Outfit and ZSTD outfit; (iv) establish the construct fit and determine the residual value of the dependent correlation (standardized residuals). The Rasch measurement model was also used to analyze differences between two variables and to measure correlation.

**3. RESULTS**

Using the Rasch measurement model, this study examined functional aspects such as (i) reliability and

isolation related to respondents; (ii) polarity to measure constructs based on PTMEA CORR value; (iii) suitability and (iv) Correlated items dependent on standardized residuals.

**Reliability and Separation Item**

To determine the reliability of the instrument, statistical analysis was based on the Rasch measurement model with regard to reliability and isolation items. Cronbach's alpha value was 0.98, and people's and item reliability 0.76 and 0.99 respectively. These values indicate the consistency of the respondent's answers and the quality of the instrument was all good. Besides, the Cronbach alpha value of 0.98 indicates the interaction between people and items was good (see table 2).

Table 2 Reliability result of the instrument by person and tem

	N	Reliability	Isolation	Mean Logit	Separation	Alpha Cronbach	Raw variance explained by measures observed	Raw variance explained by measures expected
Person	75	0.76	1.77	-2.05	1.77			
						0.98	72.5%	74.3%
Item	16	0.99	9.44	0.00	9.44			

According to Bond and Fox (2006), the Cronbach alpha value between 0.9 and 1 indicates the instrument is good, effective and consistent, and is fit to be used in actual research.(14) Reliability and isolation items were also analyzed. From table 2, the reliability value is 0.99, while the item isolation 9.44, rounded to 9. A value of 0.99 is good and acceptable for reliability. The value of item separation is also good (9.44). Linacre states that a good index for item separation should have a value of more than 2.0.

Respondents reliability was 0.76 while the item separation was 1.77. These values indicate the respondent's reliability was high and good. According to Bond and Fox (2007) Rasch models identify the adequacy of scattering items along the same linear scale. This model is divided into two parts, the item, and the respondents' reliability indexes. Generally, the Item reliability index aims to determine item difficulty

in other samples with an equivalent response value. (14); (17)

**Unidimensionality**

The unidimensionality of items plays an important role, explicitly during the initial construction process .(18); (19). It considers items in the measuring instrument to determine a sole ability. From table 2 above, the results explained by measure raw variance is 72.5%, not very different from the expected value of 74.3%. This shows the minimum requirement for 20% unity is fulfilled. A value of more than 40% is better while 60% is considered special. In this study, the results of the unidimensionality analysis were more than 60%, and therefore the items were special. (16)

**The polarity of the item through PTMEA Value Corr**

The point correlation measure (PTMEA CORR) test was carried out to detect item polarity. According to Bond and Fox (2006), a positive PTMEA value of an item measures the construct. In contrast, the negative

value indicates all items must be revised or reduced since they do not measure the construct or are too difficult for the respondent to answer. From table 3, there is no negative PTMEA Corr value, meaning all the items could be used to measure the construct.

**Table 3. PTMEA CORR**

Item	PTMEASURR-AL		INFIT		OUTFIT	
	CORR	EXP	MNSQ	ZSTD	MNSQ	ZSTD
SMK	0.50	0.69	1.62	3.46	1.59	3.19
PWS	0.68	0.57	0.49	-3.54	0.47	-3.66
JITDS	0.10	0.40	0.73	-1.33	0.76	-1.07
DKS	0.65	0.21	0.73	-1.48	0.55	-2.21
SDK	0.58	0.25	2.10	5.69	1.67	3.43
WYMK	0.34	0.31	0.53	-2.47	0.56	-2.48
SWSTDMK	0.67	0.63	0.44	-4.42	0.49	-3.85
UWMK	0.66	0.55	0.59	-2.65	0.61	-2.45
SDS	0.59	0.59	0.75	-1.53	0.85	-0.85
SPPS	0.68	0.68	1.56	3.19	1.48	2.70
PBJ	0.70	0.59	0.65	-2.25	0.66	-2.22
PUPKMTHD	0.34	0.43	3.92	8.69	3.45	7.14
DDP	0.25	0.33	0.24	-4.36	0.28	-4.38
KDDP	0.25	0.33	0.24	-4.36	0.28	-4.38
DDKM	0.53	0.28	0.70	-2.12	0.73	-1.94
KDDKM	0.49	0.25	0.80	-1.37	0.75	-1.62
	0.35	0.23	0.87	-0.80	0.92	-0.34

**Item Suitability (Fit) to Measure construct**

Content validity items are measured using the outfit index Mean square (MNSQ). A value is supposed to be good and acceptable if it is between 0.6 and 1.4.(14) Where it is more than 1.4, it is inaccurate (misleading), while a value below 0.6 means the item is too easy or out of the estimate of the respondent.(15) From table 3, PUPKMTHD is not to fit and in case it is viewed on the basis of the three criteria, the items do not meet the conditions on Outfit Mnsq (value 3.45) and Zstd Outfit (value 7.14), though for the correlation measure point criteria (value 0.34) the value is within the acceptable limits. For this reason, it should be maintained, there is no absolute reason for it be changed. Other items with one or two criteria should also be maintained.

**4. DISCUSSION**

According to World Health Organization, iron deficiency anaemia is estimated to be the single largest cause globally of morbidity and mortality in adolescent girls which expressed as disability adjusted life years.(20) Schools must be a gateway to the promotion of health for the entire community. In 1997, WHO initiated the Global School Health initiative "The Health Promoting School" which focused on school-based health improvement activities. This effort needs to strengthen the capacity of schools as a healthy place to live, study and work..(21) The school readiness model is an important community and environmental factor that contributes to behavior change. Therefore school readiness tool need to be developed to measure school community

readiness score and to identify the right intervention that could be fit with the school readiness level.

The results of the analysis with Rasch modeling were consistent and proven to reveal one contract (Unidimensional), which is screening the readiness of the school to implement WIFAS program and improve adherence to WIFAS program. There were 16 items analyzed using the model with alpha reliability coefficient 0.98. This alpha value is the reliability in the measurement in the form of interaction between person and item as a whole. The results of the coefficient indicate a high-reliability value, meaning the measurement scores are consistent and reliable. Besides, the item and respondents reliability coefficient were 0.76 and 0.77, showing 16 of these items are eminence and the respondent groups earnestly answered. This shows the measuring instrument is of good quality.

From the results of the analysis of the sixteen items in the precise model, the items which were most difficult to be approved by respondents were the DKS with the highest logit of 3. This is due to the fact that not all school respondents have data girl on adherence to the program. This problem is attributed to lack of awareness and resources, leading to the unavailability of data to monitor students. It was not easy for respondents to approve the item, though some in SMK and SPPS could easily be approved.

From the results of validity using the three criteria, only PUPKMTHD does not meet the requirement on Outfit Mnsq (value 3.45) and Zstd Outfit (value 7.14). Nevertheless, on the measure correlation criterion

(value 0.34) the value is still within the limit allowed, and therefore it should be maintained. Additionally, other items with one or two criteria should also be maintained. According to Boone, Bond and Fox in Sumintono and Widhiarso, 2015, the value of mean square outfit, z-standard outfit and correlation measure point are the criteria used to determine the level of item suitability(16.) The items are not good enough to need to be repaired or replaced in case these criteria are not met.

Another advantage of the Rasch model is to evaluate whether the instrument developed is able to measure items as required. From the results, unidimensionality is categorized as special since the score is more than 60%, showing the minimum requirement for 20% unity is fulfilled. A value of more than 40% is considered better, while more than 60% is special. (19)

## 5. CONCLUSION

Validity and reliability test using Rasch model gives a Cronbach alpha value of 0.98, person and item reliability of 0.76 and 0.7 respectively. Reliability of respondents is quite high and good. The PTMEA value corrects all positive items, which means they might be used to measure constructs.

### ETHICAL CLEARANCE

The study was conducted according to the Helsinki declaration and all procedures involving humans were approved by the University of Pembangunan Nasional Veteran Jakarta (UPNVJ)'s Ethics Committee: NO. B/1607/IX/2018/KEPK. Besides, all respondents provided written informed consent prior to enrolment in the study.

### CONFLICT OF INTEREST

There is no conflict of interest in this study.

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