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To cite this article: I B Rangka *et al* 2018 *J. Phys.: Conf. Ser.* **1114** 012127

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Measuring psychometric properties of the Indonesian version of the NoMoPhobia Questionnaire (NMPQ): insight from Rasch measurement tool

I B Rangka^{1*}, W E Prasetyaningtyas¹, I Ifdil², Z Ardi², K Suranata³, E Winingsih⁴, A Sofyan⁵, M Irawan⁶, P Arjanto⁷, R Muslifar⁸ and R S Wijaya⁹

¹Universitas Indraprasta PGRI, Jakarta, Indonesia

²Universitas Negeri Padang, West Sumatera, Indonesia

³Universitas Pendidikan Ganesha, Bali, Indonesia

⁴Universitas Negeri Surabaya, East Java, Indonesia

⁵Universitas Negeri Semarang, Central Java, Indonesia

⁶Universitas Negeri Medan, North Sumatera, Indonesia

⁷Universitas Pattimura, Maluku, Indonesia

⁸Universitas Mulawarman, East Kalimantan, Indonesia

⁹Universitas Muhammadiyah Buton, Southeast Sulawesi, Indonesia

*itsarbolo.rangka@unindra.ac.id

Abstract. Mobile phone and human interaction can be a problematic mental health issue for individuals. Several studies have developed the instruments and/or psychologist scale to identify these problems. This study was designed to translate and validate by measuring psychometric properties of NoMoPhobia Questionnaire (NMPQ) on Indonesian version. The study used survey method and collected from March to May 2018 and involved 520 Indonesian participants. In this study Rasch Model was used to measure the psychometrics properties of the 20 items of the Indonesian version of NMPQ. The results of this study showed that the Indonesian version of NMPQ fulfilled by evidence as a valid and robust research instrument because of its psychometric properties and internal consistencies. The implications of this research NMPQ can be accepted by the researchers for data collection or information linked to the problem of NoMoPhobia in Indonesia.

1. Introduction

Certainly, if behind the improvement and practice of information technology[1]–[4], especially mobile phone very rapidly, there is a possible issue that is important enough that lurk the human life[5], [6]. Undoubtedly, the mobile phone is very useful to human activities, but the mobile phone also influences human behavior and psychological aspects[7]. It is worth to remark if all mobile phone usage factors have an important relationship to the issue of NoMoPhobia [8]. The term of NoMoPhobia is derived from the abbreviation No-Mobile-Phone Phobia [9], [10].

Previous studies point out that the individual can make higher levels of fear or discomfort when they have no connection to their mobile phones [11], stress causes [5], using mobile phone can make individual addicted and have some mental health issue [12], and also to decrease academic performance, and subjective well-being [13]. This empirical evidence can invite us to actively in



recognizing the potential of existing disturbances caused by NoMoPhobia is going on around us. The main question is to find related NoMoPhobia needed instrument measurements are representative.

Information collection related cases of NoMoPhobia in different places in the world have a lot determined, especially in Turkey [14], Spain [15], Mysore [16], Italy [17], dan Pakistan [17]. Unfortunately, the information of the case of NoMoPhobia in Indonesia have not been actually identified. It is caused by instrument to securing the valid data related NoMoPhobia is not yet available in Indonesia. Several instruments to measure NoMoPhobia or the like has been established, and is quite popular such as NoMoPhobia Questionnaire (NMPQ) [10], [14], Smartphone Application-Based Addiction Scale (SABAS) [18].

This research designs to translation and validation NMPQ to Indonesia version. The validation process performed by evaluated the psychometric properties of NMPQ on Indonesia version who reach the standards of a research instrument. In addition, we are also looking sharply at how to position the respondents to respond the all items in the Indonesian version of NMPQ. We are using Rasch modeling to achieve the research objectives.

Rasch model or Rasch Measurement Tool (RMT) is a family approach of the Item Responses Theory (IRT). In contrast to Classical Test Theory (CTT) that many rely on samples, is non-linear, and limited to a range score, thus the RMT has a different perspective. RMT return data in accordance with its conditions, which the RMT has characteristics (1) do not rely on samples, (2) addressing the difference between item metrics, (3) produces a score that has been lifted from the pure error measurement, (4) overcome missing data, (5) linear, and (6) provide the independent, objective measurement/invariant because RMT is free of the kind of subject characteristics measured, characteristics of the evaluator (rater), and the characteristics of the measuring instrument [13], [19]–[24]. Further, the RMT providing more detailed diagnostic information on how to improve the scale [20]. This is our point of view will provide added value to achieve appropriate psychometric properties estimation against Indonesia's version of NMPQ.

2. Method

Nomophobia Questionnaire (NMPQ) in this research is an English version of NMPQ developed by Yildirim, C., and Correia, A 2015 [9]. NMPQ consists of 20 items self-reported questionnaire and has four dimensions, specifically: (1) not being able to communicate, (2) losing connectedness, (3) not being able to access information and (4) giving up convenience [9], [14].

The validation process is performed after we reaching permission from Yildirim, C (visit link <https://osf.io/dchjq/> to see the owner permission). The validation process is conducted through several phases, i.e. first, we translation from English to Bahasa, and; second, then we proceed with professional judgment to assess the aspect of NMPQ items qualitatively. Thirdly, NMPQ in Indonesian version is wrapped up in the set-up of 5-point Likert-Type and fit to collected data using Survey Monkey Platform®.

The research covered 520 Indonesian participants (18 to 65 years old). Data collected from March to May 2018. Participant consists of 153 (29,42%) male and 357 (70,58%) female from several provinces in Indonesia i.e. Nanggroe Aceh Darussalam (3,46%), North Sumatera (27,88%), Jambi (8,65%), South Sumatera (3,46%), Bangka Belitung (0,77%), West Java (25,38%), DI Yogyakarta (4,42%), East Nusa Tenggara (0,38%), West Nusa Tenggara (0,58%), West Kalimantan (3,85%), North Kalimantan (5,58%), South Kalimantan (0,96%), Southeast Sulawesi (13,65%), Gorontalo (0,38%), and North Maluku (0,58%). Furthermore, no credit earned by participants from their institution for his/her participation in this research. All participants actions in this research is a credential. To measure psychometrics properties we used WINSTEPS [25] computer program to perform by Rasch Measurement Model. Indonesian version of NMPQ and all the research dataset can be accessed via link osf.io/es4nq Open Science Framework (OSF) [26].

3. Results and Discussion

3.1. Initial Check for Objective Measurement

At the initial stage we worked out with two preliminary inspection i.e. to decided how accurate the data items and the person is taken in accordance with the model for ideal measurements. The magnitude of the ideal suitability is determined by the value of the measurement range in the MNSQ OUTFIT 0.5 – 1.5 logit. The 20 items of NMPQ indicated that the average value for the entire item of 1.00 logit. This indicates that all the items are in good shape for the measurement. Related information the results of the estimation of misfit items can be accessed via a link <https://osf.io/6hmuw/>. Unfortunately, at the person level we found that of 520 respondents (person) who filling in NMPQ there are 170 respondents indicated misfit. Person misfit in this research is a person did not give the correct answers, or inconsistent, and/or not serious when the NMPQ was administered. Thus, only a 350-person can be considered in this study (ideal to measurements) and we did not give a 170-person for inclusion in this study. Detailed information related the misfit respondents can be accessed via the link <https://osf.io/h3npe/>.

3.2. Test Reliability and Separation Index

Reliabilities evaluation is performed by three processes that is bringing in consideration to the item reliability, the person reliability, and reliability of interaction between person and items when the NMPQ was conducted.

Table 1. Estimation of test reliability and separation index (N = 350)

	Estimation	Measure
Items reliability		.99
Person reliability		.93
Cronbach alpha (KR-20) person raw score "test" reliability		.93
Item separation index		12.26
Person separation index		3.57
10360 data points. log-likelihood chi-square: 24102.35 with 9988 d.f. p=.0000		
Global Root-Mean-Square Residual (excluding extreme scores): .8093		

In Table 1 it is very clear that the NMPQ have a highly solid reliability. On item reliability we recognized the quality of NMPQ items (. 99) and the consistency of the answers provided by the respondents or person reliability (. 93) is appropriate. The impressive point is reliability of interaction between person and items when the NMPQ was applied also shows an excellent result ($\alpha = .93$). Further, NMPQ becomes a reasonably stable capacity in determining quality of item and person.

3.3. Threshold: Partial Credit Model

Another crucial feature that becomes the concentrate on our investigation is performing against measures of threshold analysis ranking owned NMPQ. It means to assess the suitability of the choice or alternative answers that exist on NMPQ.

Table 2. Summary of Category Structure. Model="R" (N = 350)

Label	Category Label	Observed Average	Infit MNSQ	Outfit MNSQ	Andrich Threshold
Never	1	-1.69	1.08	1.11	None
Rarely	2	-.87	.94	.97	-1.79
Sometimes	3	-.09	.98	.98	-.11
Often	4	.66	.96	.95	.38
Very often	5	1.56	1.03	1.02	2.13

In Table 2 it we noticed that a choice answers are applied in NMPQ already fit, or in other words, every respondent did not confusion, or capable to recognize and precisely understand for the alternative choice answers provided in NMPQ. This is supported by monotonic move up in the value of the observed average and Andrich Threshold, i.e., from the smallest logit for score minimum to the greatest logit for maximum score.

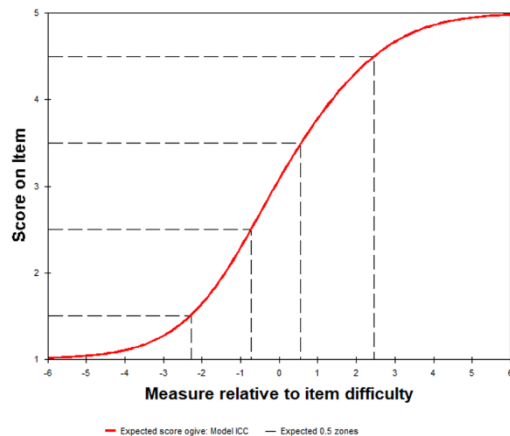


Figure 1. Expected score ICC (N=350)

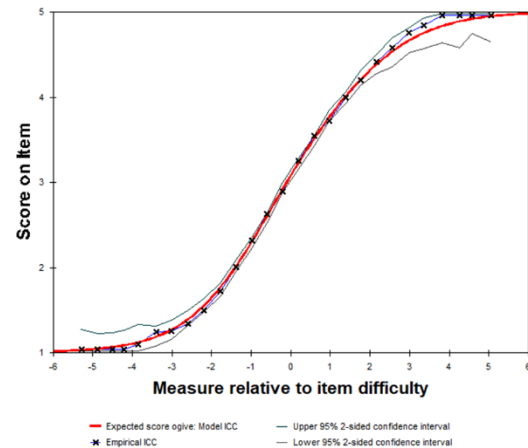


Figure 2. Expected and empirical ICC (N=350)

3.4. Estimation Validity Through Principal Component Analysis

Unidimensionality is an important measure to evaluate whether NMPQ really developed to be able to measure what is supposed to be measured. Rasch modelling in estimation of validity is based on the Principal Component Analysis (PCA).

Table 3. Standardized Residual Variance (in Eigenvalue Units) (N = 350)

	Empirical	Modelled
Total raw variance in observations	100.0%	100.0%
Raw variance explained by measures	52.6%	52.5%
Raw variance explained by persons	22.9%	22.9%
Raw Variance explained by items	29.6%	29.6%
Raw unexplained variance (total)	47.4%	47.5%
Unexplained variance in 1st contrast	6.7%	14.2%
Unexplained variance in 2nd contrast	5.2%	10.9%
Unexplained variance in 3rd contrast	4.2%	8.9%
Unexplained variance in 4th contrast	3.2%	6.7%
Unexplained variance in 5th contrast	3.1%	6.6%

Based on the results of the measurement of raw data on the variance on Table 3 we identified the fact that the NMPQ are Unidimensional. This is confirmed by the Raw value of the variance explained by measures passed 52.6% or higher than 40%, which means if NMPQ meets the Unidimensionality criteria [27], [28].

3.5. Person Measure

One of the primary objectives of analysis with RMT makes it simple for researchers to understanding data with simple ways. The data developed by the RMT its equal-interval and linear data [29]. This authorizes us to identify all person that takes a high level of NoMoPhobia or vice versa. Detail information of person measure in this research can be achieved via a link <https://osf.io/yhg2c/>.

Based on the evaluation of person measure we identified that information from the 350 respondents who fill the NMPQ are accurate, respondents 413P is the person who receives the highest approval

level (4.12 logit) of Nomophobia. On the contrary, the respondent 291L and 016P is the person who receives the lowest level for approval (3.83-logit). High or low levels of approval-based measurement of the response to each item in the NMPQ.

3.6. Item Measure

In addition to performing against estimates of Pearson's measure, we also calculated the item measure of NMPQ which intends to establish those items which are having difficulty level, the highest and the lowest.

Table 4. Item Measure of NMPQ (Item = 20, N = 350)

Item No	Measure	PTMEA Corr.	Perceived
16	1.46	.61	 Difficulties
19	1.07	.53	
17	.98	.68	
15	.71	.61	
18	.67	.71	
8	.62	.63	
3	.39	.59	
20	.34	.67	
6	-.27	.72	
14	-.36	.74	
7	-.37	.61	
5	-.37	.65	
9	-.40	.67	
1	-.40	.45	
12	-.45	.73	
2	-.48	.58	
4	-.64	.64	
13	-.64	.76	
10	-.85	.72	
11	-1.03	.70	Easiest

All measure in Logits. PTMEA Corr.= Point Measure Correlation

Each scale has a different weight, that is, from lowest to highest difficulty level. Table 4 portrays the distribution and order items from the easiest to the most difficult. Based on Table 4 we found fact that item No. 16 is a most difficult item to approved by all respondents. Conversely, item No. 11 is the easiest item to be approved by all respondents. Further, the entire item in NMPQ has a point value of a meaningful correlation measure items NMPQ according to predict data item measurements according to distribution of a sample of respondents in this study. The Indonesian Version of the NMPQ can be accessed via a link <https://osf.io/2yt6z/>.

4. Conclusions

Based on the data in this study, we conclude that the Indonesian version of NoMoPhobia Questionnaire (NMPQ) meets psychometric aspects of measurement. NMPQ has a stable reliabilities and validities and can be used to measure the degree of connection between the mobile phone and human interactions.

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