Novi Andayani Praptiningsih - An evaluation of psychometric properties of homophobia scale using data from Indonesian religion-based university students

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An evaluation of psychometric properties of homophobia scale using data from Indonesian religion-based university students

Abstract

This study aims to analyse the psychometric properties of the Indonesian translated homophobia scale. Data from a total of 327 state and private religion-based universities were analysed using Rasch model analyses, including the analysis of scale' principle component analysis (PCA) aspect, reliability analysis and the assessment of differential item functioning (DIF). The analysis showed that the homophobia scale accounted for 42.4% for the range of raw variance, indicating the unidimensionality of the scale. The scale exhibited an acceptable level of person reliability and an excellent reliability level for the item. The findings revealed a significant effect of all demographic aspects with age and study program were reported to have more DIF items. Male students were reported to be more tolerant toward homosexuals than females. Although students from state universities tend to be more tolerant than those in private universities, they negatively viewed homosexuality when it was associated with AIDS. In short, the homophobia scale assessed in the current study has sufficient psychometric properties and reveal promising construct validity.

Keywords: homophobia; religion-based universities; Rasch analysis, psychometric assessment, psychometric properties

Introduction

The stigmatisation of homosexuals among university students has been well documented in the literature. For example, a study by Kite and Bryant-Less (2016) has shown that many homosexual students received discrimination acts from other peers with different sexual orientations. In a similar context, Winberg et al. (2019) showed that the stigmatisation of homosexuals had led North American students to start using some phrases such as "That's so gay!" and "No homo!" as the negative expressions inferring that being homosexuals are inferior to being heterosexuals. In Mexico, the percentage of rejection toward homosexuals among undergraduate students had reached 18% and 3%, including extreme rejection (Moral de la Rubia & Valle de la O, 2014). In African universities, many homosexual students were reported to experience stigmatisation by usually being labelled as sinners, satanic or 'demon possessed' (Mavhandu-Mudzusi, 2017). Mavandu-Mudzusi (2017) also described that stigmatisation and discrimination happened almost everywhere on campus, including in lecture halls at the university or other areas such as student residential areas and sports grounds.

Generally, individuals' negative stigmatisation, discrimination or rejection towards people who have homosexual orientation is well known as homophobia. George Weinberg first coined the term homophobia in 1967 to reflect an irrational condemnation of homosexuals, including violence, deprivation, and separation acts (Britton, 1990). According to Barragán-Medero & Pérez-Jorge (2020), many reject homosexuals using their personal justification, claiming that homosexuals are unacceptable conduct in their society. As a result, many people, particularly those studying in the university, experience isolation in addition to verbal harassment such as insults, slurs, threats of harm, and even physical abuse (Allen, 2019; Mathies et al., 2019). In other words, homophobia can reflect the act of disliking toward people with different sexual preferences in which it involves harmful behaviour as a form of self-justification toward undesirable sexual differences.

The growing negative stigmatisation among homosexuals has prompted the development of several measures to evaluate the individual attitudes towards homosexuality and homosexuals. In an earlier 1971 study, Smith developed a psychometrically measurement comprising 24 self-report questionnaire items with two classifications: 9 items of homophobia scale (H-scale) and 15 items evaluating the individual attitudes toward a diverse set of topics (O'Donohue & Caselles, 1993). Unfortunately, O'Donohue and Caselles (1993). argue that Smith did not provide a clear description related to the H-scale he developed in addition to the failure in providing the threshold for categorisation. In 1984, Herek developed an instrument to evaluate two aspect of rejection toward gay men and rejection toward lesbians. Harek's instrument named the 'Attitudes Towards Lesbians and Gay Men (ATLG) comprises 20 items: 10 items to assess the attitude towards gay men and ten items towards lesbians (Moral de la Rubia & Valle de la O, 2014). Interestingly, ATLG is widely used and validated in a varied context in different countries (Herek & McLemore, 2013). Although ATLG is reported to have a high level of internal consistency, ALTG does not seem to provide a good fit to data from Latin American countries.

Among other homophobia scales, two scales developed by Larsen et al. (1980) and Klamen et al. (1999) have attracted attentions from many scholars and practitioners. In their paper, Larsen et al. (1980) described three phase-development processes of a homophobia scale known as Heterosexual Attitudes Towards Homosexuality (HATH). The reliability assessment of 20 HATH scale items yielded a coefficient of 0.85, indicating the high internal consistency. In addition, Klamen et al. (1999) developed twelve question items to evaluate attitudes towards homosexuals and homosexuality. Using the data of 100 second-year medical students, the reliability assessment of the scale has revealed a high level of internal consistency with Cronbach's alpha of 0.90. Unfortunately, little has been explored on how a new scale developed from the previous studies (i.e. Klamen et al., 1999; Larsen et al., 1980) is validated, mainly using data from religion-based universities in South Asian country such as Indonesia. Larsen et al. (1980) has indicated in their study that religiosity correlated with student attitudes toward homosexuals.

The current study was conducted to assess the psychometric properties of the homophobia scale using data from religion-based universities. To this end, the Rasch model analysis method was employed and several Rasch statistical analyses were performed, including the analysis of scale' principle component analysis (PCA) aspect, reliability analysis and the assessment of differential item functioning (DIF). Rasch is a one parameter item-response formulation that enables researchers or scale developers to assess the item's difficulty level and the person's ability to respond to the questionnaire items (Ben, 2020). In Rasch model analysis, the ordinal data collected from the survey were assessed as frequencies and were observed as an odd probability (Rusland et al., 2020). It is critical to highlight that the scores of particular homophobia constructs in the previous studies were obtained by summing the numerical values across the scale items (Klamen et al., 1999; Moral de la Rubia & Valle de la O, 2014). However, summing the item responses could raise concern because the assumption of having the same distance between categories for all participants is still uncertain for ordinal data (DiStefano & Jiang, 2020). As an alternative, Rasch measurement runs on a logarithm that allows the researchers to convert the odd probability into equal-interval-types for each scale unit (Boone et al., 2014; 2016). In other words, Rasch analysis reflects reliable and objective measurements where the relationship between the difficulty level of questionnaire item and the person (respondent) ability to respond to the items are assessed under the same interval (Rusland et al., 2020). Furthermore, the choice of employing Rasch model in the current study was made for its capability in evaluating the latent traits (Colledani et al., 2020) and providing invariant measurement characteristics within numerous contexts (Wright, 1992 cited in Yu, 2020).

Method

Sample

The data for the analysis in the current study were collected from two cohorts of students: state religion-based university students and private-religion-based university students in Indonesia. Using a non-probability sampling method, 327 students participated in the current study, comprising 98 students from state religion-based universities and 229 students from private-religion-based university students. Most of the students were Muslim (N=322), and some were Protestant (N=4) and Buddhist (N=1). A more detailed demography of the participants is described in the following Table 1.

Table 1 Demography of the participants

Demography		Frequency	Percentage (%)
Gender	Male	109	33.3
	Female	218	66.7
Age	< 21	172	52.6
	21 − 25	112	34.3
	26 − 30	15	4.6
	31 − 35	2	0.6
	35 <	26	7.9
Program	Diploma program	3	0.9
	Undergraduate	273	83.5
	Master program	51	15.6
	Doctoral program	0	0
University	State university	98	29.97
	Public university	229	70.03

Data collecting instrument and procedure

The research protocol for the data collecting procedure was approved to the authors' university ethic committee. The data collecting instrument used for the current study was adapted from surveys in previous research (Klamen et al., 1999; Larsen et al., 1980), of which sixteen survey items were exercised to measure students' attitudes towards homosexuality. The items were mainly classified into three: approval (APV, item Q1-Q8), refusal (RFS, item Q9-Q16), and acceptance (ACC, item Q17). In addition, some demography questions were added, such as gender, age, and the study program that students took at the time of the survey. The survey instrument was developed using a five-point Liker scale where students were asked to select one of five available alternatives for each statement, i.e. strongly agree, agree, neutral, disagree, and strongly disagree. Except for item 17, the alternative included 'agree without any condition, agree with a certain condition, neutral, disagree under certain condition, totally disagree without any condition'. The original 12-item homophobia scale was written in English and possessed a high level of internal consistency (Cronbach's Alpha = 0.90) (see Klamen et al., 1999). After the ethic clearance was obtained from our university board, in the current study, the homophobia scale was administered online to students at religion-based universities, both state and private universities. Students were contacted individually or in a group to participate in the study. Students' participation was voluntary, and consent from the participant was collected prior to the data analysis.

Rasch analysis

Rasch model analyses were carried out to examine 17 items of the homophobia scale. The analyses included the evaluation of Rasch Principle Component Analysis (PCA), the analysis

of item and person reliability, and finally, the differential item functioning (DIF). Prior to Rasch analysis, all data collected were downloaded from the Google server and were tabulated in an Excel file. Then, using WINSTEP 4.5.1 application, the tabulated raw data were converted into log-odds unit (later is called logit) values. As a part of the Rasch analysis procedure, the logit values conversion was done to maintain equal length between two measurement units of the ordinal data (Mulyono et al., 2020; Ningsih et al., 2021). Then, the data were screened for missing values, outliers and appropriateness of the respondents' responses. Ben (2020) asserts that it is common in a survey where respondents unintentionally may skip or incidentally miss to complete particular questionnaire items. Moreover, some respondents may not express their interest in responding to the statements in the questionnaire (Goh et al., 2010; Linacre, 2010). The missing values, outliers and inappropriate responses in the dataset are believed to affect the reliability of the data and the reporting of the current study (Ben, 2020).

In the current study, fit statistical analysis was performed to assess the appropriateness of response data and the outliers. Of 327 data, a number of 114 data were observed not to fit the Rasch analysis because their logit values were observed beyond the threshold -2 and +2 (see Huang et al., 2020). Linacre (2010), the misfit data were regarded as outliers and thus removed from the further statistical calculation. In the following session, we present the Rasch statistical analyses using the remaining 213 data (62 students from state religion-based universities and 151 students from private-religion-based university students). Several researchers (i.e. Linacre, 1994; Mulyono et al., 2020; Ningsih et al., 2021) have argued that the minimum sample size for Rasch analysis is 50, and thus the total of 213 was still sufficient for the Rasch statistical analysis.

Result

Descriptive statistics for item and person

As discussed earlier, all the raw data were converted into logit value (LV) to maintain an equal-interval-types for each scale unit (Boone et al., 2014, 2016) so that the analysis could reflect a reliable and precise measurement of the survey data (Rusland et al., 2020). Table 2 below presents the logit values from the students' responses to the homophobia scale items, and Table 3 summarises the person and item descriptive statistics.

Table 2 Students responses to Homophobia scale items

	Items	Logit value (LV)	SE
Q1	I enjoy making friends with homosexuals	0.54	0.08
Q2	Campus society should recognise homosexuality as normal	0.93	0.08
Q3	Campus society should accept homosexuals	0.60	0.08
Q4	The place where homosexuals gather and work should not be restricted or even be closed down	-0.91	0.08
Q5	Homosexuals are often treated unjustly in our campus society	0.23	0.08
Q6	I would feel comfortable studying and interacting with homosexuals at campus	-1.10	0.08
Q7	Homosexuals should have equal opportunity to study and to have social interaction with campus society	-0.78	0.07
Q8	There should be no reason to restrict the place where homosexuals study and collaborate	-0.40	0.07
Q9	Homosexuals should not be allowed to work with children or younger people in campus life	0.59	0.08
Q10	Homosexuality can be considered immoral	0.88	0.08
Q11	Homosexuality can be classified as a mental disorder	-0.42	0.07

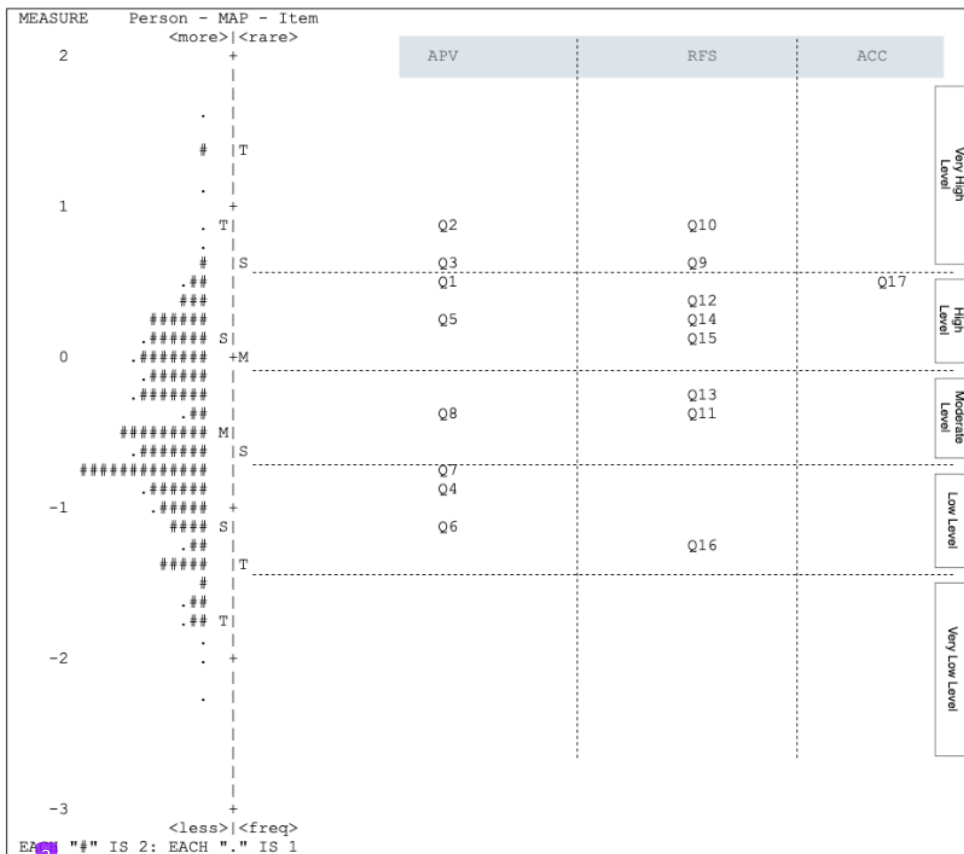| Q12 | Homosexuals with AIDS deserve their fate | 0.44 | 0.08 |
Q13	Homosexuality endangers the university and campus society	-0.21	0.07
Q14	Students who are in favour of homosexuality tend to be homosexuals themselves	0.20	0.07
Q15	Whenever possible, I try to avoid homosexuals	0.16	0.07
Q16	I feel more negative about homosexuality since I learned about AIDS	-1.24	0.08
Q17	Overall, I personally accept homosexuality and homosexuals	0.50	0.08

SE=standard of error

Table 3 Descriptive statistics for person and item

	Person statistics (N=213)		Item statistics (N=17)	
	Total score	Logit	Total score	Logit
Min	25.0	-2.20	401.0	-1.24
Max	72.0	1.62	779.0	0.93
Mean	44.6	-0.49	559.1	0.00
S.SD	8.9	0.66	123.6	0.70

In the Rasch analysis, participants' responses to the questionnaire items are classified into person and item. Person classification reflects the classification of responses in reference to the respondent ability to respond to the items, and the item classification concerns with classification of responses in reference to the item ability to distinguish the participant responses. Both person and item statistics are reported in logits. As shown in Table 3, the mean score of the person was reported at -0.49 with a sample standard deviation (S.SD) of 0.66, while the mean score of the item was observed at 0.00 with an S.SD of 0.70.

In addition, Rasch item and person map was developed to visualise the distribution of respondents' responses and the difficulty level of questionnaire items. As shown in Figure 1, the map is divided into two main areas: the distribution of the person logit on the left side and the distribution of items on the right side. The vertical line of the map concerns with the distribution of the number of people or items based upon their logit values. The vertical line of person area reflects more people responding to the item on the top, and fewer people respond on the bottom. In contrast, the vertical line in the item area shows the less item to agree on the top and more items to agree on the bottom.

Particularly in the item area, participants' responses were classified into five difficulty levels: very high level of item difficulty, high level, moderate level, low level, and very low level. For example, item Q17, '*Overall, I personally accept homosexuality and homosexuals*', was perceived as a high difficult item, indicating that student has a low level of acceptance of homosexuality and homosexuals in campus society.

```
MEASURE    Person - MAP - Item
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                |                    │   APV    │   RFS    │   ACC    │
                |                    │          │          │          │
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              # |T                   │          │          │          │  │ Very High│
                |                    │          │          │          │  │  Level  │
              . |                    │          │          │          │  │         │
   1            +                    │          │          │          │  └─────────┘
            . T|           Q2        │          Q10        │          │
            .  |                      Q3         Q9         │          ┌─────────┐
            #  |S──────────────────────────────────────────────────   │ High    │
          .##  |           Q1                              Q17        │ Level   │
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EACH "#" IS 2: EACH "." IS 1
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Fig 1. Wright person-item map (N= 213).

"#" represents two persons; "." Represents 1 person. M_p: person mean; $S_{p\,G}$: one standard deviation of person mean; T_p: two standard deviations of person mean; M_i: item mean; S_i: one standard deviation of item mean; T_i: two standard deviations of item mean; (Approval (APV): Q1-8, Refusal (RFS): Q9-16, Acceptance (ACC): Q17)

Evaluation of Rasch PCA

The analysis of Rasch Principle Component Analysis (PCA) was performed to test the assumption of unidimensionality of the homophobia scale. The assumption of unidimensionality is required to ensure that all the scale items only measure a single construct of homophobia (Yu, 2020). The analysis of Rasch PCA from the scale was done by assessing the raw variance of the scale items. It was found that the raw variance range of each variable was found greater than the PCA threshold of 20% (the global scale=42.4%, the Approval subscale=55.0% and Refusal subscale=48.2%). The finding has indicated that the Rasch model measurement could explain the raw variance. More importantly, the residuals of the unexplained variants of PCA for the global scale and the two main subscales, i.e. APV and RFS, were included and considered very good criteria.

Reliability of item and person

The reliability assessment of item and person was done to evaluate the reproducibility of the item and person classification in a new sample (Chang et al., 2014) or on a certain latent traits continuum (Chan & Subramaniam, 2020; Ningan et al., 2021). The reliability analysis has shown that the item reliability was observed at an excellent level ($\alpha > 0.90$), and the

reliability of person reliability was still at an acceptable level ($\alpha = 0.79$). The finding indicates that the person-reliability of the homophobia scale still maintain an acceptable level for its use within other new cohorts of a sample (Ningsih et al., 2021; Van Zile-Tamsen, 2017).

Differential Item Functioning (DIF) analysis for the scale items
In the current study, the DIF analysis was performed for each item scale to indicate the capability of participants from a certain group in responding to scale items compared to those from other groups (Chan & Subramaniam, 2020). A scale item is considered to exhibit DIF if the DIF contrast value is higher than 0.5 logits and a significant Rasch-Welch ($p < 0.05$). The analysis of DIF has shown potential DIFs for the scale item. All demography aspects reflect potential DIF for their items. Table 4 summarises the potential DIF on the scale item for each demography. In addition, Table 5 and Table 6 exemplifies the DIF on gender and university demography, respectively.

Table 4 Potential DIF on the scale item

No	Demography		Number of items with potential DIF (N_{DIF})	Items
1	Gender	Male (1)	2	Q10, Q11
		Female (2)		
2	Age	< 21 (1)	14	Q2, Q4, Q5, Q7, Q8, Q10
		21 – 25 (2)		Q11, Q12, Q13, Q14, Q15,
		26 – 30 (3)		Q16, Q17
		31 – 35 (4)		
		35 < (5)		
3	Program	Diploma program (1)	9	Q5, Q6, Q7, Q8, Q10, Q11,
		Undergraduate (2)		Q13, Q15, Q16,
		Master program (3)		
		Doctoral program (4)		
4	University	State university (1)	2	Q8, Q16
		Public university (2)		

Table 5 DIF on scale item for gender

Item	Gender	DIF measure	DIF contrast	*t*	*p*
Q10	1	1.31	0.56	2.83	0.00
	2	0.74			
Q11	1	-0.01	0.57	3.50	0.00
	2	-0.59			

Table 6 DIF on scale item for gender

Item	University	DIF measure	DIF contrast	*t*	Probability
Q8	4	-0.23	0.60	3.72	0.00
	2	-0.83			
Q16	4	-1.05	0.66	3.78	0.00
	2	-1.71			

As shown in Table 5, there was a significant difference between male and female participants in responding item Q10 '*Homosexuality can be considered immoral*', and Q11 '*Homosexuality can be classified as a mental disorder*'. Female students were observed to be more capable of responding to the two items compared to the males. The finding also could be interpreted that female students seemed to have more negative perceptions about

homosexuals than males. Moreover, as indicated in Table 6, students' responses to item Q8 *'There should be no reason to restrict the place where homosexuals study and collaborate'* and Q16 '*I feel more negative about homosexuality since I learned about AIDS*' revealed significant difference (DIF contrast > 0.05 and $p < 0.05$). It indicated that students from state universities were shown to be more able to respond to the two items. It is interesting to highlight that although students from state universities tend to be supportive to homosexuals than those in private universities, they had negative views about homosexuality when it was associated with AIDS.

Discussion

The current study validated the homophobia scale comprising of 17 items using the data from religion-based university students in Indonesia. In general, the homophobia scale evaluated using Rasch model appears to have good psychometric properties. The assessment of PCA has shown that the scale only measures one single construct, i.e. homophobia among the students from the two cohorts of the sample. The assessment also showed that the unexplained variance of the residuals was reported under 15%, suggesting that the scale items did not reflect another meaningful dimension other than homophobia.

The analysis of the item map also suggests that many items (N=10) were considered difficult to respond (Logit value > 0.00), and few items were regarded as easy (N=4). The item map analysis also revealed that students had a positive perception about homosexuality and homosexuals. Although students thought that homosexuals should be given the freedom to study and have social interaction in the campus society, they disagree if the campus society should recognise homosexuality as normal and thus should not be accepted in the society.

It is critical to highlight that many scale items had potential DIF in reference to the participants' demography aspects. Particularly, potential DIF was observed on many items related to the participants' age (N_{DIF} = 14) and their study program (N_{DIF} = 9). The findings indicate the need to modify the classification of age and the study program. Related to the participants' gender and university, for example, findings of the current study revealed that female students had more negative views than the male participants. This finding does not correspond to the earlier study suggesting that male people tend to be more tolerant concerning homosexuality than their female counterparts (see Larsen et al., 1980). In addition, students from state universities tend to be supportive to homosexuals than those in private universities, but they had negative views about homosexuality when it was associated with AIDS.

The psychometric analysis in the current study also has revealed that the reliability of the homophobia scale was in the acceptable range (Cronbach's alpha = 0.79). However, such reliability remained lower than one reported in the earlier study (i.e. Klamen et al., 1999; Moral-de la Rubia et al., 2015). It is important to highlight the distinct between the homophobia scale properties assessed in the current study and the scale in the earlier studies. The homophobia scale proposed by Klamen et al. (1999) comprised 12 items with four alternative responses. In addition, in their study, Moral-de la Rubia et al. (2015) selected only 8 of 12 items on the homophobia scale and modified the alternative into seven responses. These differences may explain the discrepancy of the reliability score between the two homophobia scales and the different contexts of the study participants. Nevertheless, despite the person reliability result, the item reliability has shown satisfactory result, revealing the excellent reliability level ($\alpha > 0.90$). This excellent item reliability has suggested that the homophobia scale possesses an excellent internal consistency (see You et al., 2020).

Conclusions and recommendation for further research

Overall, the assessment of the homophobia scale using the data from religion-based university students suggests that the scale possesses sufficient psychometric properties and reveals promising construct validity. However, the psychometric assessment of the homophobia scale in the current study has limitations. In the study, we assume that students had sufficient motivation to respond to all the given statements. We also thought that students might have comprehended all statements very well and provided their honest responses. Despite the fact that about 34.9% of data were considered outliers from the initial sample of 327 participants. Since the current study involved students from religion-based universities, some other variables related to their religion, both perception and practices, might have interfered with their responses. Further validation study thus should consider the participants' background of religion, perspective and practices.

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