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Adaptation of the Indonesian Version of the Nomophobia Scale (NMP-Q-10)

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Abstract

Nomophobia has become a new issue related to smartphone use. Unfortunately, in Indonesia, there is still a limited availability of valid and reliable measurement tools. This study aimed to test the construct validity of the nomophobia instrument developed by Warsah et al. (*Jurnal Pengukuran Psikologi dan Pendidikan Indonesia* 12(2):127–144, 2023), which consists of 10 items adapted into Indonesian and subsequently modified by the researchers. Data were obtained from young adults, specifically university students aged 18–24 years in Yogyakarta. A total of 410 respondents participated in this study. Confirmatory factor analysis (CFA) was conducted using Jamovi. Based on the results of the construct validity test using unidimensional CFA, a model fit was achieved in the first stage by excluding one item (item number 10). The second stage involved using the results from the first stage and renumbering the items, which also yielded a well-fitting model with valid loading factors for all items. The results of this test indicate that the Indonesian version of the nomophobia scale is valid and reliable for use in various settings to accurately measure the level of nomophobia among university students.

Keywords Confirmatory factor analysis · College students · Nomophobia

Introduction

The rapid advancement of information technology over the past decade (Lee et al., 2018) has had both positive and negative impacts on individuals (Dwivedi et al., 2023). One of the continuously evolving technological products is the smartphone (Warsah et al., 2023), which has become the primary means for individuals to explore the online world (Cisco, 2016). The presence of smartphones has significantly changed individuals' lives by providing various facilities (Al-Mamun et al., 2023). Smartphones have become an essential part of students' lives (Lee et al., 2018) as they offer convenience and assistance in completing academic tasks (Nugraha et al., 2018; Kang & Jung, 2014). A survey by APJII showed that 89.77% of Internet usage penetration in Indonesia is dominated by students (Nugraha, 2018). However, excessive smartphone use has triggered a new issue, nomophobia (Wacks & Weinstein, 2021), which has now become a global phenomenon, particularly among students (Warsah et al., 2023).

Nomophobia is the fear and anxiety caused by being away from and unable to use one's phone (Yildirim & Correia, 2015a). It is commonly found among individuals aged 18–25, most of whom are students (Odzemir, 2018). Research on 1500 smartphone users based on age showed that those aged 18–24 are particularly vulnerable to nomophobia, with 43.5% falling into the moderate category (Aparna et al., 2017). A study in the Philippines found a moderate prevalence rate of 63.2% for nomophobia. In Indonesia, the prevalence of nomophobia is also in the moderate category (Rezki et al., 2018). Additionally, it was found that most students use smartphones intensively, with a rate of 49.45% (Fajri, 2017).

Individuals experiencing nomophobia may show discomfort, nervousness, and anxiety when they cannot use their phones (Yildirim & Correia, 2015a). They may also exhibit excessive worry, loneliness, panic, and sadness (Bragazzi & Puente, 2014). Some individuals fear losing Internet connectivity (Pavithra et al., 2015) and being unable to connect to social media for distant communication (King et al., 2010). Nomophobia is also associated with psychological

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stress (Lin et al., 2018), which can lead to stress (Rodriguez-Garcia et al., 2020), insomnia, reduced social interaction, lack of focus, and decreased productivity (Yildirim, 2014). Previous research has identified several factors influencing nomophobia, including game addiction (Gao et al., 2021), FoMO syndrome (fear of missing out) (Mertkan et al., 2018), internal factors (high sensation seeking, low self-esteem, and low self-control) (Yuwanto, 2010), Internet addiction, and problematic smartphone use (SUP) (Gezgin et al., 2018). Other studies have found correlations between nomophobia and depression, avoidance or hostility (Adawi et al., 2019; Arpaci et al., 2017), obsessive–compulsive disorder (Adawi et al., 2019; Lee et al., 2018), anxiety (King et al., 2013; Darvishi, 2019), panic disorder (Adawi et al., 2019; King et al., 2010, 2014), and stress (Tams et al., 2018).

The Nomophobia Questionnaire (NMP-Q) was initially developed by Yildirim and Correia (2015a) in English and consists of 20 items with four dimensions: not being able to communicate, losing connectedness, not being able to access information, and giving up convenience. This nomophobia instrument has been validated and adapted in various countries, cultures, languages, and respondents, such as the Persian version conducted on medical students (Elyasi et al., 2018), the Chinese version on students aged 16–25 (Gao et al., 2020), the Spanish version (Gutierrez-Puertas et al., 2016; Gonzalez-Cabrera et al., 2017), the Italian version (Adawi et al., 2018), the German version with a sample including students, workers, the unemployed, and retirees, indicating that the NMP-Q-D is comparable to the original NMP-Q in terms of internal consistency (Coenen & Gorlich, 2022), the Arabic adaptation demonstrating that the NMP-Q is a reliable, valid, and appropriate instrument for assessing nomophobia (Farchakh et al., 2021; Jelleli et al., 2023), and the Indonesian version with a sample of Islamic guidance and counseling students, resulting in a 10-item high-quality version called the NMP-Q-10 Indo-version (Warsah et al., 2023).

Research on nomophobia remains largely exploratory, with many studies employing descriptive, non-experimental, and cross-sectional designs. These studies predominantly examine the prevalence of nomophobia among adolescents and university students (Daraj et al., 2023; Rodríguez-García et al., 2020). A systematic review and meta-analysis identified significant positive correlations between nomophobia, anxiety, smartphone addiction, and insomnia (Jahrami et al., 2024), underscoring the wider psychological and physical health consequences of nomophobia. Additionally, the review found that nomophobia negatively affects personality, self-esteem, stress, academic performance, and various health-related outcomes (Rodríguez-García et al., 2020).

Most prior studies have employed the Nomophobia Questionnaire (NMP-Q) developed by Yildirim and Correia to measure nomophobia (Jahrami et al., 2023). The consistent use of this tool highlights its reliability across different studies. Another systematic review reported varying prevalence rates of nomophobia, with significant differences observed by gender and age. Women and younger individuals were found to be more vulnerable to nomophobia (Rajguru et al., 2024). This demographic information is vital for understanding the extent of the issue across different groups. Furthermore, a bibliometric analysis of nomophobia-related publications revealed a growing volume of research, particularly after 2017, focusing on prevalence and diagnostic efforts across diverse populations (León-Mejía et al., 2021). This trend reflects the increasing recognition of nomophobia as a critical concern.

This study aims to revalidate the Nomophobia Questionnaire (NMPQ-10 Indo-version) adapted by Warsah et al. (2023) using a sample of students from a university in Yogyakarta province. The primary purposes of retesting the NMPQ-10 Indo-version are threefold. First, scales developed in one cultural or demographic context may not be relevant in another, necessitating adaptation to ensure validity. Second, social changes and time conditions can affect a scale's relevance, requiring updates to keep it current. Third, revalidation ensures the scale's internal consistency and construct validity, making sure it remains fair and unbiased against specific groups. Additionally, we recognize that Warsah et al. (2023) used a relatively small sample size (276 respondents), which may have impacted the results of their study. Therefore, we are retesting the NMPQ-10 Indo-version with a more representative sample of college students to obtain more accurate and reliable results, allowing for broader application in various research fields.

Method

Phase 1 Study: Lingual-Cultural Adaptation of NMPQ-10

Participants

The participants involved in this study consisted of 1 expert lecturer with a doctoral academic qualification, who has expertise related to the measurement and construct of nomophobia, and 4 psychologists with a master's degree in clinical psychology. Additionally, 20 active students aged 18–24 years, who use smartphones for more than 6 h, were included in the pre-trial stage of the Indonesian version of the NMPQ-10 scale assessment. Informed consent was obtained from the participants voluntarily. The characteristics of the participants in this study are active students, using smartphones for more than 6 h, both male and female. The aim of lingual-cultural adaptation of NMPQ-10 scale is to modify and translate the scale so that it is culturally

and linguistically appropriate for a different population than the one for which it was originally developed. This process ensures that the scale measures the same psychological constructs in a valid and reliable manner across different cultures and languages. The adaptation involves accurate translation to maintain the original meaning while considering cultural nuances, idioms, and language structure. It also requires modifying content, examples, or scenarios to make them culturally relevant and appropriate. Additionally, the process ensures conceptual equivalence, meaning that the psychological constructs being measured hold the same significance and interpretation in the new cultural context. Overall, the goal is to create a version of the scale that is both linguistically accessible and culturally meaningful, allowing for effective use in psychological assessment or research across different cultural groups.

Adaptation Procedure

The adaptation of the measurement tool from English to Indonesian in this study follows the guidelines of the International Test Commission (ITC), involving several crucial steps to ensure validity and reliability equivalent to the original version (ITC, 2017a, b). The first step is to select an appropriate measurement tool and obtain permission from the copyright holder (Hambleton, 2005; van de Vijver & Leung, 2011; ITC, 2017b). The researchers have corresponded with the copyright holder of the measurement tool and have obtained permission to use it. The second step is the translation of the scale by a professional translator proficient in both languages and knowledgeable in the relevant field, assisted by an expert to ensure the suitability of the scientific and cultural context. A team of two bilingual experts in psychology and education conducted the translations to ensure both linguistic and cultural relevance of the scale for the target population.

The third step involves a discussion group of two experts in psychology to evaluate the translation, identify cultural differences, and make revisions if necessary. The fourth step is back-translation, where the translated tool is re-translated into English by a different translator to assess consistency with the original version.

Instruments

The nomophobia scale developed by Yildirim and Correia (2015a), which was later adapted into Indonesian by Warsah et al. (2023), will be re-evaluated in this study. Warsah et al. (2023) explained that 10 items out of 20 were excluded based on factor analysis results. These 10 nomophobia items will then be re-validated on a sample of university students aged 18–24 years. Table 1 presents the 10 items of the nomophobia scale by Yildirim and Correia (2015b) that have been adapted by Warsah (2023). In Table 1, the original items are presented alongside their translations into Indonesian, along with the modifications made to the translated items. The modifications focused on readability, reducing the word count, and simplifying the sentences to ensure they are easier for respondents to understand.

This research modified the NMP-Q-10 Indo-Version measurement tool (Warsah et al., 2023) through four stages: item modification, expert assessment, pre-testing, and field testing. The first stage involved modifying the wording of each item statement. This modified nomophobia scale uses a Likert scale with four response options: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

The second stage was the expert assessment, involving five experts (raters), including one expert lecturer and four clinical psychologists, to ensure that the items aligned with the theoretical construct. The third stage was the pre-testing of the scale, aimed at verifying the accuracy of the modified items based on discussions with expert judgment and aligning with research needs. During the pre-testing phase, a first-order CFA (Confirmatory Factor Analysis) and reliability testing with item discrimination power were conducted. After obtaining valid items, the final draft of the modified NMPQ-10 Indonesian Version was prepared. The fourth stage was field testing to collect data for analysis using a second-order CFA.

Phase 2 Study: NMPQ-10 Validation Review with CFA

Participants

The sample for this study consisted of active students from a university in Yogyakarta province, aged 18–24 years, who use smartphones and social media for more than 6 h a day and always carry a charger or power bank. Prior to data collection, we used a self-reporting method where students indicated their average daily smartphone usage for various activities such as social media, entertainment, and other applications. Data collection was conducted offline by visiting each class. The sampling process took approximately 3 weeks and resulted in 410 respondents. This study used a non-probability sampling method with convenience sampling technique, meaning students who voluntarily signed the consent form and completed the questionnaire were considered participants. Table 2 presents the complete demographic data of the respondents.

Table 2 provides an overview of the demographic data of the research sample, covering gender, age, social media platform usage, and faculty distribution. Out of 410 respondents, 31.7% were male and 68.3% were female. The majority of participants are 19 years old, representing 42.7% of the sample (175 individuals). This is followed by participants aged 20, who account for 23.4% (96 individuals). Participants

Table 1 Dimensions and items of the nomophobia questionnaire

No	Dimension	Description	Original items	Items translation	Items modification
1	*Not being able to communicate*	The fear that an individual cannot communicate through their smartphone	If I did not have my smartphone with me, I would feel anxious because I could not instantly communicate with my family and/or friends	Jika saya tidak membawa ponsel pintar saya, saya merasa cemas karena saya tidak dapat berkomunikasi dengan segera dengan keluarga dan atau teman-teman saya	Jika tidak membawa ponsel, saya akan merasa cemas karena tidak dapat segera berkomunikasi dengan keluarga dan/atau teman-teman saya
			If I did not have my smartphone with me, I would be anxious because I could not keep in touch with my family and/or friends	Jika saya tidak membawa ponsel pintar saya, saya akan merasa cemas karena tidak dapat menghubungi keluarga dan/atau teman-teman saya	Jika tidak membawa ponsel, saya akan merasa cemas karena tidak dapat menghubungi keluarga dan/atau teman-teman saya
			If I did not have my smartphone with me, I would be nervous because I could not know if someone had tried to get a hold of me	Jika saya tidak membawa ponsel pintar saya, saya akan merasa gelisah karena saya tidak dapat mengetahui jika seseorang berusaha untuk menghubungi saya	Jika tidak membawa ponsel, saya akan merasa gelisah karena tidak mengetahui jika seseorang yang berusaha menghubungi
2	*Losing connectedness*	The fear of losing connection with the virtual world	If I were to run out of credits or hit my monthly data limit, I would panic	Jika saya kehabisan pulsa atau mencapai batas data bulanan, saya akan cemas	Saya akan cemas jika kehabisan pulsa atau mencapai batas data bulanan
			If did not have a data signal or could not connect to Wi-Fi, then I would constantly check to see if I had a signal or could find a Wi-Fi network	Jika tidak ada sinyal data atau tidak bisa terhubung ke Wi-Fi, maka saya akan terus menerus memeriksa apakah ada sinyal atau bisa menemukan jaringan Wi-Fi	Jika tidak ada sinyal data atau tidak bisa terhubung ke Wi-Fi, maka saya akan terus-menerus memeriksa apakah ada sinyal atau bisa menemukan jaringan Wi-Fi
			If I could not use may smartphone, I would be afraid of getting stranded somewhere	Jika saya tidak dapat menggunakan ponsel pintar saya, saya takut akan tersesat disuatu tempat	Jika tidak dapat menggunakan ponsel, saya takut akan tersesat di suatu tempat
3	*Not being able to get information*	The fear of not being able to access information	If I did not have my smartphone with me, I would be uncomfortable because I could not stay up to date with social media and online network	Jika saya tidak membawa ponsel pintar saya, saya akan merasa tidak nyaman karena saya tidak akan dapat mengikuti perkembangan terkini melalui media sosial dan jaringan daring	Jika tidak membawa ponsel, saya merasa gelisah karena akan tertinggal perkembangan terkini melalui media sosial dan jaringan daring
			If I did not have my smartphone with me, I would feel awkward because I could not check my notification for updates from my connections and online network	Jika saya tidak membawa ponsel pintar saya, saya akan merasa canggung karena saya tidak dapat memeriksa permberitahuan-pemberitahuan terkini melalui koneksi dan jaringan daring saya	Jika tidak membawa ponsel, saya akan merasa canggung karena tidak dapat memeriksa pemberitahuan terkini melalui koneksi dan jaringan daring

Table 1 (continued)

No	Dimension	Description	Original items	Items translation	Items modification
4	*Giving up convenience*	Letting go of the comfort of using a smartphone or the anxiety of losing the enjoyment of using a smartphone	If I did not have my smartphone with me, I would be worried because my family and/or friends could not reach me	Jika saya tidak membawa ponsel pintar saya, saya akan merasa khawatir karena keluarga dan/atau teman-teman saya tidak dapat menghubungi	Jika tidak membawa ponsel, saya akan merasa khawatir karena keluarga dan/atau teman-teman tidak dapat menghubungi saya
			If I did not have my smartphone with me, I would feel nervous because I would not be able to receive text message and calls	Jika saya tidak membawa ponsel pintar saya, saya akan merasa gelisah karena saya tidak akan dapat menerima pesan teks dan panggilan	Jika tidak membawa ponsel, saya akan merasa gelisah karena tidak dapat menerima pesan teks dan panggilan

Table 2 Demographic data of the research sample

Characteristics	Description	Frequency	Percentage
Gender	Male	130	31.7%
	Female	280	68.3%
Age	17	3	0.7%
	18	42	10.2%
	19	175	42.7%
	20	96	23.4%
	21	70	17.1%
	22	16	3.9%
	23	8	2.0%
Primary social media platforms	Instagram	383	48%
	WhatsApp	399	49%
	TikTok	363	47%
	Line	55	12%
	Twitter	135	25%
	Facebook	81	16%
	Others	21	5%
Faculties	Economics and business	275	66%
	Law	70	17%
	Psychology	71	17%
Social class	Upper class	31	7.56%
	Middle class	352	85.85%
	Lower class	27	6.59%

aged 21 make up 17.1% (70 individuals), while those aged 18 comprise 10.2% (42 individuals). There are smaller proportions of participants in other age groups: 22-year-olds account for 3.9% (16 individuals), 23-year-olds represent 2.0% (8 individuals), and 17-year-olds are the least represented, comprising only 0.7% (3 individuals). This distribution suggests that the sample is predominantly composed of individuals aged 19 to 21 (SD = 1.13, $M = 19$).

Regarding the primary social media usage, WhatsApp was the most used platform (49%), followed closely by Instagram (48%) and TikTok (47%). Other platforms like Twitter (25%), Facebook (16%), Line (12%), and other platforms (5%) had lower percentages of usage among respondents.

Out of the total sample, 7.56% of participants belong to the upper class, while the vast majority, 85.85%, fall into the middle class. A smaller portion of the respondents, 6.59%, are from the lower class. This distribution indicates that the sample is predominantly composed of middle-class individuals, with a relatively small representation from both the upper and lower classes.

Finally, the distribution of respondents by faculty shows that 66% of the participants were from the Faculty of Economics and Business, while 17% each were from the Faculties of Law and Psychology. This demographic data highlights the

diversity of the respondents in terms of social media usage and academic background.

Analysis Data

To test the construct validity of each item in this study, the researchers used confirmatory factor analysis (CFA) with the Jamovi application. Criteria are needed to meet the construct validity for each valid and invalid item. The steps for CFA testing or item validity and its criteria (Umar & Nisa, 2020) indicate that there is a concept or trait that is operationally defined so that questions or statements can be composed to measure it. This trait is called a factor, and the measurement of this factor is carried out through analysis of responses to its items. All items that are compiled are theorized and hypothesized to validly measure the construct, measuring only one factor or a unidimensional model. The collected data can be used to estimate the correlation matrix between items called sigma (Σ), which is then compared with the matrix from the empirical data (S). If the theory is correct, there will be no difference between the Σ matrix and the S matrix.

The null hypothesis statement is then tested with chi-square. If the chi-square is not significant ($p > 0.05$), the null hypothesis is not rejected, meaning the unidimensional theory can be accepted, indicating that the item only measures one factor. If the model fits, the next step is to see whether the item significantly measures what it is intended to measure using the t-value ($t < 1.96$), then the item is not significant in measuring what it is intended to measure and should be eliminated.

The accuracy of the hypothesized model in this study was tested using several parameters, namely the goodness of fit index (GFI), comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA). As mentioned, GFI is considered acceptable when it reaches or exceeds 0.90, indicating a good fit between the model and the data. CFI is set at a threshold of 0.95 or higher, indicating strong alignment between the proposed model and the actual data set. TLI is considered satisfactory if it reaches 0.90 or higher, and RMSEA with a benchmark of 0.08 or lower (Schumaker & Lomax, 2010). This research also conducted convergent reliability analysis based on the Cronbach alpha coefficient > 0.7, Omega coefficient > 0.7, composite coefficient (CR) > 0.7, and average variance extracted (AVE) value > 0.5.

Results

Stage 1 Study: Modification, Validity, and Reliability of NMP-Q-10

The first stage of the research focuses on modifying the Nomophobia Questionnaire (NMPQ-10) by Warsah et al. (2023). This scale consists of 10 items based on aspects of nomophobia, including not being able to communicate, losing connectedness, not being able to access information, and giving up convenience. The researchers modified these 10 items by changing some words in each item to shorten and clarify the intent of each statement.

After the researchers made these modifications, the second stage involved obtaining ratings and recommendations from five experts who are competent in the measurement and construct of nomophobia. The analysis in this rating process used Aiken's V to test the content validity of each item. The expert ratings were divided into two stages. In the first stage, it was found that the CVI values for some items were below the minimum Aiken standard for items 6, 9, and 10. The researchers then made improvements for these items to be rated again.

After the re-rating process, the second stage involved calculating the content validity index, which finally met the minimum validity score criteria set by Aiken (1985), with $V = 0.80$ and a 5% error rate. Based on the Aiken's V calculation results for the nomophobia scale, the validity values ranged from 0.900 to 0.950, with an average Aiken's V of 0.945. Following the validation of each nomophobia item using Aiken's V, a pre-test was conducted involving 200 active students. The purpose of the pre-test was to obtain data with reliability and high measurement consistency.

The selection of items is done by looking at the discrimination power of the items in order to obtain items with good reliability. The corrected item-total correlation criteria must reach a minimum of 0.30 to be said to be satisfactory (Azwar, 2019). The results of the reliability and discrimination test of the 10 items of the nomophobia scale showed that the discrimination power of items was below 0.30 (7) of 1 item with an item-rest correlation value of 0.260 so that the item was not selected or dropped and the other 9 items were continued for collecting research data with coefficient results; Cronbach's alpha is 0.888, McDonald's Omega coefficient is 0.889, and the range of item-total correlation coefficients for these 9 statements ranges from 0.5 to 0.7 which shows that the model has strong fairness. The results of reliability calculations can be seen in Table 3.

Phase 2 Study: NMP-Q-10 Validation Review with CFA Results from Phase 1 Study

This section presents an advanced construct validity test of the first phase NMPQ-10 with its four aspects: not being able to communicate, losing connectedness, not being able to access information, and giving up convenience. This was conducted on 410 students. The model fit information obtained was chi-square = 99.9, p-value < 0.001 (less than 0.05), RMSEA = 0.092 (greater than 0.08), CFI = 0.949, and TLI = 0.917, which do not meet the model fit criteria.

Table 3 Item reliability statistics

	SD	Item-rest correlation	Cronbach's α	McDonald's ω
Item 1	0.796	0.655	0.874	0.876
Item 2	0.775	0.700	0.871	0.873
Item 3	0.789	0.579	0.881	0.882
Item 4	0.692	0.616	0.878	0.878
Item 5	0.735	0.644	0.875	0.876
Item 6	0.728	0.679	0.873	0.873
Item 8	0.786	0.666	0.873	0.875
Item 9	0.811	0.643	0.875	0.878
Item 10	0.797	0.592	0.880	0.882

Therefore, it was necessary to address the residual covariance by removing item 3, as its factor loading of 0.52 was not sufficiently high. While the factor loading was acceptable, the item exhibited redundancy and reduced the overall internal consistency of the subscale. In our analysis, we consider a factor loading of 0.60 or higher essential for an optimal measurement model fit. The initial CFA of phase 2 can be seen in Fig. 1.

After removing item 3, which had a loading factor of less than 0.50, specifically 0.52, the model fit results obtained a chi-square of 77.0, a p-value of less than 0.5, an RMSEA of 0.1, a CFI of 0.956, a TLI of 0.918, and a SRMR = 0.029. These values indicate that the model fit has been achieved and demonstrate a good fit.

Next, the researcher examined the significance of the items. Therefore, it is necessary to test the hypothesis regarding the coefficients of the factor loadings of the items. The factor loading coefficients are considered significant if the z-value is greater than 1.96, and vice versa. This testing is conducted by examining the z-values of each factor loading coefficient listed in Table 4.

Table 4 shows that all items are significant with z-values > 1.96, and all coefficients are positive. Thus, all

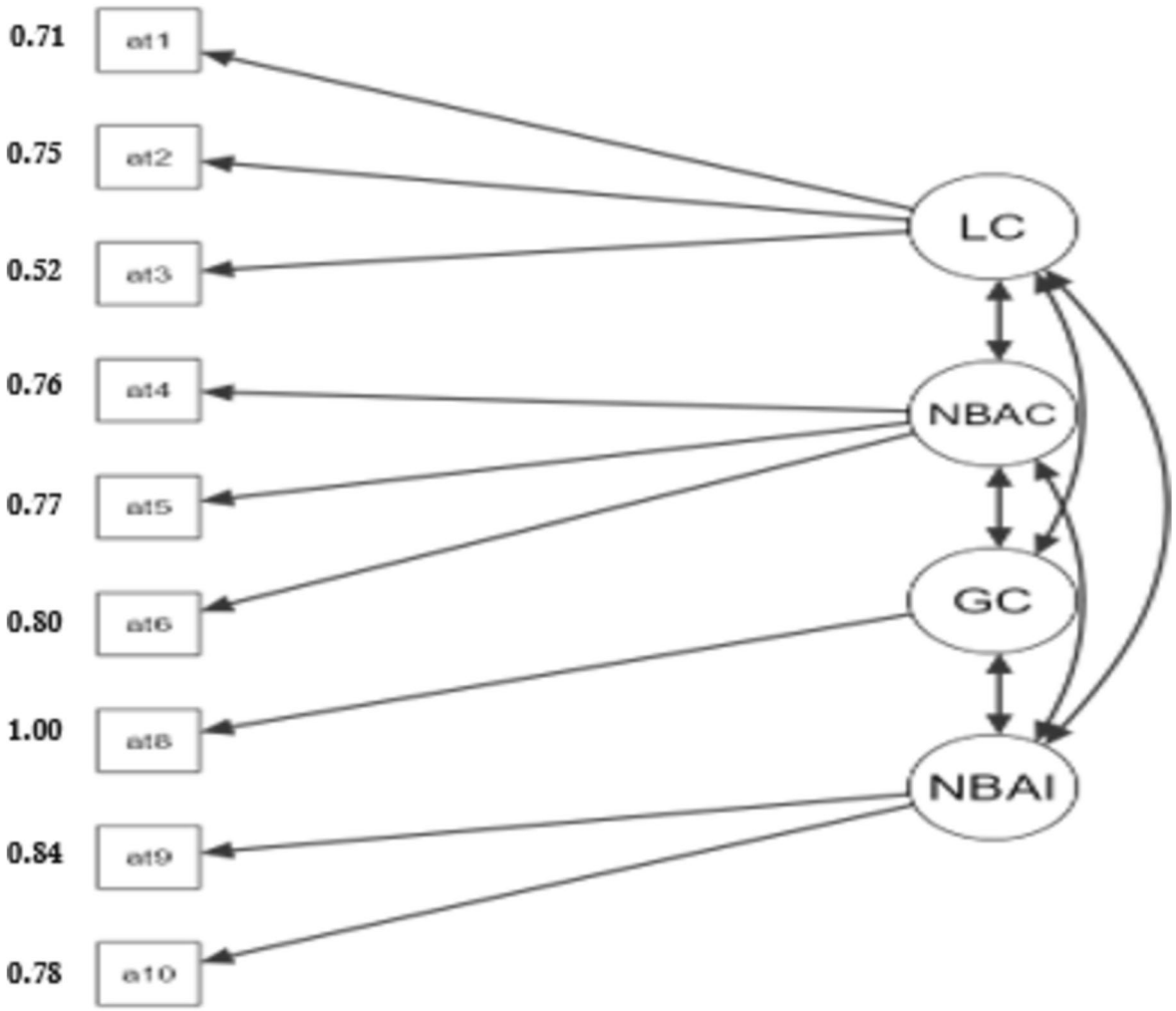

Fig. 1 First model of CFA stage 2

dimensions are valid in measuring the nomophobia factor. The following is the path diagram of the CFA model validity test results (Fig. 2).

Next, the researchers determined the psychometric properties of the NMPQ-10, including the final item selection in the second stage, considering obtaining a CFA model with a good goodness of fit. Cronbach's alpha (CA), Omega McDonalds, composite reliability (CR), and item-rest correlation were used to calculate the model's reliability. CA and Omega are used to measure the lower limit of reliability of this research construct, CR is used to obtain stronger internal reliability. Meanwhile, average variance extracted (AVE) is used to calculate the convergent validity of selected items to ensure a strong connection between the selected items and the construction underlying the items. Item selection was done by evaluating item discrimination to ensure items with good reliability. The minimum corrected item-total correlation criterion should reach 0.30 to be considered satisfactory (Azwar, 2019). The reliability calculation results in a Cronbach's alpha of 0.870, an Omega McDonalds of 0.871 and item-rest correlations ranging from 0.5 to 0.6, indicating that the model has good reliability. The reliability calculation results can be seen in Table 5.

Reliability calculations provide results based on CA, Omega, and CR values. The CA and Omega values range from 0.85 to 0.86, exceeding 0.7 as the threshold (Hair et al., 2016). The CR value ranges from 0.70 to 1.00 which is also higher than 0.7 as the threshold (Hair et al., 2016). Based on the data above, it can be concluded that the model has strong fairness. Then, the researcher measured construct validity by looking at the loading factor, convergent validity and discriminant validity. From Table 5, it shows that the loading factor with values from 0.73 to 1.00 meets good requirements because it is greater than the threshold of 0.5 (Hair et al., 2016). Then, in the AVE table, a value of 0.57 to 1.00 is obtained, which is higher than the threshold of 0.5 (Hair et al., 2016), which means it shows good convergent validity. In Table 6, it is shown the discriminant validity of the nomophobia construct.

Discriminant validity of an aspect is carried out by comparing the average correlation value between constructs with the square root of AVE. If the root of the AVE is greater than the average correlation value between constructs, then discriminant validity is achieved (Hair et al., 2016). One example is that in the aspect of losing connectedness, the discriminant validity value is shown at 0.755, which is greater than the value for the other aspects with a value of 0.482 to 0.540, so in Table 6, it can be concluded that all aspects have good discriminant validity.

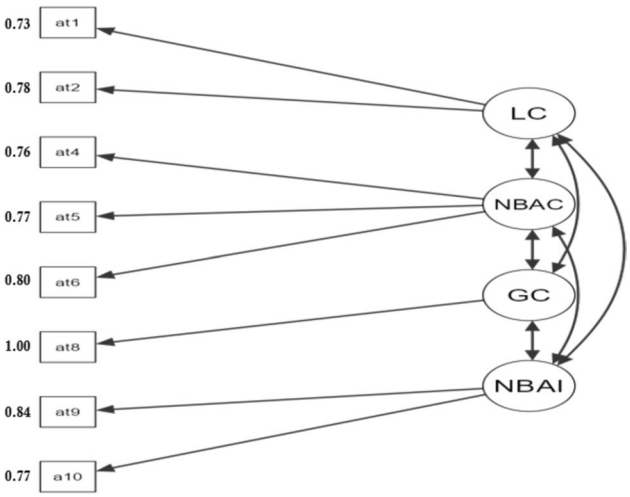

Fig. 2 Final CFA model for nomophobia

The adaptation of the nomophobia scale into Indonesian was successfully conducted, with results indicating that this instrument meets the criteria for a good fit model and is valid for measuring the level of nomophobia in the target population. The blue-print and items NMPQ-10 instrument, after modification and the second phase of testing, is as follows (Table 7).

Discussion

This study aims to revalidate the Nomophobia Questionnaire (NMPQ-10 Indo-version) adapted by Warsah et al. (2023) using a larger sample of college students. Results

Table 4 Factor loadings

Factor	Indicator	Estimate	SE	*Z*	*p*	Stand. estimate
Losing connected	Item 1	0.600	0.0400	15.0	< 0.001	0.736
	Item 2	0.611	0.0381	16.0	< 0.001	0.785
Not being able to communicate	Item 4	0.576	0.0338	17.0	< 0.001	0.765
	Item 5	0.596	0.0345	17.3	< 0.001	0.777
	Item 6	0.595	0.0328	18.1	< 0.001	0.805
Giving up convenience	Item 8	0.750	0.0262	28.6	< 0.001	1.000
Not being able to get information	Item 9	0.690	0.0385	17.9	< 0.001	0.844
	Item 10	0.611	0.0372	16.4	< 0.001	0.779

Table 5 The reliability result

Aspect	Selected items	Loading factor	Alpha Cronbach	Omega McDonalds	Composite reliability	Average variance extracted (AVE)
Losing connectedness	Item 1	0.736	0.859	0.860	0.63	0.57
	Item 2	0.785	0.855	0.857		
Not being able to communicate	Item 4	0.765	0.855	0.856	0.82	0.61
	Item 5	0.777	0.850	0.851		
	Item 6	0.805	0.849	0.850		
Giving up convenience	Item 8	1.000	0.854	0.855	1.00	1.00
Not being able to information	Item 9	0.844	0.852	0.855	0.70	0.65
	Item 10	0.779	0.858	0.860		

Table 6 Discriminant validity of nomophobia

Item-rest correlation				
Aspect	Losing connectedness	Not being able to communicate	Giving up convenience	Not being able to information
Losing connectedness	(0.755)	-	-	-
Not being able to communicate	0.540	(0.781)	-	-
Giving up convenience	0.482	0.555	(1)	-
Not being able to information	0.515	0.503	0.503	(0.802)

Table 7 The Final NMPQ-10

No	Dimensions	Items
1	Not being able to communicate	4, 5, 6
2	Losing connectedness	1, 2
3	Not being able to access information	9, 10
4	Giving up convenience	8
	Total	**8**

from stage 1 describe the process of modifying the NMPQ-10 instrument through three stages. The stages are (1) the modification stage, where the researcher made changes to some words in each item to shorten and clarify the meaning of each statement. This was followed by (2) the rating stage with five expert judgments. The researcher conducted discussions, evaluations, and recommendations with the experts in two rounds for each statement to achieve better results and ensure that each individual could understand the items easily when tested in the field. After obtaining the final draft of the NMPQ-10 modification, the researcher proceeded to the third stage: (3) the pre-testing stage. In this stage, the researcher used 20 students for lingual-cultural adaptation. The NMPQ-10 consists of 10 items covering four aspects: (a) not being able to communicate with 3 items, (b) losing connectedness with 3 items, (c) not being able to access information with 2 items, and (d) giving up convenience with 2 items.

Based on the construct validity test using a unidimensional CFA model in stage 2, the initial test showed that the model fit well, and 9 out of the 10 NMPQ-10 measurement items were found to be valid. Item number 11, which reads "if I don't carry my phone, I will feel anxious when traveling because I cannot book online transportation," needed to be dropped because its standard estimate value for the loading factor coefficient was not significant.

After obtaining the model fit in initial validity testing, the researcher prepared a revised draft of the NMPQ-10 and renumbered the items, proceeding to the second test. In this stage, the researcher used 410 students from a higher education institution in Yogyakarta. Based on second validity testing, it can be said that all items are suitable except for item number 3, which reads "if there is no network on my phone, I am afraid of getting lost somewhere," which may still be less valid in measuring the aspect of losing connectedness. Thus, based on the construct validity test with CFA in stage 2, the final blueprint of the modified NMPQ-10 instrument consists of 8 out of 9 valid items.

The psychometric properties of the modified scale in this study, which has 8 items, meet content and scale validity criteria based on confirmatory factor analysis (CFA) results. This indicates that the NMPQ-10 instrument is represented by items with sufficient quality and high loading factors, even though not all items show validity. The instrument is adequate for measuring nomophobia in individuals aged 18 to 24 years. For future research, it is recommended to use

combined latent variable scores rather than raw scores to produce more reliable tests (Woodbury & Lord, 1956).

The Nomophobia Questionnaire (NMP-Q) has been widely adapted and validated across various cultural contexts, highlighting differences in internal models and psychometric properties. In Mexico and Spain, the NMP-Q was validated in both countries, showing a four-factor structure with satisfactory reliability and cross-cultural invariance. Higher scores were observed in females and younger adolescents (Caba-Machado et al., 2024). In the Greek version of the NMP-Q confirmed a four-factor structure through exploratory and confirmatory factor analysis, with significant associations found between nomophobia and sociodemographic characteristics (Gnardellis et al., 2023).

In the Arabic version, the original 20-item structure was retained, demonstrating good model fit and internal consistency across four factors (Jelleli et al., 2023). Other studies in Bangla version supported a four-factor structure with high reliability and convergent validity, indicating its effectiveness in assessing nomophobia among students (Al-Mamun et al., 2023). The most adaptations confirm a four-factor structure, including factors like inability to communicate, loss of connectedness, inability to access information, and giving up convenience. All studies found consistently high reliability indices (e.g., Cronbach Alpha > 0.9) across different versions which indicate robust psychometric properties. Those studies also reported measurement invariance across genders and cultural contexts, suggesting the NMP-Q's broad applicability.

Based on the finding above, we recommend that counselors incorporate the validated versions of the NMP-Q into their assessment practices to effectively identify and address nomophobia in diverse populations. In doing so, they can better tailor interventions to meet the needs of individuals experiencing problematic phone use. Additionally, researchers and practitioners should continue to validate the NMP-Q with larger, more culturally diverse samples to further strengthen its reliability and adaptability. This ongoing research would improve the tool's global applicability, ensuring that it remains a valuable and robust instrument for assessing nomophobia across different cultural contexts.

Conclusion

The results of the construct validity test using the confirmatory factor analysis (CFA) approach on the modified NMP-Q-10 instrument indicate that it can measure and assess the level of nomophobia in students aged 18 to 24 years. It can be concluded that the one-factor model theorized by the NMPQ-10 instrument is acceptable because most of the items meet the criteria for good items. Future research aiming to test the validity of the NMPQ-10 adapted by Warsah et al. (2023) is advised to expand the sample beyond students and young adults to include working individuals, parents, and the elderly. Increasing the number of respondents is recommended to improve the reliability and validity of the items on the measurement instrument tested using CFA or other methods.

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Author Contribution All authors have contributed equally to the study's conceptualization, interpreting data, reviewing, and editing the manuscript. T.S. performed the statistics; wrote the method, results, and conclusion; and finalized the manuscript. A.N. wrote the introduction, collected the data, and reviewed the manuscript. All authors have read and agreed to the published version of the manuscript.

Data Availability The research data have been shared on Zenodo open science platform. See the data by this link https://zenodo.org/records/13311239.

Declarations

Ethics Approval The study followed the guidelines of the Declaration of Helsinki.

Informed Consent Informed consent was obtained from all persons involved in the study.

Conflict of Interest The authors declare no competing interests.

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