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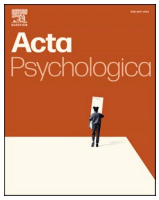

Psychometric evaluation of the Indonesian Nomophobia Questionnaire among college students: Measurement invariance across gender and levels of problematic smartphone use

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ABSTRACT

With increasing technology advancement, including the rising use of smartphones, some individuals rely heavily on smartphones in their daily lives and become increasingly anxious if they do not have access to their smartphones (i.e., nomophobia [no mobile phobia]). The present study evaluated the psychometric properties of the Indonesian version of the Nomophobia Questionnaire (NMP-Q) to evaluate its validity and reliability among Indonesian university students aged 18 to 24 years. Each item and the structure of the Indonesian NMP-Q were tested using confirmatory factor analysis (CFA). Multi-group CFA (MGCFA) was employed to examine whether different genders, individuals with different levels of problematic smartphone use, and those with different time spent on social media use (more or less than five hours daily) interpreted the NMP-Q similarly. Moreover, Pearson correlations were used to examine how the NMP-Q was associated with other measures. After removing Item 1 of Factor III, the total and individual factor scores of the NMP-Q exhibited very good internal consistency ($\alpha = 0.76–0.93$; $\omega = 0.76–0.92$), The total and individual factor scores of the NMP-Q exhibited very good internal consistency ($\alpha = 0.76–0.93$; $\omega = 0.76–0.92$). The four-factor structure of the NMP-Q was supported and was invariant across different genders, different levels of smartphone use, and different daily time spent on social media. The NMP-Q was associated more strongly with problematic smartphone use ($r = 0.17–0.41$; $p < .001$) than with measures of weight-related self-stigma and psychological distress ($r = 0.13–0.23$; $p < .001$). The Indonesian NMP-Q is a reliable and valid instrument for assessing nomophobia among Indonesian university students, which researchers and healthcare providers can use in their research and/or clinical practice.

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1. Introduction

The rapid development of technology has led to the increased use of smartphones worldwide. It has been estimated that there will be 6.1 billion smartphone users by 2029 globally (Degenhard, 2024). The increasing global adoption of smartphones has also impacted Indonesia (where the present study was conducted), and a recent report indicated that there are 354 million active smartphones in the country (Saskia & Pertiwi, 2023) among the Indonesian population of 278.7 million (Badan Pusat Statistik, 2023). In the modern era, smartphones have become an essential and beneficial tool for human life because their design facilitates connectivity, communication, and entertainment. However, the multi-functional use of smartphones (for work or personal use, social media use, gaming, gambling, etc.) can lead to excessive and problematic smartphone use (Filieri, 2016; Jokela et al., 2015; Kaida et al., 2020). Owning multiple digital devices (including smartphones) has been associated with screen addiction (Lin, Kononova, & Chiang, 2020). Moreover, excessive smartphone use is a significant predictor of (and is associated with) smartphone addiction (Cocoradă et al., 2018; Tossell et al., 2015). In the Asia-Pacific region between 2020 and 2023, Indonesians had the highest average daily smartphone use (6.05 h) (Statista Research Department, 2024). Additionally, a previous study reported that the average Indonesian university student spends 5 h daily on their mobile phone (Pratama, 2018).

The term 'nomophobia' (no mobile phobia) has been used to denote the psychological condition exhibited by individuals who experience an uncontrollable fear of not having access to their mobile phone (Nagpal & Kaur, 2016; Olivencia-Carrión et al., 2018). However, some studies suggest that the term 'anxiety' is more appropriate than 'fear'(Wang et al., 2014). Recognized as a digital disorder, nomophobia is prevalent worldwide, especially among teenagers and emerging adults (over 90 % smartphone ownership for individuals aged 15–30 years) (Badan Pusat Statistik, 2024; Berenguer et al., 2016;), females, and university students (Mudgal et al., 2024). An individual who experiences nomophobia may experience psychological problems (e.g., anxiety, stress, depression), physical problems (e.g., musculoskeletal disorders), and psychosocial problems (e.g. dependency, phantom ringing) (Abdoli et al., 2023; Anshari et al., 2019; Nadar et al., 2025).

Recent Indonesian research found that excessive use of smartphones (especially in social media) was significantly related to higher levels of nomophobia (Silmi & Lailiyah, 2024). Moreover, previous research has shown that among young Indonesian adults, time spent on smartphone activities (e.g., online applications such as *YouTube*) is an influencing predictor of making physical appearance comparisons which can contribute to increased feelings of weight stigma (e.g., posting or sharing some negative comments regarding weight bias on the internet) and psychological distress (i.e., low self-confidence and mental health) (Wiryawan & Sutantri, 2023). Therefore, nomophobia may have a significant role in experiencing weight stigma among Indonesian young adults and may be associated with psychological distress. For this reason, it is important to investigate the relationship between nomophobia and weight stigma.

Moreover, both nomophobia and weight self-stigma are related to anxiety and depression (Alimoradi et al., 2020; Tung et al., 2025). Individuals with weight-related self-stigma avoid triggering uncomfortable situations where their bodies may be exposed (e.g., when taking photographs, being filmed or even the weight loss program itself) and self-exclude themselves from social activity (Major et al., 2012; Palmeira et al., 2018; Wang et al., 2020). Because those with weight self-stigma may rely more on non-face-to-face social interactions, nomophobia may be worse for such individuals. Additionally, both weight self-stigma and nomophobia also contribute to maladaptive coping mechanisms to avoid feelings of anxiety, such as stress-eating and excessive smartphone use (Wacks & Weinstein, 2021; Wang et al., 2020).

The Nomophobia Questionnaire (NMP-Q) is a psychometric instrument developed to assess the fear of being without a mobile phone. Moreover, it has been adapted for different cultures and languages worldwide and has been psychometrically tested using different approaches (Lee et al., 2018; Lin et al., 2018; Rangka et al., 2018; Yildirim & Correia, 2015). The NMP-Q comprises four factors: (i) not being able to communicate, (ii) losing connectedness, (iii) not being able to access information, and (iv) giving up convenience (Lee et al., 2018). Two earlier studies have evaluated the psychometric properties of the Indonesian version of the NMP-Q (Rangka et al., 2018; Warsah et al., 2023). In the initial psychometric testing studies of the Indonesian NMP-Q, excellent internal consistency (Cronbach's α ranging from 0.93 to 0.97) was observed across diverse population groups (i.e., adolescents, working-age adults, and older adults) (Rangka et al., 2018; Warsah et al., 2023). However, the extant research examining the psychometric properties of Indonesian NMP-Q is limited. No previous research has examined how nomophobia associates with other relevant concepts, such as problematic smartphone use. Moreover, there is no evidence of measurement invariance for the Indonesian NMPQ across different groups in the previous studies (Rangka et al., 2018; Warsah et al., 2023). Examination of measurement invariance is essential to assess the equivalence of scale items across different groups of individuals to avoid ambiguity (Putnick & Bornstein, 2016). More specifically, evidence of measurement invariance on the Indonesian NMP-Q would be useful for future studies that want to compare differences in NMP-Q across groups with different genders, levels of smartphone addiction, and time spent on social media. Therefore, the present study provides further psychometric analyses to ensure the quality of this scale and facilitate research in this field.

As indicated by the results of a report by the Indonesian Statistics Agency in 2023, the demographic with the highest proportion of smartphone ownership is the 15–24 years age group (92.14 %) (Badan Pusat Statistik, 2024). Therefore, the present study was conducted among university students aged 18 to 24 years to investigate if the NMP-Q is psychometrically robust among this population, who are heavy smartphone users. However, prior psychometric evidence on the NMP-Q among Indoensians has not examined its factor structure. Therefore, healthcare providers need to know if the four-factor structure of the NMP-Q can be supported among Indonesian individuals and be invariant across different Indonesian subgroups. More specifically, the present study aimed to examine (i) if the NMP-Q has good internal consistency and a four-factor structure; (ii) if the NMP-Q's factor structure is invariant across different subgroups (including different genders, individuals with different levels of problematic smartphone use, and those with different time spent on social media use [more or less than five hours daily]); and (iii) the relationship between the NMP-Q and other external measures, including the Smartphone Application-Based Addiction Scale (SABAS), Weight Self-Stigma Questionnaire (WSSQ), and Depression, Anxiety and Stress Scale 21 (DASS-21).

2. Methods

2.1. Participants and procedure

A cross-sectional study was conducted among university students in Indonesia aged 18 years and above. The data were collected through the distribution of a survey hosted on the *SurveyMonkey* platform. The online survey was disseminated by 50 research assistants who had undergone training by the researchers so that they could explain the procedure for completing the survey and the purpose of the study, as well as assist participants in understanding the purpose of the survey. Moreover, the research assistants physically visited 16 faculties in the Universitas Airlangga to recruit potential participants. Each research assistant was tasked with recruiting 10 to 12 students in the respective faculty to participate in the online survey. After a potential participant agreed to participate, the research assistant provided the individual with the online link to complete the survey. The online survey incorporated a statement of willingness to participate in the research (i.e., informed

consent) prior to the participants' completion of the survey. The survey included a demographic questionnaire, NMP-Q, SABAS, WSSQ, and DASS-21. The study was approved by the Health Research Ethics Committee in the Faculty of Nursing, Universitas Airlangga (Number: 3016-KEPK) before data collection (February to March 2024).

2.2. Measures

2.2.1. Demographic questionnaire

The participants were asked to complete demographic information, including age, gender, self-reported weight and height, education level, marital status, and average number of daily hours spent using social media.

2.2.2. Nomophobia Questionnaire (NMP-Q)

The 20-item NMP-Q is a self-report scale developed by Yildirim and Correia and assesses the risk of developing nomophobia among adolescents and adults (Galhardo et al., 2020; Lee et al., 2018). The NMP-Q comprises four dimensions of nomophobia: Factor I = not being able to communicate (Items 10–15); Factor II = losing connectedness (Items 16–20); Factor III = not being able to access information (Items 1–4); Factor IV = giving up convenience (Items 5–9) (Lee et al., 2018). Each item on the NMP-Q relates to past-year mobile phone use (Lee et al., 2018; Nurmala et al., 2022). Example items include: "*I would feel anxious because I could not instantly communicate with my family and/or friends*" (Factor I); "*I would be nervous because I would be disconnected from my online identity*" (Factor II); "*I would feel uncomfortable without constant access to information through my smartphone*" (Factor III); and "*Running out of battery in my smartphone would scare me*" (Factor IV). Each item is rated on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*) (Lee et al., 2018). The total score is calculated by summing all 20 items, ranging from 20 to 140 (with a higher score indicating a greater nomophobia) (Lee et al., 2018). The recommended cut-off points for different levels of nomophobia are: 21–59 (mild), 60–99 (moderate), and ≥ 100 (severe) (Lee et al., 2018). The NMP-Q has been translated and validated across various languages: for example, English (overall Cronbach's α = 0.95; Cronbach's α = 0.82–0.94 for each factor) (Lee et al., 2018), Portuguese (overall Cronbach's α = 0.96; Cronbach's α = 0.87–0.96 for each factor) (Galhardo et al., 2020), Chinese (overall Cronbach's α = 0.94; Cronbach's α = 0.84–0.94 for each factor) (Ma & Liu, 2021), and Indonesian (overall Cronbach's α = 0.93–0.97) (Lin et al., 2018; Rangka et al., 2018).

2.2.3. Smartphone Application-Based Addiction Scale (SABAS)

The six-item SABAS was developed by Csibi et al. and assesses the risk of developing smartphone addiction (Csibi et al., 2018; Csibi, 2023). Each item of SABAS asks participants to rate the severity of their use of smartphone applications during the past year (Csibi et al., 2018; Nurmala et al., 2022). An example item is "*If I cannot use my smartphone when I feel like, I feel sad, moody, or irritable*". Each item is rated on a 6-point Likert scale (1 = *strongly disagree* to 6 = *strongly agree*). The total score is calculated by summing up all six items, ranging from 6 to 36, with a higher score indicating a greater risk of smartphone addiction. The recommended cut-off point for being at risk of smartphone addiction is 21 out of 36 (Nurmala et al., 2022). The SABAS has been translated and validated across various languages: for example, English (Cronbach's α = 0.81) (Csibi et al., 2018), Chinese (Cronbach's α = 0.78–0.79) (Leung et al., 2020), and Indonesian (Cronbach's α = 0.74) (Nurmala et al., 2022). In the present study, Cronbach's α was good (α = 0.76).

2.2.4. Weight Self-Stigma Questionnaire (WSSQ)

The 12-item WSSQ is a self-report scale developed by Lillis et al. and assesses internalized weight stigma (Lillis et al., 2010). The WSSQ comprises two subscales: the first six items comprise the self-devaluation subscale and the other six items comprise the fear of enacted stigma (Lillis et al., 2010). Each item of the WSSQ relates to weight self-stigma during the past year (Lillis et al., 2010). An example item is "*I feel guilty because of my weight problems*" for the self-devaluation subscale, and "*People discriminate against me because I've had weight problems*" for the fear of enacted stigma subscale. Each item is rated on a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*) (Lillis et al., 2010). The total score is calculated by summing all 12 items, ranging from 12 to 60, with a higher score indicating greater internalized weight stigma (Lin & Lee, 2017). The WSSQ has been translated and validated across various languages: for example, English (overall Cronbach's α = 0.88; 0.81 for self-devaluation; 0.87 for fear of enacted stigma) (Lillis et al., 2010), Chinese (overall Cronbach's α = 0.88; 0.78 for self-devaluation; 0.88 for fear of enacted stigma) (Lin & Lee, 2017), Indonesian (overall Cronbach's α = 0.90; 0.86 for self-devaluation; 0.87 for fear of enacted stigma) (Nadhiroh et al., 2022). In the present study, the Cronbach's α was very good (overall α = 0.91; 0.88 for both subscales).

2.2.5. Depression, Anxiety and Stress Scale 21 (DASS-21)

The 21-item DASS-21 is a self-report scale developed by Lovibond and Lovibond and assesses symptoms of depression, anxiety, and stress among both clinical and non-clinical populations (Lovibond & Lovibond, 1995; Sinclair et al., 2012). The DASS-21 comprises three subscales: depression, anxiety, and stress (Lovibond & Lovibond, 1995). Each DASS-21 item is rated during the past week (Oei et al., 2013). Example items include: "*I felt down-hearted and blue*" (depression); "*I was worried about situations in which I might panic and make a fool of myself*" (anxiety); and "*I found myself getting agitated*" (stress). Each item is rated on a 4-point Likert scale (0 = *did not apply to me at all* to 3 = *Applied to me very much or most of the time*) (Sinclair et al., 2012). The total score is calculated by summing all the items and multiplying by two, with higher scores indicating a greater level of psychological distress (i.e., depression, anxiety, and stress) (Lin & Lee, 2017). The DASS-21 has been translated and validated across various languages: for example, English (Cronbach's α = 0.81–0.91) (Lovibond & Lovibond, 1995), Chinese (Cronbach's α = 0.79–0.82) (Lu et al., 2018), and Indonesian (Cronbach's α = 0.85–0.92) (Nada et al., 2022). In the present study, Cronbach's α was very good (α = 0.82–0.89).

2.3. Data analysis

Statistical analyses were performed using Jeffrey's Amazing Statistics Program (JASP) version 0.18.03 (JASP, 2024). Descriptive statistics were used to describe participants' demographics and examine properties for each item of the NMP-Q. Skewness and kurtosis were used to determine if the data distribution was normal. Each NMP-Q item was further analyzed using factor loadings (which were derived from confirmatory factor analysis [CFA]), and the corrected item-total correlation, with recommended cutoffs for both evaluated indicators (i.e., factor loading and corrected item-total correlation) being 0.4 or higher (Hair et al., 2019; Wang et al., 2007). Additionally, CFA was performed to test the factorial structure of the Indonesian NMP-Q, comparing two different factor structures: a one-factor structure and a four-factor structure. Both CFA were estimated using a diagonally weighted least squares (DWLS) estimator (Mindrila, 2010). The evaluated indicators of model fit were the chi-square test (χ^2), comparative fit index (CFI), Tucker-Lewis Index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). A good fitting model should have the following characteristics: non-significant χ^2, CFI and TLI > 0.9, and RMSEA and SRMR <0.08 (Leung et al., 2020; Lin, Broström, et al., 2020). For internal consistency of the NMP-Q, Cronbach's α and McDonald's omega (ω) coefficients were used to examine the NMP-Q total score and each factor score. Both indicators of α and ω >0.7 are considered acceptable reliability (Nejati et al., 2021; Nunally, 1978).

Moreover, the Indonesian NMP-Q was tested for measurement invariance using multi-group CFA (MGCFA) to evaluate the equivalence

of factor structure in different subgroups with the following comparison groups: gender (female vs. male), level of problematic smartphone use (SABAS scores <21 vs. ≥ 21 score), and daily time spent using social media (< 5 h vs. ≥ 5 h). After validating the factor structure of NMP-Q by CFA, the establishment of three nested models were constructed and compared: (i) configural model (M1: which examines whether the factor structure of NMP-Q is similar across groups); (ii) metric model (M2: which examines whether the factor loadings of NMP-Q items are similar across groups); and (iii) scalar model (M3: which examines whether the intercepts are similar across groups). In this regard, the comparison between three nested models (i.e., configural, metric, and scalar models) is evaluated. A good fitting model should have the following characteristics: non-significant χ^2 and difference tests of ΔCFI, ΔRMSEA, and ΔSRMR <0.01 (Lin, Imani, et al., 2020).

As aforementioned, the recommended cut-off score for being at risk of smartphone addiction is 21 out of 36 (Nurmala et al., 2022). Prior studies have reported that smartphone users with a score above 20 on the SABAS have significantly greater levels of psychological distress than those who score below 21 (Hosen et al., 2021; Mamun et al., 2022). Finally, the relationships between NMP-Q with SABAS, WSSQ, and DASS-21 were examined using Pearson correlations.

3. Results

Table 1 presents the characteristics of participants (n = 868). The participants comprised 376 males (43.3 %) and 492 females (56.7 %). The mean age was 19.71 years (SD = 1.40; range 18 to 24 years). The mean BMI was 21.70 kg/m^2 (SD = 4.15). Over four-fifths of the participants reported no condition or disease when the survey was completed (81.1 %). Most participants were single (99.7 %) and studying for a Bachelor's degree (97.0 %). More than half of the participants spent more than five hours daily using social media (50.3 %). The mean scores on the psychometric scales were: 93.78 (out of 120) on the NMP-Q (SD = 19.34), 21.41 (out of 36) on the SABAS (SD = 4.85), 30.83 (out of 60) on the WSSQ (SD = 9.37), and 18.63 (out of 63) on the DASS-21 (SD = 10.44). Moreover, 59.0 % of the sample had a higher SABAS score than 21 (i.e., at risk of smartphone addiction).

Table 1
The characteristics of participants (n = 868).

	Mean (SD)	N (%)
Age (year)	19.71(1.40)	–
Gender		
Male	–	376 (43.3 %)
Female	–	492(56.7 %)
BMI (kg/m^2)	21.70(4.15)	–
Any condition or diseases		
Yes	–	164(18.9 %)
No	–	704(81.1 %)
Education level		
Bachelor	–	842(97.0 %)
Diploma	–	26(3.0 %)
Marital status		
Single	–	865(99.7 %)
Married	–	3(0.3 %)
Social media time	5.48(3.83)	–
< 5 h	2.83(1.05)	431(49.7 %)
≥ 5 h	8.10(3.78)	437(50.3 %)
NMP-Q (T)	93.78(19.34)	–
SABAS (T)	21.41(4.85)	–
< 21 score	16.81(2.72)	356(41.0 %)
≥ 21 score	24.61(3.12)	512(59.0 %)
WSSQ (T)	30.83(9.37)	–
DASS (T)	18.63(10.44)	–

NMP-Q (T): Nomophobia Questionnaire (Total score).
SABAS (T): Smartphone Application Based Addiction Scale (Total score).
WSSQ (T): Weight Self-Stigma Questionnaire (Total score).
DASS (T): Depression Anxiety Stress Scale–21 (Total score).
SD: Standard deviation.
BMI: Body mass index.

Table 2 presents the item properties and reliability of NMP-Q. Analysis showed that all items of NMP-Q had low mean and SD as well as low values of kurtosis (−2.67–1.03) and skewness (−1.06–0.71), indicating normal distributions of the data. Each item of NMP-Q had standardized factor loadings and an item-total correlation higher than 0.4, except for Item 1 (factor loadings = 0.12 and item-total correlation = 0.18). Additionally, the NMP-Q (total score) and each NMP-Q subscale score generally had very good to excellent internal consistency: total NMP-Q Cronbach's α and McDonald's ω both = 0.92; Factor I Cronbach's α = 0.93 and McDonald's ω = 0.92; Factor II Cronbach's α = 0.85 and McDonald's ω = 0.86; Factor IV Cronbach's α and McDonald's ω both = 0.84) for the present sample. However, Factor III had relatively low internal consistency (Cronbach's α = 0.60 and McDonald's ω = 0.62). Due to the weak factor loading and low item-total correlation for Item 1, this item was removed in a further round of analyses. After removing this item, Factor III showed acceptable internal consistency (Cronbach's α and McDonald's ω = 0.76).

Table 3 presents the results of fit indices in the CFA with Item 1 removed. The fit indices of the four-factor structure of NMP-Q showed all fit indices (CFI = 0.984, TLI = 0.981, RMSEA = 0.050, SRMR = 0.063) to be better than the one-factor structure (CFI = 0.955, TLI = 0.949, RMSEA = 0.078, SRMR = 0.092). However, one-factor and four-factor NMP-Q had a non-significant χ^2 due to larger sample sizes. Moreover, Table 4 presents the results of measurement invariance across various subgroups on the NMP-Q with a four-factor structure without removing any items.

Because of the low factor loading and low item-total correlation of Item 1, the four-factor structure of NMP-Q was tested again for its measurement invariance with Item 1 removed. Based on the four-factor structure, Table 5 presents the results of measurement invariance across various subgroups with Item 1 removed. The MGCFA showed a good fit model across all subgroups. When considering gender subgroup (female vs. male), the different values between the three nested models were lower than 0.01 (M2-M1; ΔCFI = 0.000, ΔRMSEA = −0.001, ΔSRMR = 0.001, p = .384: M3-M2; ΔCFI = 0.000, ΔRMSEA = −0.001, ΔSRMR = −0.003, p = .91). For the level of problematic smartphone use subgroup (SABAS <21 vs. ≥ 21 scores), the different values between the three nested models were lower than 0.01 (M2-M1; ΔCFI = −0.004, ΔRMSEA = 0.004, ΔSRMR = 0.005, p < .001: M3-M2; ΔCFI = −0.001, ΔRMSEA = 0.000, ΔSRMR = −0.002, p = .034). Similarly, for daily time spent using social media (< 5 vs. ≥ 5 h), the different values between the three nested models were lower than 0.01 (M2-M1; ΔCFI = −0.002, ΔRMSEA = 0.002, ΔSRMR = 0.003, p < .001: M3-M2; ΔCFI = 0.000, ΔRMSEA = −0.001, ΔSRMR = −0.002, p = .655). However, all three different nested models across subgroups had a significant χ^2, except model M3-M2 for the level of daily time spent using social media (p = .654) (see Table 6).

Table 5 presents the correlations between scores on the NMP-Q (with and without Item 1 removed), SABAS, WSSQ, and DASS-21. All correlations were significant. However, the NMP-Q score had relatively stronger correlations with SABAS score (r = 0.17–0.41, p < .001) than with the scores on the other scales: r = 0.13–0.18 (p < .001) with the WSSQ; r = 0.17–0.23 (p < .001) with the DASS-21.

4. Discussion

Apart from testing internal consistency, the present study used CFA to confirm the four-factor structure of the NMP-Q. Moreover, the measurement invariance evidence showed that the Indonesian NMP-Q was interpreted similarly across the following subgroups: different genders, different levels of problematic smartphone use, and daily time spent using social media. In addition, the findings indicated that nomophobia was more strongly associated with problematic smartphone use than with psychological distress and weight-related self-stigma. These results highlight that the Indonesian NMP-Q is a suitable psychometric tool for

Table 2
Item properties and scale properties for the Nomophobia Questionnaire.

	*Factor loadings	Item-total correlation	Mean (SD)	Skewness	Kurtosis	α	ω
Total						0.92	0.92
Factor I						0.93	0.92
Item 10	0.81	0.75	5.09(1.37)	−0.67	0.09		
Item 11	0.70	0.74	5.45(1.27)	−0.98	0.96		
Item 12	0.88	0.81	4.83(1.47)	−0.54	−0.26		
Item 13	0.87	0.87	4.97(1.44)	−0.68	0.04		
Item 14	0.88	0.87	4.96(1.44)	−0.65	−2.67		
Item 15	0.77	0.66	4.64(1.47)	−0.39	−0.38		
Factor II						0.85	0.86
Item 16	0.67	0.71	3.08(1.53)	0.40	−0.51		
Item 17	0.71	0.75	3.43(1.59)	0.19	−0.72		
Item 18	0.86	0.75	4.08(1.61)	−0.13	−0.70		
Item 19	0.71	0.64	3.73(1.53)	0.02	−0.53		
Item 20	0.70	0.48	4.67(1.57)	−0.51	−0.32		
Factor III						0.60/0.76[a]	0.62/0.76[a]
Item 1	0.12/−−[a]	0.18/−−[a]	2.70(2.19)	0.71	−1.21		
Item 2	0.78/0.75[a]	0.60/0.68[a]	5.23(1.31)	−0.97	0.83		
Item 3	0.69/0.68[a]	0.40/0.52[a]	4.39(1.45)	−0.33	−0.43		
Item 4	0.73/0.71[a]	0.50/0.57[a]	5.30(1.31)	−1.02	0.93		
Factor IV						0.84	0.84
Item 5	0.74	0.66	4.59(1.56)	−0.50	−0.41		
Item 6	0.76	0.73	4.88(1.50)	−0.67	−0.02		
Item 7	0.59	0.62	5.48(1.33)	−1.06	1.03		
Item 8	0.64	0.56	5.04(1.48)	−0.64	−0.23		
Item 9	0.80	0.63	5.02(1.35)	−0.63	0.10		

NMP-Q: Nomophobia Questionnaire.
SD: Standard deviation.
α: Cronbach alpha coefficient.
ω: McDonald omega coefficient.
* Factor loadings derived from confirmatory factor analysis.
[a] With Item 1 removed.

Table 3
Index of fit in the confirmatory factor analysis for the Nomophobia Questionnaire.

	NMP-Q (a)	NMP-Q (b)	NMP-Q (c)
Fit indices			
χ^2 (*df*)	1070.44 (170)	524.55 (164)	466.26 (146)
p-value	< 0.001	< 0.001	< 0.001
CFI	0.955	0.982	0.984
TLI	0.949	0.979	0.981
RMSEA (90 % CI)	0.078 (0.074, 0.083)	0.050 (0.046, 0.05)	0.050 (0.045, 0.055)
SRMR	0.092	0.062	0.063

NMP-Q (a): Nomophobia Questionnaire (one-factor structure).
NMP-Q (b): Nomophobia Questionnaire (four-factor structure).
NMP-Q (c): Nomophobia Questionnaire (four-factor structure with Item 1 removed).
CFI: Comparative fit index.
TLI: Tucker-Lewis index.
RMSEA: Root mean square error of approximation.
SRMR: Standardized root mean square residual.

assessing nomophobia among university students aged between 18 and 24 years.

According to Tables 3 and 5, the findings indicated a significant χ^2 for both CFA and measurement invariance analysis. Previous studies have shown that chi-square model fit tests are sensitive to large sample sizes ($n = 868$ in the present study) and statisticians suggest reporting chi-square difference tests along with other indicators of model fit index (e.g., RMSEA, SRMSR, and CFI) (Alavi et al., 2020). Therefore, the Indonesian NMP-Q indicates an adequate fit irrespective of the significant χ^2.

The NMP-Q was first developed by Yildirim and Correia in 2015 (Lee et al., 2018) and subsequently translated into different language versions (Al-Mamun et al., 2023; Figueroa-Quiñones et al., 2025; Rangka et al., 2018) including Bahasa Indonesian (Rangka et al., 2018; Warsah et al., 2023). However, to the best of the present authors' knowledge, the four-factor structure of the Bahasa Indonesian NMP-Q has never been psychometrically examined in the two previous psychometric evaluations of the Indonesian NMP-Q. More specifically, one study investigated the Bahasa Indonesia NMP-Q and examined its psychometric properties using Rasch analysis (Rangka et al., 2018). The other study investigating the Bahasa Indonesia NMP-Q did not examine the 20-item version; instead, they only examined the 10-item version (Warsah et al., 2023). Consequently, it was unclear before the present study was conducted if the 20-item Bahasa Indonesian NMP-Q was valid using the classical test theory method. Therefore, the present study findings fill this gap, confirming the four-factor structure of the 20-item NMP-Q using CFA. However, the psychometric findings for internal consistency in the present study agree with the two previous studies evaluating the 10-item (Warsah et al., 2023) and 20-item (Rangka et al., 2018) Indonesian NMP-Q, which indicates that the NMP-Q is a valid instrument to assess nomophobia among Indonesian adults. Moreover, the four-factor structure confirmed in the present study corresponds well to prior exploratory findings showing that the NMP-Q has four dimensions (González-Cabrera et al., 2017; Lee et al., 2018).

The findings in Table 2 show that Item 1 of Factor III (i.e., not being able to access information) had a low standardized factor loading and item-total correlation (both values ≤0.4). According to Warsah et al. (2023), the number of items in the Indonesian NMP-Q was reduced from 20 to 10 items based on the low factor loadings (including Item 1). It is possible that this item may duplicate content with other items in Factor III. However, future research should investigate further to ensure that using the Indonesian NMP-Q assesses the risk of developing nomophobia. The present study also examined if the four-factor structure in NMP-Q was measurement invariant across gender differences, levels of problematic smartphone use, and daily time spent using social media. Previous studies have indicated the presence of gender bias in specific scales, such as the Self-Reporting Questionnaire 20 (Burnette et al., 2024) and Self-Report Measures of Emotional Intelligence (Lopez-Zafra

Table 4
Measurement invariance across gender (female vs. male), SABAS (< 21 score vs. ≥ 21 score) and social media time (< 5 h vs. ≥ 5 h) on the Nomophobia Questionnaire.

	χ^2 (or $\Delta\chi^2$)	*p*-value	CFI (or ΔCFI)	RMSEA (or ΔRMSEA)	SRMR (or ΔSRMR)
Gender (female vs male)					
M1 (*df* = 328)	597.25	< 0.001	0.986	0.044	0.066
M2 (*df* = 344)	689.06	< 0.001	0.983	0.048	0.070
M3 (*df* = 360)	961.59	< 0.001	0.970	0.062	0.076
M2-M1 (Δ*df* = 16)	(91.81)	<0.001	(−0.003)	(0.004)	(0.004)
M3-M2 (Δ*df* = 16)	(272.53)	<0.001	(−0.013)	(0.014)	(0.006)
SABAS (< 21 vs. ≥ 21 score)					
M1 (*df* = 328)	611.59	< 0.001	0.984	0.045	0.068
M2 (*df* = 344)	697.25	< 0.001	0.980	0.049	0.072
M3 (*df* = 360)	742.17	< 0.001	0.978	0.050	0.071
M2-M1 (Δ*df* = 16)	(85.66)	< 0.001	(−0.004)	(0.004)	(0.004)
M3-M2 (Δ*df* = 16)	(44.92)	0.0001	(−0.002)	(0.001)	(−0.001)
Social media time (< 5 vs. ≥ 5 h)					
M1 (*df* = 328)	594.75	< 0.001	0.986	0.043	0.066
M2 (*df* = 344)	655.85	< 0.001	0.984	0.046	0.069
M3 (*df* = 360)	669.10	< 0.001	0.984	0.045	0.066
M2-M1 (Δ*df* = 16)	(61.10)	< 0.001	(−0.002)	(0.003)	(0.003)
M3-M2 (Δ*df* = 16)	(13.25)	0.654	(0.000)	(−0.001)	(−0.003)

M1: Configural model.
M2: Loadings constrained equal.
M3: Loadings and thresholds constrained equal.
CFI: Comparative fit index.
TLI: Tucker-Lewis index.
RMSEA: Root mean square error of approximation.
SRMR: Standardized root mean square residual.

Table 5
Measurement invariance across gender (female vs. male), SABAS (< 21 score vs. ≥ 21 score) and social media time (< 5 h vs. ≥ 5 h) on the Nomophobia Questionnaire with Item1 removed.

	χ^2 (or $\Delta\chi^2$)	*p*-value	CFI (or ΔCFI)	RMSEA (or ΔRMSEA)	SRMR (or ΔSRMR)
Gender (female vs male)					
M1 (*df* = 292)	526.96	< 0.001	0.988	0.043	0.066
M2 (*df* = 307)	542.93	< 0.001	0.988	0.042	0.067
M3 (*df* = 322)	551.16	< 0.001	0.988	0.041	0.064
M2-M1 (Δ*df* = 15)	15.97	0.384	0.000	−0.001	0.001
M3-M2 (Δ*df* = 15)	8.23	0.914	0.000	−0.001	−0.003
SABAS (< 21 vs. ≥ 21 score)					
M1 (*df* = 292)	544.42	< 0.001	0.985	0.045	0.068
M2 (*df* = 307)	630.16	< 0.001	0.981	0.049	0.073
M3 (*df* = 322)	656.58	< 0.001	0.980	0.049	0.071
M2-M1 (Δ*df* = 15)	85.74	< 0.001	−0.004	0.004	0.005
M3-M2 (Δ*df* = 15)	26.42	0.034	−0.001	0.000	−0.002
Social media time (< 5 vs. ≥ 5 h)					
M1 (*df* = 292)	521.36	< 0.001	0.988	0.043	0.066
M2 (*df* = 307)	577.47	< 0.001	0.986	0.045	0.069
M3 (*df* = 322)	589.78	< 0.001	0.986	0.044	0.067
M2-M1 (Δ*df* = 15)	56.11	< 0.001	−0.002	0.002	0.003
M3-M2 (Δ*df* = 15)	12.31	0.655	0.000	−0.001	−0.002

M1: Configural model.
M2: Loadings constrained equal.
M3: Loadings and thresholds constrained equal.
CFI: Comparative fit index.
TLI: Tucker-Lewis index.
RMSEA: Root mean square error of approximation.
SRMR: Standardized root mean square residual.

& Gartzia, 2014), as evidenced by imbalanced scores between male and female participants. The present study showed that the four-structure model was a good fit for both genders. The same results were also found when the NMP-Q was tested on students with different problematic smartphone use levels (SABAS <21 and ≥ 21), where the higher the SABAS score, the greater the risk of smartphone addiction (Csibi et al., 2018). A previous study indicated that one of the reasons for the persistent use of smartphones is social media addiction (Lin et al., 2021), and analysis showed the NMP-Q can also be used for individuals with different levels of social media addiction. Therefore, it can be concluded that the NMP-Q can be used to assess nomophobia among populations comprising different genders and different levels of smartphone addiction risk and social media addiction risk.

Finally, the present study also showed that there were significant relationships between the nomophobia and (i) problematic smartphone use, (ii) weight self-stigma, and (iii) psychological stress. Based on the results in Table 5, nomophobia had a relatively stronger relationship with problematic smartphone use than either weight stigma or psychological distress. Both the NMP-Q and the SABAS assess the interaction between individuals and smartphones (i.e., NMP-Q assesses nomophobia and SABAS assesses addiction risk toward smartphones). Therefore, they are likely to have a strong association. Nomophobia and weight-related self-stigma may be associated through the phenomenon of excessive social media use, because social media use exerts an important influence on the formation of an individual's body image due to the effect of other people's posts on social media (Clark et al., 2021; Selensky & Carels, 2021). However, weight-related self-stigma (as compared with smartphone addiction) does not have a close relationship with nomophobia (i.e., weight-related self-stigma may not always come from smartphone use). Therefore, the association between weight-related self-stigma and nomophobia is likely to be weaker than that between smartphone addiction and nomophobia. In addition, weight self-stigma is also associated with other mental states, such as depression, anxiety, and stress (Ali et al., 2024), in a manner analogous to both the NMP-Q (Gnardellis et al., 2023) and SABAS (Vally & Alowais, 2022).

There are some limitations in the present study. First, the study only included Indonesian university students, limiting generalizability to other populations, such as high school students, working professionals,

Table 6
Correlation between NMPQ, SABAS, WSSQ, DASS-21.

	NMP-Q(T)	NMP-Q(F1)	NMP-Q(F2)	NMP-Q(F3)	NMP-Q(F3r)	NMPQ(F4)	SABAS(T)	WSSQ(T)	DASS(T)
NMP-Q (T)	–								
NMP-Q (F1)	0.87***	–							
NMP-Q (F2)	0.82***	0.59***	–						
NMP-Q (F3)	0.61***	0.40***	0.38***	–					
NMP-Q (F3r)	0.73***	0.49***	0.46***	0.87***	–				
NMP-Q (F4)	0.87***	0.68***	0.61***	0.49***	0.62***	–			
SABAS (T)	0.41***	0.30***	0.37***	0.17***	0.28***	0.38***	–		
WSSQ (T)	0.18***	0.14***	0.14***	0.16***	0.13***	0.19***	0.28***	–	
DASS (T)	0.23***	0.17***	0.19***	0.22***	0.17***	0.21***	0.36***	0.36***	–

NMP-Q (T): Nomophobia Questionnaire (Total score).
NMP-Q (F1): Nomophobia Questionnaire (Factor I; Not being able to communicate domain score).
NMP-Q (F2): Nomophobia Questionnaire (Factor II; Losing connectedness domain score).
NMP-Q (F3): Nomophobia Questionnaire (Factor III; Not being able to access information domain score).
NMP-Q (F3r): Nomophobia Questionnaire (Factor III revised; Not being able to access information domain score with Item one removed).
NMP-Q (F4): Nomophobia Questionnaire (Factor IV; Giving up convenience domain score).
SABAS (T): Smartphone Application Based Addiction Scale (Total score).
WSSQ (T): Weight Self-Stigma Questionnaire (Total score).
DASS (T): Depression Anxiety Stress Scale–21 (Total score).
*** $p < .001$.

or older adults. Self-report biases may also be present because all the data were self-reported, which may be influenced by social desirability bias or inaccurate self-assessment. Although the Indonesian NMP-Q showed satisfactory psychometric properties, cultural differences in problematic smartphone use might require further validation in different regions of Indonesia. Moreover, because the study was cross-sectional, it was unable to establish causality between the study variables or track changes in nomophobia over time. Longitudinal studies are needed to assess how nomophobia develops or changes over time. The study did not account for other factors influencing nomophobia, such as personality traits, other mental health conditions, or academic stress levels.

5. Conclusion

The present study's results show that the Indonesian version of the NMP-Q has satisfactory psychometric properties and can be used to assess nomophobia among Indonesian university students. In addition, the measurement invariance of the NMP-Q was supported across gender, level of problematic smartphone use, and daily time spent using social media. Therefore, the present findings demonstrate that NMP-Q has a four-factor structure that is relatively stable across different subgroups of Indonesian university students. Healthcare providers and researchers may use NMP-Q to evaluate how worried university students are when they do not have access to their smartphones in relation to other psychosocial variables of concern.

CRediT authorship contribution statement

Muthmainnah Muthmainnah: Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Kamolthip Ruckwongpatr:** Writing – review & editing, Writing – original draft, Visualization, Software, Methodology, Formal analysis, Conceptualization. **Ira Nurmala:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Lutfi Agus Salim:** Writing – review & editing, Validation, Methodology, Data curation. **Asma Nadia:** Writing – review & editing, Validation, Methodology, Data curation. **Yuli Puspita Devi:** Writing – review & editing, Validation, Methodology, Data curation. **Annisa Clara Salsabila:** Writing – review & editing, Validation, Methodology, Data curation. **Musheer A. Aljaberi:** Writing – review & editing, Validation, Supervision, Methodology, Conceptualization. **Mark D. Griffiths:** Writing – review & editing, Validation, Methodology. **Chung-Ying Lin:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Resources, Project administration, Investigation, Funding acquisition, Conceptualization.

Consent for publication

Not applicable.

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki and approved by the Health Research Ethics Committee in the Faculty of Nursing, Universitas Airlangga (Number: 3016-KEPK). All participants gave their informed consent before participating in the study.

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Declaration of competing interest

The authors have no competing interests to declare that are relevant to the content of this research or article.

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Data availability

Data will be made available on reasonable request.

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