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Disambiguating the Items in the Nomophobia Questionnaire through a Psychometric Evaluation using Rasch Measurement Model

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Abstract

Behavioral addiction related to smart phone usage has led to the development of measures like Nomophobia Questionnaire (NMPQ). Nomophobia had been theorised as a form of behavioural addiction with four dimensions: losing connectedness, giving up convenience, not able to communicate, and not having access to information. The concern about its factor structure, the limitations of its psychometric evaluation, and the need to use the NMPQ in Malaysia motivated the present work. This study aimed to translate and examine the NMPQ using Rasch Models among Malaysians adults. The study involved back-translation, expert validation, and Rasch analysis. The translation into Bahasa Melayu and rating from experts revealed the need to revise some items to fit the conceptualisation of nomophobia as an addiction rather than fear. An online survey was conducted with responses from 677 Malaysian adults. Using the Rasch Rating Scale Model, it was found that the NMPQ-BM Revised has satisfactory psychometric properties after the removal of two items. In addition, this study also removed ambiguities from some items to better reflect behavioural addiction. At the conceptual level, this study highlighted Communication as a potential stand-alone dimension. The NMPQ-BM Revised has been validated as an objective measure and can be used to further examine nomophobia as a behavioural addiction. This study has contributed to the semantic clarity for the measurement of nomophobia. The revised instrument has items that are conceptually closer to nomophobia than fear of missing out or addiction to technology and the internet.

Keywords: Behavioral addiction, mobile phone, nomophobia, psychometric properties, Rasch Measurement Model

Abstrak

Ketagihan tingkah laku yang berkaitan dengan penggunaan telefon pintar telah membawa kepada pembangunan pengukuran seperti Soal-selidik Nomophobia (NMPQ). Nomophobia telah diteorikan sebagai satu bentuk ketagihan tingkah laku dengan empat dimensi: kehilangan sambungan, melepaskan kemudahan, tidak mampu untuk berkomunikasi, dan tidak mempunyai akses kepada maklumat. Kebimbangan mengenai struktur faktornya, keterbatasan penilaian psikometriknya, dan keperluan untuk menggunakan NMPQ di Malaysia telah mendorong kajian ini. Kajian ini bertujuan untuk menterjemah dan mengkaji NMPQ dengan menggunakan Model Rasch dalam kalangan orang dewasa di Malaysia. Kajian ini melibatkan terjemahan semula, pengesahan pakar, dan analisis Rasch. Terjemahan kepada Bahasa Melayu dan penilaian daripada pakar-pakar telah mendedahkan keperluan untuk menyemak semula beberapa item bagi memenuhi konseptualisasi nomophobia sebagai ketagihan dan bukannya ketakutan. Satu kajian dalam talian telah dijalankan dengan melibatkan sampel sebanyak 677 orang dewasa di Malaysia. Dengan menggunakan Model Skala Pemeringkatan Rasch, didapati bahawa NMPQ-ubahsuai mempunyai sifat psikometri yang memuaskan selepas dua item disingkirkan. Di samping itu, kajian ini juga telah mengurangkan kekaburan daripada beberapa item untuk lebih mencerminkan ketagihan tingkah laku. Pada tahap konseptual, kajian ini telah mengetengahkan Komunikasi sebagai dimensi yang berpotensi untuk berdiri sendiri. NMPQ-ubahsuai telah disahkan sebagai pengukuran yang objektif dan boleh digunapakai untuk mengkaji dengan lebih lanjut tentang nomophobia sebagai ketagihan tingkah laku.

Kata kunci: Ketagihan tingkah laku, telefon mudah alih, nomophobia, sifat-sifat psikometrik, Model Pengukuran Rasch

1.0 INTRODUCTION

Social media usage in Malaysia has increased significantly over the last decade, echoing global digital trends. As of January 2024, around 83.1% of Malaysians were active social media users, representing a 4.6% growth over the previous year as report by Statista. This expansion relies heavily on mobile connectivity. Malaysia's mobile penetration rate was 129.2% in 2024, accounting for 44.55 million cellular mobile connections. Notably, 95.7% of these connections offered high-speed internet access, highlighting the extensive availability of mobile internet services (Tariq et al., 2025).

People's daily lives now revolve around the use of smartphones. However, when the failure to use a smartphone to establish and sustain electronic communication is associated with psychological suffering, such behavior may be classified as a modern-age phobia, or

nomophobia (no-mobile-phone-phobia). Smartphone usage is particularly high among the young, raising worries because it causes distress and leads to a variety of difficulties. Today, the general usage of smartphones has surged in this group, showing the onset of a significant disorder that requires attention (Mohani et al., 2024). Nomophobia, defined as the dread of being without or unable to use a mobile phone, has grown common in today's technologically advanced culture. Given the increasing reliance on mobile devices, it is critical to understand the potential psychological repercussions of nomophobia (Sharma, 2023). According to Abdoli et al., (2023), nomophobia appears to be a mood disorder with higher connections with anxiety symptoms and, to a lesser extent, with depression and stress symptoms. Due to the Internet's extensive availability, problematic or addictive Internet use has been recognized. In light of this, it may be said that panic episodes, irritability, and anxiety are common side effects of nomophobia.

Rodríguez, Villar, Tarín, and Blázquez (2023) stated that 5.18 billion people, or two-thirds of the world's population, utilize the internet, making it an indispensable element of modern life. 55% of people worldwide have access to mobile internet; the highest percentages are found in North America (83%), sub-Saharan Africa (23%), and Europe (85%). The number of unique mobile internet users stood at 4.28 billion in 2020, indicating that over 90% of the global internet population uses a mobile device to go online (Statista, 2021). With the COVID-19 pandemic, Internet services have seen rises in usage from 40 % to 100 %, compared to pre-lockdown levels (De, Pandey & Pal, 2020). The COVID-19 pandemic has created the conditions for the expansion of teleworking in numerous sectors and organizations, and higher education institutions have had to adapt to this context (Catană, Toma, & Barbu, 2021). The pandemic has amplified the usage of mobile phone above its already high level observed before.

The more diverse the functions of the mobile phone the stronger the attachment of the user to the device (Miakotko, 2016). Thus, the more frequent and longer use of mobile phones, the higher the risk of nomophobia developing among smartphone users. Nomophobia has been generally referred to as dependence (Dixit et al., 2010), anxiety (Gezgin et al., 2018) and addiction (Forgays et al., 2014) to mobile phones. It is often considered a subcategory of a larger issue known as technology (or cyber) addiction, and it has become so prevalent that it was proposed as a diagnostic category of addiction in the Diagnostic and Statistical Manual of Mental Disorders (Chóliz, 2010, Bragazzi & Del Puente, 2014).

Nomophobia has a high prevalence and is an emerging mental health condition (Sharma, et al. 2019) significantly associated with depression, anxiety, and poor quality of life (Aarthi at el., (2020), maladaptive coping strategies (Anjana et al., 2021) and loneliness (Arpaci, 2020). Given the dire relationship between nomophobia and psychological outcomes and the mitigating external situation (e.g. Covid-19 pandemic), improvements to the existing measure of nomophobia are needed.

Nomophobia is getting more prevalent in Malaysia, with cultural, technical, and societal forces all playing a role. While mobile phones serve as useful tools for communication and entertainment, their excessive use, and the fear of being disconnected can have major psychological and social implications. As the digital era progresses, politicians, educators, and mental health experts must address the issue of nomophobia through awareness campaigns, digital wellness education, and encouraging healthy smartphone usage (Chia, Teo & Ang, (2021).

■2.0 NOMOPHOBIA QUESTIONNAIRE

Nomophobia Questionnaire (NMP-Q) was developed by Yildirim and Correia (2015) as a four-factor instrument (fear of losing connectivity, fear of not being able to communicate, fear of not being able to access information, and fear of giving up convenience). It comprises 20 items rated on 7-point Likert type rating scale. Subsequently, it was translated into various languages and validated using both Classical Test Theory and Item Response Theory.

Studies applying Classical Test Theory reported the use of Exploratory Factor Analysis (Adawi et al., 2018), Confirmatory Factor Analysis (CFA) (Galhardo et al., 2020) and a combination of EFA and CFA (Gao et al., 2020, Ozdemir & Bektas, 2020). Among these and other studies, the factor structures found was mixed. The original factor structure was replicated in a sample of the general population (Nascimento da Silva, et al, 2020) undergraduate students (Lee et al., 2018), school children (Ozdemir & Bektas, 2020), and nursing students (Gutiérrez-Puertas, Márquez-Hernández, & Aguilera-Manriqu, 2016). The 4-factor structure were also replicated albeit with the removal of two items (Gao et al., 2020; Lin). Meanwhile, Farchakh et al. (2021) and Adawi et al. (2018) found a 3-factor structure instead; in the earlier Giving Up Conveniences was merged with Losing Connectedness and the later dropped the Giving Up Convenience factor. Al-Balhan et al. (2018) found poor fit for the 4-factor structure where there were items that loaded to different factor compared to the original structure. Meanwhile Galhardo et al. (2020) found a good fit for a model with one global factor.

The inconsistency in the factor structure reported by the various studies call into question the original conceptualisation of nomophobia proposed by Yildirim and Correia (2015). While differences in the samples tested could be a contributing factor, the items themselves may need to be re-checked for content validity. Gutiérrez-Puertas, et al., (2016) tested the content validity with 20 experts, but little was reported about what exactly had been examined. Additionally, given that nomophobia had frequently been described as phobia and anxiety, the salience of anxiety in the items should be linked sufficiently to addiction. There is a need to disambiguate the items of NMP-Q to produce a more coherent questionnaire measuring addiction-based situational phobia experiences.

There are many more psychometric, validation, and translation studies that used the Classical Test Theory than Item Response Theory. Studies that used Rasch measurement model to examine the psychometric properties on the NMP-Q had been limited in terms of the depth of analysis by focusing on Differential Item Functioning analysis (see Lin, Griffiths, & Pakpour, 2018; Syahputra & Erwindra, 2020). While Rangka et al. (2018) provided more elaborate analyses, they did not report unidimensionality that happens to be highly recommended to be included in a psychometric evaluation of an instrument (Aryadoust, Ng, & Sayama, 2021). A clear advantage of using Rasch Rating Scale Model is the ability to provide empirical justification for classifying the levels of nomophobia. Rather than relying on the values used in the original (ordinal) rating scale, Rasch analysis provide person separation value to indicate whether the instrument is able to differentiate persons with different abilities (nomophobia). Additionally, item calibration is Rasch analysis can help researchers to identify items that are most indicative of phobia (items with highest difficulty). A person endorsing the most difficult items is very likely to have strong nomophobia compared to endorsement of very easy items.

In summary, it is observed that researchers' understanding of the psychometric properties of the NMPQ have been limited to analyses based on the Classical Test Theory. Meanwhile, studies using Rasch analysis are limited in their scope of analysis. Secondly, the inconsistency of the findings regarding the items belonging to the theorised dimension warrant further examination of the NMPQ's conceptualisation. Thirdly, a properly validated NMPQ for use among Bahasa Melayu speaking people in Malaysia is not available. Therefore, the present study aims to add clarity to the items of the NMPQ through the use of Rasch analyses for the Bahasa Melayu version of the NMPQ. The objectives of this study are as follows:

(1) To translate the NMPQ into Bahasa Melayu using a back translation method.
(2) To review the content validity of the NMPQ-BM using Many Facet Rasch Model.
(3) To validate the revised NMPQ-BM using Rasch Measurement Model.

3.0 METHODOLOGY

The NMPQ was translated into Bahasa Melayu by the first author who is a proficient bilingual university lecturer with a background in psychology education and research. It was then back-translated into English by a university lecturer who is also a proficient bilingual and has received a Ph. D in English language with more than 20 years of experience in teaching English. All three authors then discussed the translations to harmonize the Bahasa Melayu version.

Content validity was assessed using expert ratings of the items. The need to review the content validity was compounded by the observation that Nomophobia is a relatively new instrument and phenomena being studied in Malaysia, and the challenges faced in achieving semantic equivalence during the back-translation process. Five experts with relevant teaching and/or research background (e.g. psychology, English language) were selected to rate the 20 items for relevance, simplicity of sentence structure, understandability of the words used, and fairness (avoidance of bias) using a 3-point rating scale (e.g. 1=not relevant, 2=quite relevant, can be improved, 3=relevant). The ratings were analysed using Minifac 3.83.3 to examine raters' severity (spread of raters' measures), item fit (Outfit MNSQ between 0.5 and 1.4), and item quality (location of item's logit relative to the items' standard deviation). The experts are university lecturers with relevant research experiences. Items were revised based on the qualitative feedback and quantitative analysis of the ratings.

The revised NMPQ was administered as an online survey using Google Form. The link to the form was distributed via social media by the researchers. The survey included information relevant for informed consent as suggested by the American Psychological Association. The questionnaire was aimed at Malaysians aged 18 and above. Voluntary response sampling technique was used by means of distributing the links to the survey to potential respondents through social media platform (WhatsApp). With a sample size exceeding 250, item calibration that is stable within ±0.5 and confidence of 99% would be achieved (Linacre, 1994). For this validation study, the preciseness of item calibration is more of a priority than having a representative sample. Nevertheless, the obtained sample size exceeded the minimum recommendation (384) by Krejcie and Morgan for a large population (>1,000,000).

The first part was data cleaning for identification of outliers and misfitting persons and items. The second part was about the instrument's reliability and separation. The third part involved examining the instrument-level validity such as unidimensionality, item targeting, and rating scale analysis. The fourth part examined the item quality (fit, bias and difficulty). All analyses were done in Winstep version 5.1.0.0. These analyses covered more than the recommendations outlined by Aryadoust and Sayama (2021). The relevant indicative statistical value and cut-off points used are presented in Table 1.

Table 1 Statistical values and cut-off points for the measurement model analysis

Analysis	Index	Reference
Person and Item Reliability	≥0.80	Fisher (2006)
Person and Item Separation	≥ 2	Fisher (2006)
Unidimensionality	Variance explained by the measure ≥ 40% Variance explained by the first contrast ≤ 15% Eigenvalue of the first contrast ≤ 3	Linacre (2010)
Rating Scale functioning	1.4 < Andrich Threshold distance < 5 Monotonic increase of observed measures' average Frequency of category > 10 Outfit MNSQ < 2	Linacre (1999)
Item fit	0.5 < Outfit MNSQ <1.5 PTMea. Corr >0.0	(Boone et al., 2014) (Bond & Fox, 2015)
DIF	DIF contrast < |0.5| Welch's t < |2| Mantel-Hanzl *p* >.05	Linacre (n.d.)

4.0 RESULTS

4.1 Expert Validation

The raters were lenient in rating the items. The raters' measures ranged from -2.0 to -3.4. There were no misfitting raters, their Outfit MNSQ ranged from 1.09 to .75. There were six items with highest rating possible (4, 10, 11, 12, 13, and 14) and one misfitting item (20); the rest of the items have satisfactory fit indices. The rating criteria themselves showed no misfitting problems, the Outfit MNSQ ranged from .57 (Fairness) to 1.01 (Clarity).

The SD for the item measures was 1.24. Therefore, items with measures below 2 unit of SD (<-2.48) would be considered weak and not acceptable in terms of their quality. Using this criterion, none of the items was rejected as the lowest item measure was -1.65. The

statistical results showed the need to revise item 20 (misfitting issue). In addition, qualitative feedback from the experts revealed revisions that should be carried out.

The feedback was mainly centred around differentiating nomophobia from other experiences like fear of missing out, internet addiction and fear in general. Table 2 provides the details of the comment and the revisions done. The revisions helped to disambiguate the items so that they were more directly related to nomophobia.

Table 2 Revisions to the items based on expert ratings and feedback

Original item	Comment	Revised item
5. Running out of battery in my smartphone would scare me.	Worrying is conceptually nearer to phobia than being scared.	Running out of smartphone battery is worrying as it will interfere with the smooth running of my tasks.
6. If I were to run out of credits or hit my monthly data limit, I would panic.	Need to have a context to link the statement to giving up convenience.	I will become panic if I run out of credit or reach the data limit because I can no longer enjoy the functions of the smartphone.
7. If I 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.	The item is closer to technology addiction (compulsion to check) rather than nomophobia.	I will feel restless if I cannot get an internet connection because I have lost the facilities the phone has provided that can be enjoyed.
8. If I could not use my smartphone, I would be afraid of getting stranded somewhere.	Stranded is less directly related to being nomophobic compared to feeling restless.	I will feel restless if I cannot use a smartphone because my tasks will be affected.
9. If I could not check my smartphone for a while, I would feel a desire to check it.	The item is closer to technology addiction (compulsion or craving) rather than nomophobia.	I would feel uncomfortable if I could not check my smartphone because there might be things that need to be done.
16. I would be nervous because I would be disconnected from my online identity.	'Online identity' is not clear.	I will feel anxious because my presence or existence on social media will be affected.
20. I would feel weird because I would not know what to do.	A word that expresses a more intense emotion is desirable.	I will feel nervous because I do not know what to do.

4.2 Psychometric Properties

The online survey resulted in 677 respondents. This sample size was greater than the minimum needed (n=250) to achieve item calibration stability within ±0.5 logit with 99% confidence interval (Linacre, 1994).

Table 3 Demographic profile (N=592)

Profile	Frequency	Percentage (%)
Gender		
Male	163	27.5
Female	429	72.5
Working		
Full time students	314	53.0
Full time employees	139	23.5
Part time employees	37	6.3
Not working	46	7.8
Seeking employtment	20	3.4
Self-employed	36	6.1
Highest academic qualification		
Primary	82	13.9
Secondary	204	34.5
Pre-University	120	20.3
Bachelor	161	27.2
Master	19	3.2
PhD	5	0.8

4.2.1 Data Cleaning: Outliers and Misfitting

From 677 respondents, 25 were considered maximum outliers. After the removal of the 25 respondents, a further 60 (9.2% from 652) were removed due to misfit concerns (person OutMNSQ >2.0). None of the items was found to be outliers or misfitting. The remaining analysis was based on N=592 with details presented in Table 3. These respondents' age ranged from 18 to 82 with M=25.95 and SD=9.52.

4.2.2 Reliability and Separation

Based on N=592, and after removal of Item 1 and 3 (see *Item Targeting*) it was found that the NMQ-BM Revised showed excellent reliability (person = .93, item = .99, and Cronbach = .95) and good separation (person = 3.74, item = 11.55). Based on the Person Separation Index, the instrument is able to differentiate 5 levels of phobia (person strata = 5.3).

4.2.3 Unidimensionality

Evidence of unidimensionality was satisfactory, (raw variance explained = 60.9%, variance explained by first contrast = 6.2%, eigenvalue of the first contrast = 2.8). The ratio of variance explained by the items to the variance explained by the first contrast was 31.2 : 6.2 giving a ratio that exceeded 3:1. Examination of the loadings of the first contrast suggested a clustering of all six Communication items (all positive loadings) against the rest of the items (loading ≤ 0). This observation might suggest Communication as a latent dimension of NMQ-BM Revised separate from the other items. However, other indices support a unidimensional interpretation of the instrument's structure.

4.2.4 Local Independence

Local independence was evidenced by standardized residual correlations being lower than 0.5 with observed values ranging from -.28 to .40.

4.2.5 Item Fit, Location and Preciseness

At the item level, the measures' *SD* = 0.46 indicated a lower spread than ideal (*SD*>0.5). However, the Mean Standard Error of Measurement = .04 for item measures indicated acceptable preciseness in measurement. Point Measure Correlations for all items were within 0.49 and 0.78 indicating item polarity as desired. However, two items as highlighted in Table 4 were found to be misfitting; the Outfit MNSQ for Item 1 ("I would feel uncomfortable without constant access to information through my smartphone"/ "*Saya akan berasa tidak selesa tanpa capaian yang berterusan ke atas maklumat menerusi telefon pintar saya*") was 1.94 and Item 3 ("Being unable to get the news (e.g., happenings, weather, etc.) on my smartphone would make me nervous" / "*Saya akan berasa gelisah jika tidak boleh mendapat berita (contoh: peristiwa, cuaca dll) menerusi telefon pintar saya*." was 1.74. Both items measured Access and were deleted.

Table 4 *Fit statistics for the items.*

ENTRY	MEASURE	IN.MSQ	IN.ZSTD	OUT.MSQ	OUT.ZSTD	PTMA
1	-0.61	1.57	7.72	**1.94**	9.90	0.48
2	-0.91	1.34	4.73	1.40	5.00	0.53
3	0.32	1.49	7.35	**1.74**	9.90	0.57
4	-0.68	1.19	2.62	1.42	4.98	0.59
5	-0.41	1.03	0.55	1.00	-0.02	0.68
6	0.14	0.96	-0.64	0.95	-0.75	0.73
7	-0.19	1.01	0.25	0.98	-0.25	0.70
8	-0.25	0.98	-0.31	1.00	0.05	0.69
9	0.07	1.01	0.20	0.98	-0.28	0.71
10	0.06	0.79	-3.80	0.77	-3.96	0.77
11	-0.28	0.86	-2.38	0.80	-3.18	0.73
12	-0.02	0.66	-6.40	0.64	-6.35	0.80
13	-0.17	0.71	-5.37	0.69	-5.52	0.78
14	-0.15	0.75	-4.52	0.72	-4.90	0.76
15	0.26	0.86	-2.56	0.82	-3.14	0.76
16	0.94	1.17	2.97	1.15	2.36	0.71
17	0.32	0.77	-4.15	0.75	-4.58	0.78
18	0.67	0.81	-3.58	0.81	-3.29	0.78
19	0.22	0.85	-2.62	0.93	-1.10	0.75
20	0.66	1.31	5.04	1.47	6.50	0.66

4.2.6 Item Targeting

There was a ceiling effect (9 respondents with maximum score, 1.5%) and no floor effects. The spread of person measures was wider (*SD*=1.30) compared to the item measures (*SD*=.48) as evident in the Measure column in Figure 1. Person abilities were covered by the items as shown in the operational range of the *Top* and *Bottom* columns except for approximately 19 to 25 persons (highest ability) and for approximately 2 to 6 (lowest abilities).

4.2.7 Item Difficulty

Based on the item measures' SD = .48, four levels of difficulties were proposed: Very High (logit > 0.48), High (0.48 ≤ logit < 0), Low (0 ≤logit < -.48) and Very Low (logit ≤ 0.48). The higher the difficulty, the less likely were the respondents to endorse the items. The Very

High Difficulty items were 16 , 18 (“saya akan berasa huru-hara kerana saya tidak boleh membaca notifikasi tentang maklumat baharu dari kenalan-kenalan dan rangkaian-rangkaian dalam talian”/ “*I would feel anxious if I cannot read notifications of new information from friends and online networks*)) and 20 (all Connection) and the Very Low Difficulty items were 2 (“. I would be annoyed if I could not look information up on my smartphone when I wanted to do so.” / “*Saya akan berasa terganggu jika saya tidak boleh mendapatkan maklumat menerusi telefon pintar saya ketika saya mengkehendakinya*.”) and 4 (“. I would be annoyed if I could not use my smartphone and/or its capabilities when I wanted to do so.” / “*Saya akan berasa terganggu jika saya tidak dapat menggunakan telefon pintar dan/atau apa yang ia boleh buat ketika saya memerlukannya*”): both were Access items.

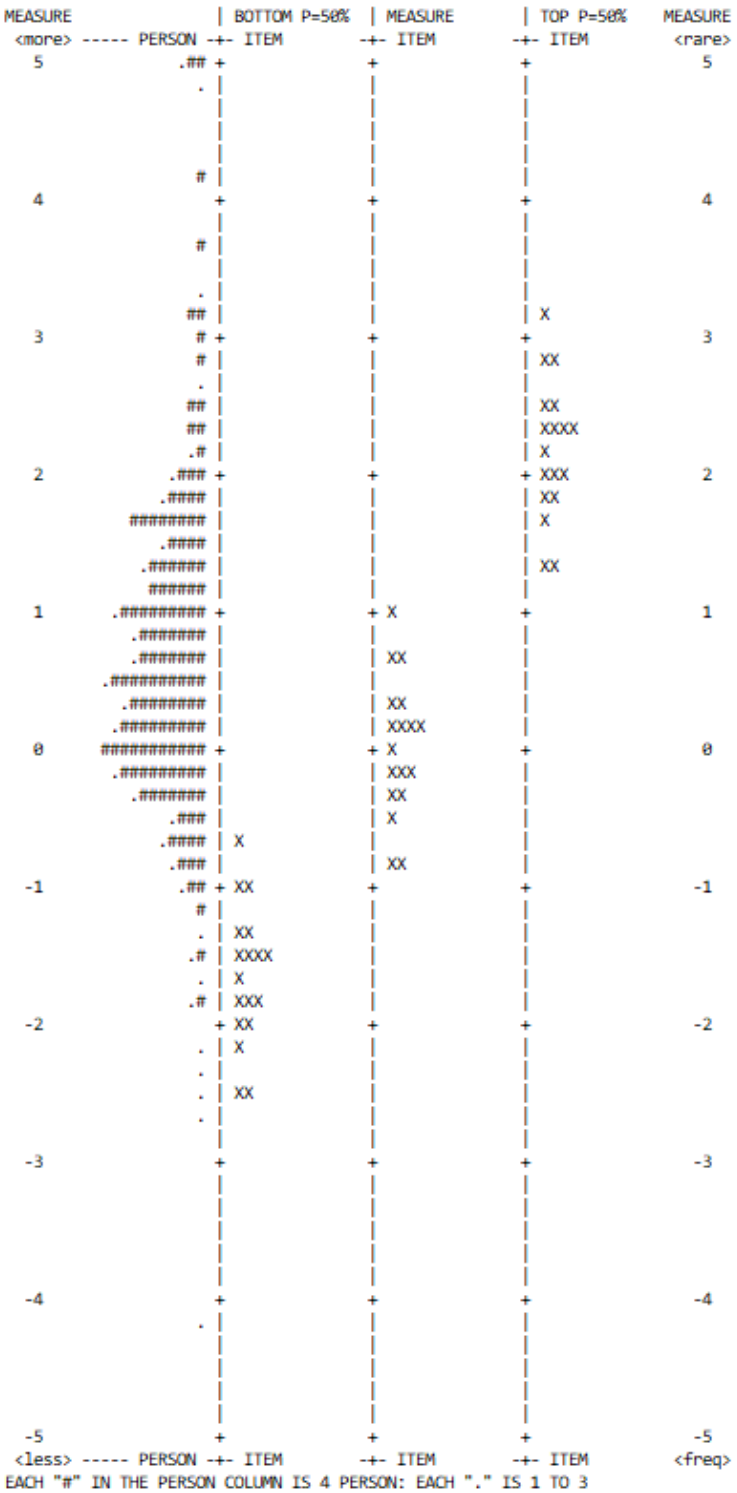

Figure 1 Wright map with item difficulty levels

4.2.8 Rating Scale Analysis

Rating scale analysis revealed sufficient frequency of responses (>10) for each category as shown in Table 5. The observed averages increased monotonically as desired, and no category was misfitting (Outfit Mean Square < 2.0). However, the differences of the Andrich Threshold between adjacent categories were all smaller than 1.4. Collapsing of response categories (e.g. 2 and 3; 5 and 6) was advisable with these findings. Thus, the recommended rating scale is one with five categories instead of seven.

Table 5 Rating scale analysis

Category	Observed Label Score		Observed Average	Infit MNSQ	Outfit MNSQ	Andrich Threshold	Category Measure
	Count	%					
1	561	5	-1.39	-1.41	1.12	NONE	(-2.67)
2	623	6	-0.77	-0.77	1.03	-1.17	-1.48
3	877	8	-0.29	-0.31	0.98	-0.88	-0.8
4	2054	19	0.09	0.13	0.87	-0.94	-0.18
5	2347	22	0.61	0.61	0.94	0.23	0.59
6	2238	21	1.24	1.2	0.93	0.94	1.6
7	1947	18	2.03	2.05	1.11	1.81	-3.16

4.2.9 Item Bias

Evidence for Item bias based on gender was not found. None of the items fulfilled all three conditions for DIF. Three items showed partial evidence for DIF. Item 2 had a t= 2.02 and Mantel-Hanzl p=0.04, but the DIF contrast was 0.2. The statistics for Item 17 (DIF contrast=-.27, t=-3.05 and p=.003) and Item 18 (DIF contrast=-.21, t=-2.46 and p=.053) also showed partial evidence for DIF.

An independent samples t-test was performed to compare the Nomophobia scores between male and female respondents. The variances of the two groups were accepted as statistically similar, Levene's $F(1,590)$=1.81, p=.180. However, Kolmogorov-Smirnov statistics = 0.089, p<.001 indicated a non-normal distribution of scores. Therefore, Mann-Whitney U was reported here. The logit measures were the same for males and females, Median=.560, Mann-Whitney U = 35,684, p=.869. The logit measures were not correlated with age. There was no significant linear correlation, r (N=592)=-0.068, p=.101. In other words, nomophobia is not linearly related with age. Given the dominance of younger generation in this sample, and the prevalence of FOMO among them, any true correlation between age and nomophobia may be masked. It could be possible that above a certain age threshold, there exist a negative correlation (the older the respondent, the lesser the nomophobia). Stated differently, older respondents are not as affected by FOMO and, by extension, nomophobia.

■5.0 DISCUSSION

Based on the analysis done on the NMPQ-BM with 18 items (two original items removed and seven items reworded), it was found that the data has a good fit to the Rasch model. Thus, it is concluded that there is satisfactory evidence for reliability and validity at the instrument and items levels. At the semantic level, the items had been improved to be better samples of behaviour for each respective sub-construct of nomophobia.

As reviewed by León-Mejía et al. (2021), the 4-level (absence, mild, moderate and severe) categorisation is most commonly reported in the literature. One major limitation of such categorisation is the dependence on scores obtained from ordinal scale. Using the NMPQ-BM Revised, it would be possible to differentiate respondents with different levels of the phobia (e.g. categories based on units of person measures' standard deviation or separation index). According to the present findings, five levels of nomophobia might be defensible. With person mean=0.7 and SD=1.3, the proposed logit cut-off points (average raw score) are -1.25 (2.44), 0.05 (3.44), 1.35 (5.72), and 2.65 (6.56). With this four cut-off points, a five-level categorization is proposed for further evaluation.

The cut-off points for the levels of nomophobia can be applied uniformly to male and female respondents. León-Mejía et al. (2021) reported studies advising separate cut-off points for males and females. Based on the DIF analysis, the separation is not necessary. No item bias was found for males and females. Thus, it is recommended that the cut-off points are the same for both genders.

The nomophobia scores were not significantly different between males and females. Additionally, there is also no significant correlation between the score and age. The findings were in contrast with most studies reviewed by León-Mejía et al. (2021) in which there are higher nomophobia among females and negative correlation (younger people have higher nomophobia). The use of objective measurement could have contributed to the dilution of gender differences and correlation with age. Specifically for age, the nature of the correlation could be investigated further. The data (from visual inspection of the scatterplot) from this study seem to suggest the nature of the correlation may differ by age group.

■6.0 LIMITATION AND FUTURE RESEARCH SUGGESTION

The 7-point rating scale needs to be revised into smaller number of categories. A 5-point rating scale may be promising although Rangka (2018) found the Andrich Threshold between category 3 and 4 does not meet the recommended distance. Thus, a 4-point rating scale is proposed for the future psychometric evaluation of the NMP-Q-Revised.

In terms of the sample, the online survey produced an unbalanced ratio of male to female respondents (less than 30% males, much less than 51% observed in the general population according to 2024 Cansus data) that is more commonly observed in institutions of higher learnings in Malaysia. The present sample does not reflect the gender distribution in the country. Moreover, university students are

overrepresented in the sample. These limitations may limit the conclusions that could be made regarding estimates like item and person reliability. Future research could select a more heterogenous sample to test the NMP-Q-Revised.

More items measuring the wider range of person ability are required especially at the higher end of the ability spectrum. Items that can help to distinguish persons with severe and low level of nomophobia levels would add to the instrument's item targeting ability and utility for clinical purposes. Studies could be done to identify a sample of such items based on experts' experiences in dealing with nomophobia cases.

■7.0 CONCLUSION

Smartphone usage is a leading cause of musculoskeletal difficulties and pain (Mustafaoglu et al.,2021; Alsalameh et al., 2019; Sharan et al., 2014). According to Abdoli et al., (2023), since 2020, severe nomophobia prevalence rates ranged from 1% to 87%. Higher scores for nomophobia were associated with higher scores for depression, anxiety, stress, and sleep disturbances, as well as lower scores for self-esteem and social support. Smartphone usage has surged among this population, indicating a serious condition that requires intervention. This study has contributed to the semantic clarity for the measurement of nomophobia. The revised instrument has items that are conceptually closer to nomophobia than fear of missing out or addiction to technology and the internet. The study has also presented evidence that NMPQ-BM Revised as a unidimensional measure of nomophobia. These advances can help future research to examine nomophobia with less ambiguity.

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Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper

References

Aarthi, K., Prathap, L., Priya, J. A., & Preetha, S. (2020). Nomophobia and its impact on health and mind- a structured review. *European Journal of Molecular & Clinical Medicine*. 7 (1).

Abdoli, N., Sadeghi-Bahmani, D., Salari, N., Khodamoradi, M., Farnia, V., Jahangiri, S., Brühl, A.B., Dürsteler, K.M., Stanga, Z., Brand, S. (2023). Nomophobia (No Mobile Phone Phobia) and Psychological Health Issues among Young Adult Students. *European Journal of Investigation in Health, Psychology and Education.* 13, 1762–1775. DOI: https://doi.org/10.3390/ejihpe13090128

Adawi, M., Bragazzi, N. L., Argumosa-Villar, L., Boada-Grau, J., Vigil-Colet, A., Yildirim, C., & Watad, A. (2018). Translation and validation of the Nomophobia Questionnaire in the Italian language: Exploratory factor analysis. *JMIR mHealth and uHealth*, *6*(1), e9186.

Al-Balhan, E. M., Khabbache, H., Watfa, A., Re, T. S., Zerbetto, R., & Bragazzi, N. L. (2018). Psychometric evaluation of the Arabic version of the nomophobia questionnaire: Confirmatory and exploratory factor analysis–implications from a pilot study in Kuwait among university students. *Psychology Research and Behavior Management*, *11*, 471.

Ali, A., Muda, Ma., Ridzuan, A. R., Nuji, M. N. N. M., Izzamudin, M. H., & Imma, D. (2017). The Relationship Between Phone Usage Factors and Nomophobia. *Advanced Science Letters,* 23. 7610-7613. DOI: https://10.1166/asl.2017.9534

Alsalameh A. M., Harisi M. J., Alduayji M. A., Almutham A. A., & Mahmood F. M. (2019). Evaluating the relationship between smartphone addiction/overuse and musculoskeletal pain among medical students at Qassim University. *Journal of Family Medicine Primary Care.* 8(9), 2953-2959. doi: 10.4103/jfmpc.jfmpc_665_19. PMID: 31681674; PMCID: PMC6820402.

Anjana, K. K., Suresh, V. C., Sachin, B. S., & Poornima, C. (2021). The relationship between nomophobia, mental health, and coping style in medical students. *Indian Journal of Social Psychiatry*, *37*(2), 207.

Arpaci, I. (2020). Gender differences in the relationship between problematic internet use and nomophobia. *Current Psychology*, 1-10.

Aryadoust, V., Ng, L. Y., & Sayama, H. (2021). A comprehensive review of Rasch measurement in language assessment: Recommendations and guidelines for research. *Language Testing*, *38*(1), 6-40.

Bhardwaj M., & Ashok M. S. J. (2015). Mobile phone addiction and loneliness among teenagers. *International Journal of Indian Psychology*, *2*. 27-34

Bragazzi, N. L., & Puente, D. G. (2014). A proposal for including nomophobia in the new DSM-V. *Psychology Research and Behavior Management*, *7*, 155.

Catană, Ş. A., Toma, S. G., & Barbu, A. (2021). The Effects of the COVID-19 Pandemic on Teleworking and Education in a Romanian Higher Education Institution: An Internal Stakeholders Perspective. *International Journal of Environmental Research and Public Health*, *18*(15), 8180. DOI: https://doi.org/10.3390/ijerph18158180

Chia, J. H., Teo, Y. L., & Ang, H. P. (2021). Digital Dependency: The Rise of Nomophobia in Malaysian Adolescents. *Asian Journal of Communication Studies*, 5(2), 102-115.

Chóliz M. (2010). *Mobile phone addiction in Adolescence: Evaluation and prevention of mobile addiction in teenagers*. Saarbrücken: Lambert Academic Publishing.

Chóliz, M., & Villanueva, V. (2011). *Evaluación de adicción al móvil en la adolescencia*. Revista

Chóliz, M. (2012). Mobile-phone addiction in adolescence: The Test of Mobile Phone Dependence (TMD). *Progress in Health Sciences, 2*, 33-44.

Choy, Y., Fyer, A. J., & Lipsitz, J. D. (2007). Treatment of specific phobia in adults. *Clinical psychology review*, *27*(3), 266-286.

De', R., Pandey, N., & Pal, A. (2020). Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice. *International Journal of Information Management*, *55*, 102171. DOI: https://doi.org/10.1016/j.ijinfomgt.2020.102171

Dixit, S., Shukla. H., Bhagwat, A., Bindal, A., Goyal, A., Zaidi, A. K, (2010). A study to evaluate mobile phone dependence among students of a medical college and associated hospital of central India. *Indian Journal of Community Medicine, 35*(2): 339-41. DOI: https://doi:10.4103/0970- 0218.66878

Echeburua, E., Labrador, F. J., Becoña, E. (2009). *Adicción a las nuevas tecnologías en jóvenes y adolescentes*. Madrid: Pirámide.

Ellwood-Clayton, B. (2003). *Virtual strangers: Young love and texting in the Filipino archipelago of cyberspace.* In: Nyíri K., editor. Mobile Democracy: Essays on Society, Self and Politics. Vienna: Passagen Verlag. 225-39. *Española de Drogodependencias, 36*, 165-84.

Jing, H. F., Noh, M., A. M., & Ibrahim, R. (2020). Nomophobia and Its Relationship to Learning Process among Malaysian Undergraduates in Higher Learning Institution. *Malaysia Online Journal of Education, 4,* 1-7.

Farchakh, Y., Hallit, R., Akel, M., Chalhoub, C., Hachem, M., Hallit, S., & Obeid, S. (2021). Nomophobia in Lebanon: Scale validation and association with psychological aspects. *Plos one*, *16*(4), e0249890.

Hazirah, F., Karim, A., & Surena, S., & Abdullah, S. M. (2017) *Nomophobia dan konflik kerja-keluarga di Malaysia: Satu analisis menggunakan structural equation modeling (Nomophobia and Work-Family Conflict in Malaysia: An Analysis Using Structural Equation Modeling). Journal of Social Sciences and Humanities*, *12* (3). ISSN 1823-884x

Fisher, J. W. P. (2006). Survey design recommendations. *Rasch Measurement Transactions*. 20(3), 1072-1074.

Fisher, J. W. P. (2007). *Rating scale instrument quality criteria*. https://www.rasch.org/rmt/rmt211m.htm Retrieved on 7th November 2023.

Forgays, D., Hyman, I., & Schreiber, J. (2014). Texting everywhere for everything: gender and age differences in cell phone etiquette and use. *Computers in Human Behavior*, *31*, 314e321. DOI: http://dx.doi.org/10.1016/j.chb.2013.10.053

Galhardo, A., Loureiro, D., Raimundo, E., Massano-Cardoso, I., & Cunha, M. (2020). Assessing nomophobia: validation study of the European Portuguese version of the Nomophobia Questionnaire. *Community Mental Health Journal*, *56*(8), 1521-1530.

Gao, Y., Dai, H., Jia, G., Liang, C., Tong, T., Zhang, Z., & Zhu, Y. (2020). Translation of the Chinese version of the Nomophobia questionnaire and its validation among college students: factor analysis. *JMIR mHealth and uHealth*, *8*(3), e13561.

Gezgin, D. M., Cakir, O., & Yildirim, S. (2018). The relationship between levels of nomophobia prevalence and internet addiction among high school students: The factors influencing Nomophobia. *International Journal of Research in Education and Science*, *4*(1), 215-225.

Goswami, V., & Singh, D. R. (2016). Impact of mobile phone addiction on adolescents's life: A literature review. *International Journal of Home Science. 2*(1), 69-74.

Griffiths, M. D. (1999). Internet addiction: fact or fiction? *Psychologist, 12*, 246-50.

Grohol, J., Slimowicz, J., & Granda, R. (2013). The Quality of Mental Health Information Commonly Searched for on the Internet. *Cyberpsychology, Behavior and Social Networking*, *17,* DOI: https://10.1089/cyber.2013.0258

Gutiérrez-Puertas, L., Márquez-Hernández, V. V., & Aguilera-Manrique, G. (2016). Adaptation and validation of the Spanish version of the Nomophobia Questionnaire in nursing studies. *CIN: Computers, Informatics, Nursing*, *34*(10), 470-475.

Hassanzadeh, R., Rezaei, A. (2011). Effect of sex, course and age on SMS addiction in students. *Middle-East Journal of Scientific Research*, *10*(5). 619-5.

Igarashi, T., Motoyoshi, T., Takai J., Yoshida, T. (2008). No mobile, no life: self-perception and text-message dependency among Japanese high school students. *Computer Human Behaviour. 24,*11-24. DOI: https://doi:10.1016/j.chb.2007.12.001

Ishii, K. (2006). Implications of mobility: The uses of personal communication media in everyday life. *Journal of Communication, 56*(2), 346-65. DOI: https://doi:10.1111/j.1460-2466.2006.00023.x

Ithnain, N., Ghazali, S., & Jaafar, N. (2018). Smartphone Addiction Among Undergraduate Students. *Institute for youth research Malaysia,* 18, 135-147.

Kang, S., & Jung, J. (2014). Mobile communication for human needs: A comparison of smartphone use between the US and Korea. *Computers in Human Behavior, 35*, 376-387.

King, A. L. S., Valença, A. M., & Nardi, A. E. (2010). Nomophobia: The mobile phone in panic disorder with agoraphobia: Reducing phobias or worsening of dependence? *Cognitive and Behavioral Neurology*, *23*(1), 52–54.

King, A. L. S., Valença, A. M., Silva, A. C. O., Baczynski, T., Carvalho, M. R., & Nardi, A. E. (2013). Nomophobia: Dependency on virtual environments or social phobia? *Computers in Human Behavior*, *29*(1), 140-144.

King, A. L. S., Valença, A. M., Silva, A. C., Sancassiani, F., Machado, S., & Nardi, A. E. (2014). ''Nomophobia'': Impact of cell phone use interfering with symptoms and emotions of individuals with panic disorder compared with a control group. *Clinical Practice and Epidemiology in Mental Health*, *10*, 28-35.

Kuss, D. J., & Griffiths, M. D. (2011) Online social networking and addiction – A review of the psychological literature. *International Journal of Environmental Research in Public Health. 8,* 3528-52.

Lane, W., & Manner, C. (2011). The impact of personality traits on smartphone ownership and use. *International Journal of Business Social Sciences*, *2*, 22-8.

Lee, S. Y. (2014). Examining the factors that influence early adopters' smartphone adoption: The case of college students. *Telematics and Informatics*, *31*(2), 308-318.

Lee, S., Kim, M., Mendoza, J. S., & McDonough, I. M. (2018). Addicted to cellphones: Exploring the psychometric properties between the nomophobia questionnaire and obsessiveness in college students. *Heliyon*, *4*(11), e00895.

León-Mejía, A. C., Gutiérrez-Ortega, M., Serrano-Pintado, I., & González-Cabrera, J. (2021). A systematic review on nomophobia prevalence: Surfacing results and standard guidelines for future research. *PloS one*, *16*(5), e0250509.

Lin, C. Y., Griffiths, M. D., & Pakpour, A. H. (2018). Psychometric evaluation of Persian Nomophobia Questionnaire: Differential item functioning and measurement invariance across gender. *Journal of Behavioral Addictions*, *7*(1), 100-108.

Linacre, J. M. (1994). Sample size and item calibration or person measure stability. *Rasch Measurement Transactions*, *7*, 328.

Linacre, J. M. (1999). Investigating rating scale category utility. *Journal of Outcome Measurement,* 3, 103-122

Linacre, J.M. (n.d.) *Help for Winsteps Rasch measurement and Rasch analysis software*: Available at www.winsteps.com Retrieved on 25th May2023.

Miakotko, L. (n.d.) *The impact of smartphones and smart-phone devices on human health and life.* Retrieved from: http://www.nyu.edu/classes/keefer/waoe/miakotkol.pdf. Retrieved on 22nd September 2023.

Mohani, M. R., Phansopkar, P., Seth, N. H., & Fokmare, P. S., (2024). The prevalence of Nomophobia in undergraduate students of central India. *Cureus.* 16(3): e57056. DOI: https://doi:10.7759/cureus.57056

Moran, J. M. (1995*). Novas tecnologias e o re-encantamento do mundo. Revista Tecnologia Educacional, 126*(23), 24-6.

Moran J. M., Masetto M. T., & Behrens M. A. (2007). *Novas tecnologias e media-ção pedagógica*. Campinas SP: Papirus Editora.

Moreira, A. F. B., & Kramer, S. (2007). Contemporaneidade, educação e tecnologia. *Educação & Sociedade*, 28 (100), 1037-1057. DOI: https://doi:10.1590/S0101-73302007000300019

Mustafaoglu, R., Yasaci, Z., Zirek, E., Griffiths, M. D., Ozdincler, A. R. (2021). The relationship between smartphone addiction and musculoskeletal pain prevalence among young population: a cross-sectional study. *Korean Journal of Pain* 34, 72-81. DOI: https://doi: 10.3344/kjp.2021.34.1.72.

Sharan, D., Mohandoss, M., Ranganathan. R., Jose, J. (2014). Musculoskeletal disorders of the upper extremities due to extensive usage of hand-held devices. *Ann Occup Environ Med.* 26:22. https://doi:10.1186/s40557-014-0022-3

Sharma, K. (2023). Effect of Nomophobia on Body Image Satisfaction and Aggression Among College Students. *Clinical Medicine and Health Research Journal.* 3(5) 547-553.DOI: https://doi: 10.18535/cmhrj.v3i5.233

Silva,N. D. P. G., Machado, S. M. D. O., Estanislau, A. M., Pimentel, C. E., da Fonseca, P. N., & de Medeiros, E. D. (2020). Nomophobia Questionnaire: psychometric properties for the Brazilian context. *Revista Iberoamedicana De Diagnostico Y Evaluacion-E Avaliacao Psicologica, 2*(55), 161-172.

Nyíri, K. (2003). *Mobile Democracy: Essays on Society, Self, and Politics*. Vienna (Austria):

OECD (2020). *Strengthening online learning when school are closed: The roles of families and teachers in supporting students during COVID*, OECD Publishing Paris.

Oksman, V., & Turtiainen, J. (2004). Mobile communication as a social stage. the meanings of mobile communication among teenagers in Finland. *New Media and Society*, *6*(3), 319-39.

Oksman, V. (2010). *The Mobile Phone: A Medium in Itself*. Retrieved from http://www.vtt.fi/inf/pdf/publications/2010/P737.pdf. Retrieved on 26th June 2023.

Oulasvirta, A., Rattenbury, T., Ma, L., & Raita, E. (2012). Habits make smartphone use more pervasive. *Personal and Ubiquitous Computing*, *16*(1), 105-114.

Özdemir, E. Z., & Bektaş, M. (2020). Psychometric properties of a Turkish Version of the Nomophobia Scale for the nine-eighteen age group. *The Journal of Pediatric Research*, *7*(4), 316-322.

Park, B. W., & Lee, K. C. (2011). The Effect of Users' Characteristics and Experiential Factors on the Compulsive Usage of the Smartphone. In: Kim, Th., Adeli, H., Robles, R.J., Balitanas, M. (eds) Ubiquitous Computing and Multimedia Applications. UCMA 2011. *Communications in Computer and Information Science,* vol 151. Springer, Berlin, Heidelberg. DOI: https://doi.org/10.1007/978-3-642-20998-7_52

Perez, P. E. J., Monje, R. M. T., & Leon, R. S. J.M. (2012). *Adicción o abuso del teléfono móvil: revisión de la literatura.* Adicciones, *24*, 139-52

Rangka, I. B., Prasetyaningtyas, W. E., Ifdil, I., Ardi, Z., Suranata, K., Winingsih, E., & Wijaya, R. S. (2018). Measuring psychometric properties of the Indonesian version of the NoMoPhobia Questionnaire (NMPQ): Insight from Rasch measurement tool. In *Journal of Physics: Conference Series* 1114(1), 012127). IOP Publishing.

Rodríguez P, Villar JP, Tarín C, Blázquez J. Sociedad Digital en España (2023) [Internet]. Penguin Random House Grupo Editorial, S. A. U. Madrid, España; 2023. Available from: https://www.fundaciontelefonica.com/cultura-digital/sociedad-de-la-informacion/2023/. Retrieved on 13th May 2023.

Salehan, M., & Negahban, A. (2013). Social networking on smartphones: When mobile phones become addictive. *Computers in Human Behavior*, *29*(6), 2632-2639.

Serra, G., Scalzo, L., & Giuffrè, M. (2021). Smartphone use and addiction during the coronavirus disease 2019 (COVID-19) pandemic: cohort study on 184 Italian children and adolescents. *Italian Journal of Pediatrics,* 47**,** 150 DOI: https://doi.org/10.1186/s13052-021-01102-8

Sharma, M., Amandeep, Mathur, D. M., & Jeenger, J. (2019). Nomophobia and its relationship with depression, anxiety, and quality of life in adolescents. *Industrial Psychiatry Journal*, *28*(2), 231-236. DOI: https://doi.org/10.4103/ipj.ipj_60_18

Skolnick, R., Schare, M. & Wyatt, K., & Tillman, M. (2012). Aviophobia assessment: Validating the Flight Anxiety Situations Questionnaire as a clinical identification measure. *Journal of Anxiety Disorders, 26.* 779-784. 10.1016/j.janxdis.2012.07.006.

Statista (2021). Percentage of mobile device traffic worldwide from 1st quarter 2015 to 1st quarter 2021. https://www.statista.com/statistics/277125/share-of-website-traffic-coming-from-mobile-devices/ Retrieved on 12th March 2023.

Syahputra, Y., & Erwinda, L. (2020). Perbedaan Nomophobia mahasiswa; analisis Rasch. *JPPI Jurnal Penelitian Pendidikan Indonesia. 6*(2), 69-76.

Takao M., Takahashi S., Kitamura M. (2009). Addictive personality and problematic mobile phone use. *Cyberpsychology Behavior*, *12*, 1-9.

Tariq, R, Isawasan, P, Shamugan, L, Asmawi, M. A. H., Azman, N. A. N., Zolkepli, I. A. (2025). Exploring Social Media Research Trends in Malaysia using Bibliometric Analysis and topic Modelling. *EAI Endorsed Transactions on Scalable Information Systems*. 1-12.

Park, B. W., & Lee, K.C. (2011). The Effect of Users' Characteristics and Experiential Factors on the Compulsive Usage of the Smartphone. In: Kim, Th., Adeli, H., Robles, R.J., Balitanas, M. (eds) Ubiquitous Computing and Multimedia Applications. UCMA 2011. *Communications in Computer and Information Science,* 151. Springer, Berlin, Heidelberg. DOI: https://doi.org/10.1007/978-3-642-20998-7_52

Thomee, S., Harenstam, A., Hagberg, M. (2011). *Mobile Phone Use and Stress, Sleep Disturbances, And Symptoms of Depression Among Young Adults--A Prospective Cohort Study*. BMC Public Health. 11, 66.

Yildirim, C., Sumuer, E., Adnan, M., & Yildirim, S. (2016). A growing fear: Prevalence of nomophobia among Turkish college students. *Information Development*, *32*(5), 1322-1331.

Yildrim, C., & Correia, A. (2015). Exploring the dimension of nomophobia: Development and validation of a self-reported questionnaire. *Computers in Human Behaviour*, *49* (2015), 130-137.

Zarghami, M., Khalilian, A., Setareh, J., & Salehpour, G. (2015). The Impact of Using Cell Phones After Light-Out on Sleep Quality, Headache, Tiredness, and Distractibility Among Students of a University in North of Iran. *Iranian Journal of Psychiatry and Behavioral Sciences. 9*. DOI: https://doi.10.17795/ijpbs-2010

Zhao, T. Y., & Zou, S. P. (2007). Exposure to cell phone radiation up-regulates apoptosis genes in primary cultures of neurons and astrocytes. *Neuroscience Letters, 412*(1), 34-8.