Smartphone use, nomophobia, and academic achievement in Vietnamese high school students☆

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A B S T R A C T

Nomophobia, the fear of being without one's smartphone, is pervasive among students globally, yet its relationship with smartphone uses and academic achievement remains underexplored, particularly in countries like Vietnam. This cross-sectional study examined 950 students from six high schools in Central Vietnam. Results revealed that 60.1% of participants used smartphones for over three years, dedicating an average of 5.73 h daily. Nomophobia prevalence reached 99.9%, with 23.7% exhibiting severe levels. Females and older students displayed higher nomophobia levels than males and younger peers. A robust correlation emerged between nomophobia and daily phone-checking frequency. The study emphasizes the urgent need for further research to uncover contributing mechanisms to nomophobia and develop interventions promoting responsible smartphone use among students, providing valuable insights into an increasingly prevalent concern impacting the academic landscape.

1. Introduction

The proliferation of smartphone technology has dramatically altered how individuals communicate and engage with their surroundings. The spread of COVID-19 has seriously impacted education, resulting in widespread disruptions to in-person education and increasing the use of digital devices, including smartphones, for remote learning (UNESCO, 2020). Currently, the smartphone has inevitably become a part of modern life (Samaha & Hawi, 2016) with plenty of valuable and convenient features such as social media, apps, games, GPS, live streams, online courses, entertainment, training, psychological treatment, and more (Yilmaz et al., 2023). Globally, psychological problems related to overusing smartphones have been reported, such as more than half of Americans have symptoms of panic if their phone battery is below 20%, nearly half of them admit that they could not live without their smartphone and feel addicted to it (Lee & Kim, 2022; Wheelwright, 2021). This dependence has resulted in the emergence of a new form of phobia, referred to as Nomophobia, or the fear of being without one's mobile phone (Richardson, 2013). Smartphone use in education can provide numerous benefits, such as access to educational resources,

communication with classmates, and the ability to complete assignments from any location and at any time (Turkle, 2011). However, excessive use of these devices can also have detrimental effects on human life, including distractions, decreased attention, increased procrastination, and problematic health issues that can reduce academic performance (Rosen et al., 2013). Many studies indicate that people who overuse smartphones may experience various risks of problems, including "technostress," "ring anxiety," phantom vibration syndrome, depression, loneliness, sleep disturbance and nomophobia (Chen et al., 2016; Demirci et al., 2015; Gao et al., 2017; Mahapatra, 2019; Tarafdar et al., 2007).

Nomophobia, NO MO(bile) PHO(ne) (pho)BIA (Yilmaz et al., 2023), is a condition characterized by an excessive and irrational fear of being separated from one's mobile phone, experiencing a loss of mobile network connectivity, or having an insufficient amount of battery or credit (Dixit et al., 2010). This particular phobia is considered a situational fear, as it arises due to the absence of mobile phone access in difficult or uncomfortable situations (King et al., 2013). In addition, individuals with nomophobia may rely on their mobile devices to avoid social interactions, finding it more comfortable, safer, and even more

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successful than interacting with the physical world (Gezgin et al., 2018). Typical signs of nomophobia can include the overuse of smartphones, owning multiple devices, regularly carrying a mobile charger, and experiencing anxiety when unexpectedly unable to use a phone (Bragazzi & Del Puente, 2014; Qutishat et al., 2020). There is evidence showing that nomophobia is prevalent among students attending schools, with the rate varying from 18.5 to 73% (Abraham et al., 2014; Dixit et al., 2010; Kaur, 2010; Vanitha, 2014), with determinants identified as age, gender, self-image, self-esteem, and personality (Qutishat et al., 2020).

The relationship between smartphone use, nomophobia, and academic achievement is a complex and multi-faceted phenomenon that has garnered increased attention in recent years, revealing a complex interplay between these variables. The high frequency of using smartphones can increase the risk of nomophobia (Buctot et al., 2020; Fu et al., 2021). With the inevitable excessive use of smartphones, the risk of having nomophobia has become severe. Therefore, understanding the correlation between smartphone use and nomophobia is crucial, especially among students, to warn educators and parents to control smartphone use among their children (Nguyen & Tran, 2017; Nguyen & Tran, 2017).

The influence of smartphone utilization on academic achievement has been the subject of considerable scrutiny, with an accumulating body of research indicating that excessive engagement with these devices might undermine students' educational outcomes. Notably, excessive smartphone usage can precipitate distractions, diminished attention spans, and heightened procrastination, as elucidated by Rosen et al. (Rosen et al., 2013). Beyond the mere duration of smartphone usage, the psychological dependence on these devices, including phenomena such as nomophobia, is also implicated in academics. Nomophobia, in particular, has been linked to adverse educational outcomes, as evidenced by integrative reviews among nursing students, which demonstrate its adverse effects on attention, time management, and motivation, consequently leading to poorer academic performance (Berdida, 2023; Brenner, 2022). The pervasive engagement with smartphones can impede academic pursuits (Chow & Lee, 2016), a finding corroborated by studies among medical students in Saudi Arabia, which associate nomophobia with diminished academic achievements (Aldhahir et al., 2023; Alkalash et al., 2023). However, research in this area remains sparse in Vietnam, a country witnessing a significant uptick in smartphone usage among students (FinTechNews Singapore, 2018; Tran & Houston, 2012). Notably, Vietnamese youth aged 15 to 35 reportedly spend approximately 169 min per day on their phones (Davis, 2016), with excessive use linked to a variety of problematic behaviors, including alcohol abuse, smoking, unsafe sexual behaviors, obesity, and mental illness (Do et al., 2014; Jordan et al., 2013; D. Nguyen, Dedding, et al., 2013; P. V. Nguyen, Dedding, et al., 2013). In school settings, the multi-faceted use of smartphones for study, entertainment, and social connectivity has escalated among students.

Nonetheless, studies exploring the interconnections between nomophobia, smartphone use, and academic achievement in this demographic are notably limited. This study aims to bridge this knowledge gap by examining the frequency of smartphone use, nomophobia, and their associations with sociodemographic characteristics and academic achievement among Vietnamese high school students. Understanding the ramifications of smartphone usage on education attainment in this cohort is essential for devising interventions that promote responsible and beneficial smartphone practices.

This study aims to answer the following research questions:

(1) What does the frequency of smartphone use among Vietnamese high school students, and what are the differences between sociodemographic characteristics?
(2) What is the prevalence of nomophobia among Vietnamese high school students?

(3) Are there significant associations between smartphone use, nomophobia, and academic achievement among Vietnamese high school students?

2. Methods

A correlational school-based study was structured to explore the research questions.

2.1. Participants

A sample of 950 students was randomly selected from three secondary schools and three high schools in Hue city (Thua Thien Hue province, Vietnam). Participants were from grades 7 to 12, between 15 and 18 years of age (M = 15.47; SD = 1.69), and included both male and female (53%) students. In total, 1.140 students were invited to the study, and they all returned the questionnaire. However, due to the substantial missing data in the core measurement, we eliminated 190 questionnaires. 950 completed questionnaires were used for data analysis (response rate 83.3%).

2.2. Measures

This study used an anonymous questionnaire to collect data for analysis, including the core measurement and demographic information such as sex, age, school, academic ranking, and GPA. The core measurement is described as follows.

2.2.1. Nomophobia

The Nomophobia Questionnaire (NMP-Q), developed by Yildirim and Correia in the U.S. (Yildirim & Correia, 2015), measured the fear or phobia of being without one's smartphone. The questionnaire includes 20 items exploring four factors: Not being able to access information (6 items), Losing connectedness (5 items), Not being able to access information (4 items), and Giving up convenience (5 items). All items were 7-Likert designed from 1 (Strongly Disagree) to 7 (Strongly Agree). The total score ranges from 20 to 40, in which the score interpretation is that there is no nomophobia if the score is 20, Mild if the score is from 21 to under 60, Average if the score is from 60 to under 100; and Severe if the score is from 100 to 140. The original version can be downloaded and used for free from the author's website (https://yildirimcaglar.github.io).

The NMP-Q has been translated and validated for use among students in many countries, such as Spain (Gutiérrez-Puertas et al., 2019; Leon-Mejia et al., 2021), Italy (Adawi et al., 2018), Pakistan (Nawaz et al., 2017), Iran (Elyasi et al., 2018; Lin et al., 2018), Turkey (Arpaci, 2017; Yildirim et al., 2016), China (Gao et al., 2019; Ma & Liu, 2021), Indonesia (Rangka et al., 2018), Portugal (Galhardo et al., 2022), and Oman (Kazem et al., 2021). The Vietnamese version of the NMP-Q scale was translated and tested for clarity and semantic compatibility. The stepwise CFA test showed the model fits the data set with appropriate values for all factors. The 4-factor model was found to be fit for students in Vietnam, with Cronbach's Alpha of 0.67–0.90 (Fig. 1). All observed variables meet item-total correlation requirements, with an average inter-item correlation of 0.32–0.59 (Nguyen et al., 2022).

2.2.2. Smartphone use

A series of questions was formulated to investigate smartphone usage among high school students. The content of these questions was derived from a thorough literature review and prior local studies pertinent to this subject (H. P. N. Nguyen & V. C. Tran, 2017). The questionnaire comprises a total of fourteen questions, encompassing various aspects: one question probes the duration of smartphone usage (*"How long have you used a smartphone?"*), one question assesses the availability of internet access via smartphone (*"Can you access the Internet via your smartphone?"*), one question explores the daily time spent on
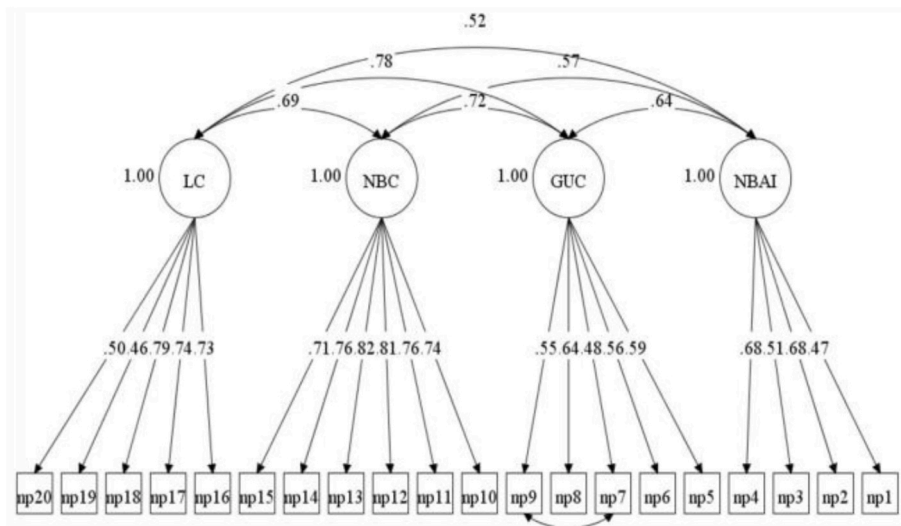
Fig. 1. The four-factor model of the NMP-Q scale in Vietnamese.

smartphones (*"How many hours do you spend on a smartphone each day?"*.

Additionally, two questions examine the frequency of smartphone checks throughout the day (*"How many times do you check your smartphone each day?"* and *"How often do you check your smartphone each day?"*), while others inquire about the everyday activities conducted on smartphones (*"How many calls do you make from your smartphone each day?"*, *"How many calls do you receive from your smartphone each day?"* *"How many messages do you send from your smartphone each day?"* *"How many messages do you receive from your smartphone each day?"* *"How many emails do you send from your smartphone each day?"* *"How many emails do you receive from your smartphone each day?"* *"How many apps does your smartphone have?"*), the purposes of daily smartphone usage (*"What are purposes that you use your smartphone for?"*) and the contexts in which smartphones are used (*"When do you use your smartphone each day?"*).

2.2.3. Academic performance

Students' academic achievement was assessed using a single-item question: *"What was your academic outcome last year?"*. Participants were provided with five response options to gauge their performance. These options were categorized as follows: "Excellent," "Very Good," "Good," "Average," and "Under Average". This approach allowed for a straightforward yet effective measure of academic achievement, capturing a spectrum of outcomes reflecting varying academic success levels over the previous year in Vietnam educational settings.

2.3. Procedure

During the school day, information was gathered from students who obtained informed consent from their parents/guardians. Those who were allowed by their parents/guardians and willingly consented to participate in the study were requested to complete a confidential and anonymous questionnaire. The students were instructed not to include their names anywhere in the questionnaire. The Review Board of Hue University of Education authorized the research, code DHH2020-03-142.

2.4. Data analysis

Data was analyzed using SPSS 25.0 (Pallant, 2013). Descriptive statistics were calculated for all variables: means, standard deviations (S.D.), quantity, and percentage (%). Pearson's correlation coefficients were used to examine the relationship between smartphone use, nomophobia, and average academic grades. Spearman's correlation was used to investigate the correlation between smartphone use and academic performance. An Independent *t-test* was used to examine the difference in smartphone use nomophobia by age and sex. Multiple linear regression was used to explore the unique contribution of smartphone use and nomophobia to academic achievement, controlling for the influence of sociodemographic variables such as age and sex status.

3. Results

3.1. Smartphone use among school students in Vietnam

3.1.1. Time, duration, and frequency of smartphone use

Survey data reveals that 60.1% of students have utilized a smartphone for a duration exceeding three years, and 96.3% of the surveyed students affirmed their ability to access the Internet through their mobile devices (Table 1). The average duration of students engaging with cell phones for academic purposes was 5.73 h per day. Analysis depicted in Fig. 1 illustrates that a predominant frequency of students, constituting 36.5%, habitually check their mobile phones every 30–60 min. Notably, 7.8% of students tend to check their phones at intervals as frequently as every 5 min (Fig. 2) (see Table 2).

3.1.2. Smartphone engagement among students

In light of the prevalent functionalities of smartphones, an array of activities was presented to students within the research ambit. After the survey, conventional data processing ensued, with a value of 1 assigned for selected operations and 0 for non-selected ones. Consequently, a mean score approaching 1 indicated a higher prevalence of engagement in the respective activity. The outcomes of the survey are delineated in Table 1.

Notably, students predominantly utilized smartphones for text-based communication with family or friends, ranking this activity as the most frequent. Following closely in popularity were activities such as listening to music and conducting online information searches.

3.1.3. The utilization patterns of smartphones among students

The utilization patterns of smartphones are illustrated in Table 1. A predominant majority of students disclosed resorting to their smartphones in moments of emotional distress, boredom (acknowledged by 88.9% of respondents), solitude (as affirmed by 75.8% of respondents), or while awaiting someone or something (endorsed by 65.6% of respondents). In academic settings, during ambulation, break periods, or public transportation, smartphone usage exhibited comparatively lower

Table 1
Smartphone usage of students.

		n	%	Mean	SD
Smartphone usage time	<1 year	96	10.1		
	1 year to <2 years	124	13.1		
	2 years to <3 years	149	15.7		
	3 years to <4 years	169	17.8		
	4 years to <5 years	140	14.7		
	>5 years	262	27.6		
	Cannot remember	10	1.1		
	Total	**950**	**100.0**		
Accessing the Internet from a smartphone	No	21	2.2		
	Yes	915	96.3		
	Prefer not to say	14	1.5		
	Total	**950**	**100.0**		
Activities daily on a smartphone	Check notes	196	20.6	0.20	0.40
	Check email	194	20.4	0.20	0.40
	Take note of studying and meetings	277	29.2	0.29	0.45
	"Kill time"	570	60.0	0.60	0.49
	Read the news or wrap information	571	60.1	0.60	0.49
	Talk to family or friends	595	62.6	0.63	0.48
	Check notifications from social media	609	64.1	0.64	0.48
	Play games	722	76.0	0.76	0.43
	Search information from the Internet	758	79.8	0.80	0.40
	Entertainment (Music, Movie)	781	82.2	0.82	0.38
	Text to family or friends	806	84.8	0.85	0.36
Context of using smartphones among students	While walking	194	20.4	0.21	0.41
	In class	197	20.7	0.20	0.40
	While talking to someone	207	21.8	0.22	0.41
	Between classes/ sessions (break time)	208	21.9	0.22	0.41
	On transportation (e.g., Bus, car …)	254	26.7	0.27	0.44
	In toilet/restroom	269	28.3	0.28	0.45
	On dining table	289	30.4	0.30	0.46
	While watching a movie or TV	325	34.2	0.34	0.47
	While chatting or gossiping with friends	381	40.1	0.40	0.49
	While waiting for someone or something	623	65.6	0.66	0.47
	When alone	720	75.8	0.76	0.43
	When felt bored or sad	845	88.9	0.89	0.31

prevalence within this surveyed sample.

4. Nomophobia prevalence among school students in Vietnam

Out of the 950 students subjected to assessment, only one student exhibited no nomophobia symptoms. Remarkably, 99.9% of the students had symptoms ranging from mild to severe levels of nomophobia. Within this cohort, the majority manifested average symptoms, constituting 63.1% of the total respondents, while a considerable segment experienced severe levels of nomophobia, representing 23.7% (Fig. 3). Further delineation by gender revealed that 81.9% of males and 90.2% of females exhibited moderate to severe symptoms. Additionally, when stratified by age groups, 86.5% of students within junior schools (aged 12 to <15 years old) and 87.0% of high school students (aged 15–18 years old) demonstrated symptoms at moderate to severe levels.

This study also investigated nomophobia among school students in Vietnam by gender and school level. Independent *t-tests* on samples of sex and school levels revealed the results in Table 3.

The analysis indicates a statistically significant difference in nomophobia scores based on gender ($p < 0.001$) and age ($p < 0.01$). Notably, female students exhibit higher nomophobia scores compared to their male counterparts. Additionally, students within the 15–18 age group demonstrate higher nomophobia scores compared to those in the 12–15 age range. Further scrutiny of the results unveils that, within the female cohort experiencing moderate levels of nomophobia, there is a discernible elevation in scores compared to their counterparts. However, this pattern is not replicated for individuals experiencing severe levels of nomophobia.

4.1. The correlation between smartphone use, nomophobia, and academic achievement among school students in Vietnam

The findings presented in Table 4 elucidate a positive correlation between the frequency of checking phones and the level of nomophobia, along with its constituent components *(p < 0.01)*, excluding the factor of "losing connectedness" *(p > 0.05)*. Conversely, the frequency of checking phones exhibits a negative correlation with the level of nomophobia and its components *(p < 0.01)*.

A linear regression was conducted to examine potential predictive factors influencing academic outcomes. The results are delineated in Table 5, presenting four distinct models. Among the considered variables, both sex and age emerge as potential contributors to academic performance. However, the explanation proportions for academic outcomes attributed to age and sex are 4.8% *(p < 0.001)* and 3.0% *(p < 0.001)*, respectively. Furthermore, within the realm of nomophobia factors, only the elements of "losing connectedness" and "not being able to communicate" demonstrate a significantly explanatory impact on academic outcomes *(p < 0.01* and *p < 0.05,* respectively). Conversely, factors such as the duration of smartphone usage or the frequency of checking phones do not contribute to explaining learning outcomes.

Table 2
Nomophobia prevalence among school students in Vietnam by sex and age.

Level of nomophobia	Sex				Age			
	Female		Male		12 to <15		15 to 18	
	n	%	n	%	n	%	n	%
Normal	0	0.0	1	0.2	1	0.2	0	0.0
Mild	51	9.9	74	17.8	63	13.3	62	13.0
Moderate	308	59.5	278	66.8	318	67.4	281	58.8
Severe	158	30.6	63	15.2	90	19.1	135	28.2
Total	**517**	100.0	**416**	100.0	**472**	100.0	**478**	100.0

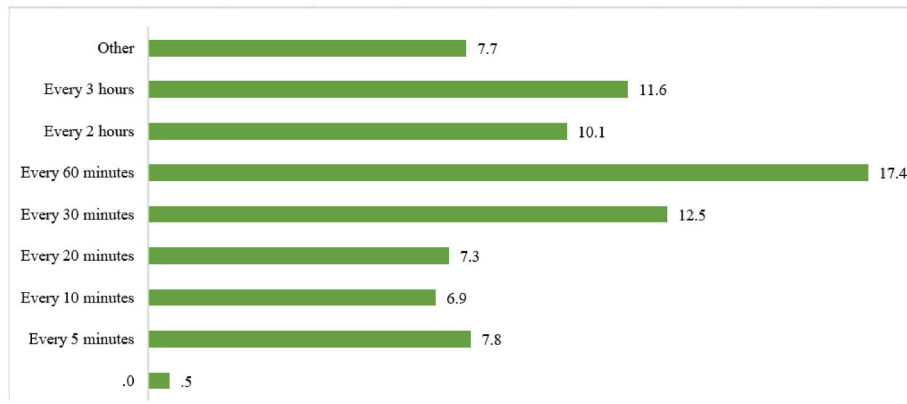*Note:* No. = Quantity of respondents; % = Percentage.

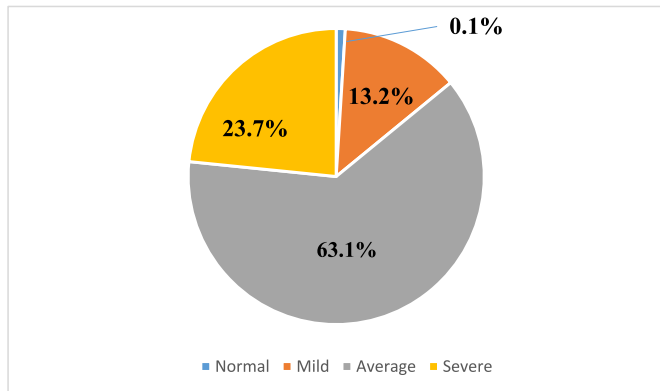**Fig. 2.** Students' frequency of checking smartphones in one day.

Fig. 3. Prevalence of nomophobia among school students in Vietnam.

Table 3
Nomophobia among school students in Vietnam by gender and age.

		Mean	SD	t	F	df	p
Sex							
Overall	Female	4.37	1.05	−7.07[b]	0.61	**931**	**0.000**
nomophobia	Male	3.88	1.05				
Mild	Female	2.50	0.47	−1.63	0.234	123	0.105
nomophobia	Male	2.36	0.50				
Moderate	Female	4.06	0.55	−3.45[a]	**1.36**	**584**	**0.001**
nomophobia	Male	3.91	0.51				
Severe	Female	5.52	0.41	−1.03	0.05	219	0.306
nomophobia	Male	5.58	0.43				
Age							
Overall	12 to <15	4.05	1.01	−2.58[a]	**6.24**	**931**	**0.010**
nomophobia	15 to 18	4.22	1.11				
Mild	12 to <15	2.39	0.48	−0.48	0.11	123	0.631
nomophobia	15 to 18	2.44	0.51				
Moderate	12 to <15	3.98	0.53	−0.35	0.73	597	0.724
nomophobia	15 to 18	4.00	0.55				
Severe	12 to <15	5.51	0.37	−1.33	3.13	223	0.186
nomophobia	15 to 18	5.59	0.45				

Note.
[a] p < .01.
[b] p < .001.

5. Discussion

The pervasive integration of smartphones among students in schools inevitably heightens the susceptibility to nomophobia. The findings of this study underscore the prevalent and elevated rates of nomophobia among school students in Vietnam, indicating a robust association with smartphone use. Notably, this research stands as one of the few conducted in Vietnam that specifically investigates nomophobia among high school students, and its high response rate substantiates the evidence that it warrants attention from educational institutions and families alike.

5.1. Smartphone usage patterns among high school students in Vietnam

A significant proportion of high school students in Vietnam use prolonged smartphones, with over half reporting durations exceeding three years and approximately 28.5% indicating usage periods of five years or more. These findings suggest an early initiation into cellphone usage among students, aligning with broader demographic patterns in Vietnam, where 40% of mobile phone users are under 24 (Appota, 2021). Additionally, a substantial majority of students (96.3%) possess internet access via smartphones, slightly surpassing the reported general population rate of 95% in Vietnam (Appota, 2021).

On average, participants in this study spend 5.73 h per day on their cell phones, a figure congruent with the 5.1 h per day reported by Appota (2021) during their 2020 survey. Fig. 1 illustrates that a significant proportion of students (30.3%) check their phones every 30–60 min, with 8.4% checking as frequently as every 5 min. However, some students reported less frequent checks, contingent on specific times and solely in response to new notifications such as messages or incoming calls. The primary motivations for smartphone usage among students were emotional states such as sadness, boredom, loneliness, or waiting for someone/something, with the predominant objective being a connection with family and friends. Additional motivations encompass entertainment pursuits like gaming, music consumption, or news reading. Although smartphone utilization for educational purposes is discernible, it does not command the foremost priority within this sample of students.

In considering these usage patterns, it is crucial to acknowledge the emergence of nomophobia, a term signifying the fear of being without one's mobile phone or the inability to use it. The high prevalence of nomophobia among students is notably associated with their daily smartphone usage (Yildirim & Correia, 2015). Frequent checking, including instances as frequent as every 5 min, suggests a potential inclination toward mobile device addiction (Hawi & Samaha, 2017), warranting attention from educators and families that they should play pivotal roles in fostering awareness and providing guidance on the balanced integration of smartphones into students' lives, ensuring that

Table 4

The correlation between smartphone use and nomophobia.

		Number of times checking phones per day	Frequency of checking phones	GPA	Academic Ranking
Nomophobia	All	**0.114**[a]	−**0.224**[a]	0.010	0.004
	Mild	−0.02	0.04	0.03	0.03
	Moderate	**0.11***	−**0.09***	−0.02	−0.01
	Severe	0.14	−0.10	−0.04	0.08
Not being able to access information	All	**0.071***	−**0.136**[a]	0.097	0.770
	Mild	−0.03	0.06	−0.07	−0.01
	Moderate	0.02	−0.01	**0.11***	0.06
	Severe	0.06	−0.08	0.01	0.08
Losing connectedness	All	0.056	−**0.234**[a]	0.011	−0.006
	Mild	−0.02	0.05	0.11	0.17
	Moderate	0.07	−**0.16**[a]	−0.08	−0.07
	Severe	−0.08	−0.04	−0.04	0.02
Not being able to communicate	All	**0.110**[a]	−**0.181**[a]	0.012	0.013
	Mild	−0.001	−0.12	0.04.	−0.05
	Moderate	**0.09***	−0.03	0.04	0.05
	Severe	**0.15***	−0.03	−0.04	0.05
Giving up convenience	All	**0.119**[a]	−**0.167**[a]	−0.002	−0.030
	Mild	0.000	0.17	0.03	0.02
	Moderate	0.04	−0.02	−**0.10***	−0.06
	Severe	**0.19**[a]	−0.08	0.01	0.04

Note: GPA = Grade Point Average.

[a] p < .01.

Table 5

Regression linear with academic performance (GPA) as dependent variable.

Model		Standardized Coefficients Beta	Coefficients Std. Errors	t	R^2	Adjusted R^2
1	Age	−0.22	0.31	−5.52[a]	0.048	0.047
2	Age	−0.23	0.02	−5.90[a]	0.078	0.075
	Sex	0.17	0.07	4.41[a]		
3	Age	−0.24	0.02	−5.62[a]	0.078	0.075
	Sex	0.17	0.07	4.36[a]		
	Length of time using the smartphone	0.01	0.02	0.22		
4	Age	−0.22	0.02	−5.34[a]	0.083	0.077
	Sex	0.18	0.07	4.43[a]		
	Length of time using the smartphone	0.01	0.02	0.27		
	Checking smartphone frequency	0.07	0.02	1.84		
5	Age	−0.22	0.02	−5.36[a]	0.104	0.092
	Sex	0.18	0.07	4.46[a]		
	Length of time using the smartphone	0.01	0.02	0.15		
	Checking smartphone frequency	0.07	0.02	1.77		
	Not being able to access information	0.08	0.01	1.76		
	Losing connectedness	−0.16	0.01	−2.91[b]		
	Not being able to communicate	0.13	0.01	2.34*		
	Giving up convenience	−0.02	0.01	−0.40		

Note: GPA = Grade Point Average.

[a] p < .001.

[b] p < .01.

academic priorities are not overshadowed by potential pitfalls associated with excessive smartphone use. The multi-faceted motivations for smartphone use, spanning emotional connection and entertainment, align with the broader societal trends in technology integration (Rozgonjuk et al., 2020).

5.2. Nomophobia among high school students in Vietnam

Nomophobia has been documented as highly prevalent globally, with rates ranging from 77% to 99% in different settings globally (Harish & Bharath, 2018; Ozdemir et al., 2018; Qutishat et al., 2020). This study, encompassing a sample of 950 high school students in Vietnam, reveals a staggering rate of nomophobia, with 99.9% exhibiting symptoms. Among these, 24.7% reported severe symptoms of nomophobia. This rate is comparable to a high prevalence of nomophobia among students reported in many other studies (from 85.3% to 99.8%). Specifically, a survey of 224 students in the United States

reported 99.5% experienced nomophobia (Cain & Malcom, 2019), with 18.2% in the severe range, while in Brazil and Ghana, the prevalence was 99.7% and 96.4%, respectively. Among these, 64.5% of Brazilian and 81.5% of Ghana students had moderate and severe levels of nomophobia (Essel et al., 2021; Kubrusly et al., 2021). In Asia, 99.3% of students in Oman survey displayed nomophobia symptoms (Qutishat et al., 2020). A 2018 study recorded all Indian students had nomophobia symptoms (67.7% in the moderate and severe range), while only one was free from this phobia (Sethia et al., 2018). In Saudi Arabia, 97%–99% of students also reported having nomophobia (Aldhahir et al., 2023; Alkalash et al., 2023). However, in some other studies, the rates were lower than ours. For instance, studies in Indonesia found a nomophobia prevalence of 78.1% among subjects aged 11 to 17 (Rezki & Ganis, 2018), while approximately 70% of Moroccan high school students exhibited nomophobia symptoms (Louragli et al., 2018). Studies in India observed rates of 90–92% among high school students (Menezes & Pangam, 2017) (Anushri et al., 2018), and among Chinese students,

the prevalence was 84.2% collected from 2000 samples (Gao et al., 2019). The differences among studies might arise from the discrepancy in nomophobia tools used. Furthermore, the increase in smartphone usage among adolescents in Vietnam might be a reason that may be attributed to the high rate of nomophobia.

The elevated rate of nomophobia in Vietnam may be attributed to the timing of the studies, with our research conducted in 2021, compared to the previous studies conducted around three to four years ago when the rate of smartphone and mobile internet usage among adolescents was lower. Moreover, the growth rate of mobile phone and internet usage in Vietnam is among the highest globally.

Regarding the level of nomophobia, the majority of high school students in this study (87%) reported moderate to high levels, with an average level accounting for the most considerable portion at 58.8%. These findings align with global studies, where participants generally exhibited average or higher levels of nomophobia. For instance, studies in Indonesia and Morocco reported 70–80% of participants with average or higher nomophobia levels (Louragli et al., 2018; Rezki & Ganis, 2018), and a study in Pakistan found 82.1% of participants had moderate to severe nomophobia, with an average level accounting for 60% (Farooqui et al., 2018). Similarly, students in Turkey experienced nomophobia at an average level (Gezgin et al., 2018), while those in Spain and Portugal reported higher-than-average levels of nomophobia (Gutiérrez-Puertas et al., 2019). Oman shared a result with 65% having severe symptoms (Qutishat et al., 2020). These consistent findings underscore nomophobia's global nature and highlight its pervasive impact on individuals across diverse cultural and geographical contexts.

5.3. Nomophobia among high school students in Vietnam by gender

The results of this study reveal a notable gender disparity in the prevalence and intensity of nomophobia, with female students exhibiting higher levels compared to their male counterparts. This aligns with the findings of several prior investigations, substantiating the robustness of this gender-based trend. For instance, a study by Sagita and Santika (Sagita & Santika, 2020) involving 400 adolescents in Indonesia observed that female adolescents exhibited an average high category prevalence of 69.3%, while their male counterparts registered a medium category prevalence of 61%. A study on Chinese students similarly evidenced higher nomophobia scores for females compared to males [t (2000) $= -10.53$, $p < 0.001$] (Gao et al., 2019). A comprehensive meta-analysis by Esin (Esin, 2022) drawing from 10 selected studies out of 3370 studies from nine electronic databases further reinforced the pattern of women generally manifesting higher levels of nomophobia than men.

Further corroborating evidence comes from Yildirim's study (Yildirim & Correia, 2015), which focused on a student sample, revealing a nomophobia tendency in 70% of females as opposed to 61% of males. Rakhmawati's investigation (Rakhmawati, 2017) echoed a similar trend, reporting the highest prevalence of nomophobia among women, with 63% of female respondents experiencing it. In academia, Atkay & Kuscu's study (Atkay & Kuscu, 2019) on teachers found that women exhibited a higher level of nomophobia than men, mainly driven by concerns about losing connection and communication breakdown. Existing research posits that these gender disparities may be attributed to distinct smartphone usage patterns. It is suggested that women often employ their smartphones for entertainment purposes, including chatting, gossiping, and engaging in social media activities, leading to an extended duration of phone use compared to men (Sagita & Santika, 2020). This inclination could be linked to the perceived importance of mobile phones in women's personal lives, particularly in texting (Choliz, 2012; Geser, 2006). The findings align with Yeboah & Ewur's study (Yeboah & Ewur, 2014), indicating that 80% of participants used WhatsApp for communication and gossip, and with Gezgin et al.'s study (2018), suggesting that elevated social stress and anxiety levels contribute to the higher incidence of nomophobia in women.

Contrary to the prevailing trend, a subset of studies, including those conducted by Dongre et al. (Dongre et al., 2017), Prasad et al. (Prasad et al., 2017), and Farooqui et al. (2018), posits an alternate perspective, suggesting men might exhibit higher levels of nomophobia than their female counterparts. These investigations propose that anxiety or fear related to being without mobile phones or other devices could be more pronounced among men. On the flip side, studies conducted by Adnan & Gezgin (Adnan & Gezgin, 2016) and Esin (2022) challenge the notion of a significant gender-based disparity in nomophobia levels. According to these studies, gender may not be decisive in predicting the likelihood of experiencing nomophobia. The cumulative findings present a nuanced picture, suggesting that the relationship between gender and nomophobia intricate and may vary across different contexts.

Nevertheless, the existing body of research indicates caution in generalizing gender patterns, emphasizing the need for more extensive exploration of this relationship. The mixed nature of findings underscores the complexity of the interaction between gender and nomophobia, prompting the call for further research to delve deeper into the underlying dynamics. Additionally, there is a recognition that factors beyond gender, such as cultural nuances and socioeconomic status, may exert influence in determining the likelihood of experiencing nomophobia. Future studies should, therefore, incorporate a more comprehensive examination of these factors to enrich our understanding of the multifaced nature of nomophobia.

5.4. Nomophobia among high school students in Vietnam by age

The study investigated the prevalence of nomophobia among students across distinct age groups. It unveils a nuanced landscape, with a higher incidence identified among individuals in the 16–18 age range than those in the 12–15 age category. While the direct comparative research on these specific age groups is limited, a consistent theme emerges from existing literature focused on university students and adults aged 18 and above, reporting escalated levels of nomophobia in this demographic (Dixit et al., 2010; Dongre et al., 2017; Farooqui et al., 2018; Gutiérrez-Puertas et al., 2019; Myakal & Vedpathak, 2019; Prasad et al., 2017; Sharma et al., 2015; Tavolacci et al., 2015) when contrasted with studies involving younger cohorts (Anushri et al., 2018; Gezgin et al., 2018; Louragli et al., 2018; Menezes & Pangam, 2017; Onal, 2019; Rezki & Ganis, 2018).

This intriguing finding prompts contemplation of the susceptibility of older students to nomophobia, with potential implications for their mental health and overall well-being. The study, however, does not delve into a detailed exploration of the reasons behind the observed aged-based disparity in nomophobia levels. While acknowledging the significance of this discovery, future research endeavors should undertake a comprehensive investigation into the underlying factors contributing to nomophobia across varying age demographics.

Understanding the nuanced dynamics of nomophobia within different age groups is imperative for tailoring interventions that address students' unique challenges at distinct adolescence stages. Such targeted interventions can play an essential role in mitigating nomophobia's prevalence and fostering healthier relationships with mobile technology among students. Consequently, the study's identification of age-related patterns in nomophobia sets the stage for future inquiries aimed at unpacking the intricacies of this phenomenon, contributing to the broader discourse on technology-induced psychological impacts among students.

This finding suggests that older students may be more susceptible to nomophobia, which might have implications for their mental health and well-being. In addition, it is essential to note that the reasons for the higher levels of nomophobia among older students are not explained. Future research should explore the underlying factors contributing to nomophobia among different age groups to develop effective interventions to reduce its prevalence.

5.5. The correlation between nomophobia, smartphone use, and academic achievement among school students in Vietnam

The intricate relationship between nomophobia, smartphone use, and academic achievement among school students in Vietnam emerges as a multi-faceted interplay with nuanced correlations and implications. The findings from this study uncover a positive correlation between mobile phone use, both in terms of time spent and the frequency of usage, and the prevalence of nomophobia. This suggests that individuals investing more time checking and using their phones are more prone to experiencing nomophobia, aligning with contemporary research (Dongre et al., 2017; Yildirim et al., 2016). Notably, the study highlights a statistically significant connection between high levels and frequency of phone use and moderate nomophobia. Notably, specific components of nomophobia, such as "Not being able to communicate" and "Giving up convenience," manifest a significant association with the number of times students check their phones, particularly among those exhibiting symptoms of moderate to severe nomophobia. This underscores the core role of connection and communication in adolescent experience, resonating with the findings of Prasad et al. (Prasad et al., 2017).

However, when scrutinizing the impact of nomophobia on academic performance, a distinct pattern emerges. The study reveals no significant correlation between overall nomophobia and academic achievement. Yet, a closer examination of nomophobia components unravels a more intricate narrative. Specifically, "Not being able to access information" and "Giving up convenience" exhibit a significant correlation with GPA among students with moderate nomophobia. As a ubiquitous tool for accessing information, knowledge, and communication, the smartphone plays a crucial role in supporting students' academic endeavors (Richardson, 2013). The observed correlation suggests that disruptions in information access and inconvenience might contribute to students' dependence on their phones, particularly in instances of moderate nomophobia. However, in the linear regression analysis, two specific nomophobia factors, the fear of "Losing connectedness" and "Not being able to communicate," modestly contribute to the predicting academic outcomes, despite a relatively low explanation percentage. Intriguingly, factors directly related to smartphone use, such as the time spent and frequency of checking smartphones, do not exhibit a significant relationship with academic performance.

This study contributes significantly to the theoretical understanding of nomophobia and its impact on academic performance by demonstrating how varying levels of smartphone dependency can affect students' educational outcomes. These findings extend the existing theories on media presence and the psychological effects of technology dependency, suggesting that not all aspects of smartphone use are detrimental but that specific dependency features, such as nomophobia, have more pronounced effects. The differentiation between nomophobia components and their unique contributions to academic performance challenges expands the theoretical framework of technological dependency in educational contexts.

Furthermore, the absence of a significant overall correlation between nomophobia and academic performance in contrast to specific nomophobia components suggests a complex relationship that current theoretical models may not fully encapsulate. The study's limitations, including excluding factors such as loneliness, academic stress, personality, socioeconomic status, and social support, restrict the generalizability of the results. These unexplored factors are likely to play significant roles in shaping the overall impact of smartphone use on academic performance. They could potentially explain the lack of significant correlation found in this study. This invites further theoretical exploration and potentially the development of new models or theories that consider the multi-faceted influences of technology on academic outcomes.

In addition, recognizing the limited impact of general smartphone use on academic results compared to nomophobia-specific issues provides a nuanced perspective that could inform future theoretical and empirical work, encouraging a more differentiated approach to studying technology's role in education. This aligns with and extends the work of researchers like Junco (Junco, 2012), Louragli et al. (2018), and Mahapatra (Mahapatra, 2019), who have explored the broader impacts of technology on students' behavior and achievement. This study thereby calls for more robust theoretical investigations into the specific aspects of smartphone interaction that are most detrimental or beneficial in educational settings.

Finally, the population selection in Central Vietnam's high school setting might limit the application of this study's findings to the broader population. Future studies should consider exploring high schools in developed cities of Vietnam where smartphone usage might be higher.

6. Conclusion

This study illuminates a concerning prevalence of nomophobia among high school students in Vietnam, particularly among females, highlighting significant behavioral patterns related to smartphone use. The research underscores a noteworthy correlation between nomophobia and the duration and frequency of smartphone use. However, a critical observation emerges as no significant correlation surfaces between nomophobia and academic performance. This finding challenges conventional assumptions about the direct impact of smartphone anxiety on educational outcomes. It suggests a more complex interplay that may not directly hinder academic performance as previously theorized. The absence of a strong correlation between nomophobia and academic performance indicates that while smartphone use is pervasive and can lead to anxiety or panic related to its usage, its direct impact on educational outcomes may be mediated by other factors not captured in this study. This nuance in the findings indicates that the relationship between technology use and academic performance is not linear and is possibly contingent upon a range of intervening variables, such as individual coping mechanisms, the nature of smartphone use, and the personal and educational contexts of the students. Furthermore, the pronounced nomophobia among females points towards possible gender differences in emotional and psychological responses to technology dependence. This aspect of the findings underscores the need for gender-sensitive approaches to understanding and addressing pervasive technology use's psychological impacts.

This study's insights are foundational for promoting a healthy and mindful approach to technology usage among high school students in Vietnam. Recommendations for future research include integrating previously unexplored factors that may influence the relationship between smartphone use, nomophobia, and academic outcomes. A more representative sample encompassing diverse academic performance levels could enhance the robustness of future findings. Additionally, the advocacy for longitudinal studies is crucial, as such studies could provide deeper insights into the enduring impacts of smartphone use on both nomophobia and academic performance over time.

Future research should also explore the underlying mechanisms of nomophobia to understand better how it develops and persists among students. Investigating these mechanisms can aid in devising effective interventions that foster responsible smartphone use among youth. While the omnipresence of smartphones is inevitable in modern times, this study underscores the paramount need to leverage their potential benefits while mitigating the adverse impacts on academic performance.

CRediT authorship contribution statement

Tuan-Vinh Nguyen: Writing – original draft, Validation, Methodology, Funding acquisition. **Quynh-Anh Ngoc Nguyen:** Writing – review & editing, Visualization. **Ngoc P.H. Nguyen:** Software, Conceptualization. **Uyen B. Nguyen:** Resources, Data curation, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used ChatGPT in order to revise the English expression. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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