Nomophobia among Preservice Teachers: a descriptive correlational study at Ghanaian Colleges of Education

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Abstract

The present study aimed at investigating nomophobia prevalence, thus, recurrence of anxiety without a smartphone, with preservice teachers in the Colleges of Education, Ghana. An actual sample of 345 preservice teachers responded to a 20-item questionnaire on nomophobia (NMP-Q). A one-way MANOVA between different groups statistics was applied in determining the differences in nomophobic behaviours among preservice teachers based on non-technology-related variables (gender, age, specialism, subjective economic status, sleep/rest hours, and religion) and technology-related variables (number of smartphones owned, smartphone ownership duration, active internet services, and daily internet usage time). The results evidenced that the vast majority of preservice teachers had mild to severe nomophobia, and their most significant anxiety was related to access to information and communication. Besides, non-technology-related variables in gender, sleep hours, and subjective economic status significantly impacted the preservice teachers' nomophobia. Technology-related variables that significantly influenced the nomophobic behaviour of preservice teachers included the number of smartphones owned, smartphone ownership duration, and active internet service. A sizable majority of the preservice teachers showed signs of mild to severe nomophobia. The present study provides prefatory support for the prevalence of nomophobia among the Ghanaian preservice teachers.

Keywords Nomophobia · Smartphone · Preservice teachers · Colleges of Education · Ghana · Descriptive correlational design

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1 Introduction

The dot-com revolution has digitally transformed human culture. Universities are trying to adjust to the new needs of the society to prepare their learners to be competitive and successful in the labour market but also in their lives (Arora et al., 2021 & Goyal et al., 2021). Digital technologies, such as smartphones, have made lives easier for people, enhance access to the network, create content, communicate, collaborate and cooperate with others, and educate them, through different technology enhanced teaching and learning models, such as e-learning (Vlachopoulos, Sangrà and Cabrera, 2012; Moreno-Guerrero et al., 2021). The use of smartphones is increasing with the new dawn of technology every day; its success can be attributed to its portability, mobility, and easy connectivity without geographical and time restrictions (Sevim-Cirak and Islim, 2020). However, the progressive use of smartphones leads to overuse and further damage (Makker et al., 2009 & Kuscu et al., 2021). Sevim-Cirak and Islim (2020) and Çevik-Durmaz, Yalçinkaya-Önder & Timur (2021) posit that the desire to own and use smartphones is higher among the younger than the older generation, attributing that to some of these reasons: improvement of interpersonal relationships, increase autonomy, increase social communication, and increase prestige among peers. Lindell (2020) & Lai, Saab & Admiraal (2022) highlighted the different opinions and options for students and teachers on how mobile phone use can be utilized and/or limited. According to Geniş et al. (2016), there is a higher percentage of ownership of smartphones among preservice teachers, especially the females, and three-quarters of preservice teachers used their smartphones for instructional and social networking purposes. The situation is causing many people to be unreasonably attached to the extent of being addicted to their phones (Ellis, 2019; Lopez-Fernandez et al., 2017; Chóliz et al., 2016; Chóliz, 2012). This situation with its attending problems has led to many studies (Leon-Mejı et al., 2021; Yildirim and Correia, 2015) culminating in the term "Nomophobia", as a a modern age phobia, which comes as a result of the interaction between people and mobile technologies, especially smartphones.

While Nomophobia has already received a great deal of attention by media (Yildirim et al., 2016), yet research into nomophobia has been scant, and the boundary between regular use of smartphones and addictive behaviour is becoming blurred increasingly among preservice teachers. The present study provides prefatory support for the prevalence of nomophobia among Ghanaian preservice teachers, aiming to answer the following research questions:

- Do preservice teachers manifest nomophobic behaviours?
- What is the relationship between non-technology-related variables (gender, age, specialism, subjective economic status, sleep/rest hours, and religion) and nomophobic behaviours among preservice teachers?
- What is the relationship between technology-related variables (number of smartphones owned, smartphone ownership duration, active internet services, and daily internet usage time) and nomophobic behaviours among preservice teachers?

In Sect. 2 we present the results of our review of previous studies on Nomophobia and preservice teachers, which highlight the importance of conducting additional research in a context like Ghana, which is one of the frontliners in the adoption and statistically significant increases in Smartphone ownership (Essel et al., 2021). Section 3 describes the methodological approach followed in this research, with a focus on the presentation of the research design and its adequacy in relation to the nature of the research questions; the study population and sample; the data collection and analysis, as well as the ethical considerations related to the study. Section 4 presents the results of the study on the prevalence of nomophobia among the pre-service teachers, in association with sociodemographic factors. In Sect. 5 we present a discussion on the collected data in relation to the existing literature and we answer the research questions of the study. The section ends with the identification of some limitations of the study, as well as recommendations for future research. Finally, Sect. 6 includes our concluding statements and the implications of the study for preservice teachers, policy makers and scholars in the field.

2 Nomophobia and preservice teachers

Nomophobia is the fear of being out of touch with smartphones while in school; it influenced diverse characteristics of a person's life, particularly social, work and academic relations, because of the dependency on smartphones (Moreno-Guerrero et al., 2021; Gutiérrez-Puertas et al., 2019). The term nomophobia was first introduced by the UK Post Office in 2008 after a study to examine whether mobile users in the UK were exhibiting any anxiety regarding their phone usage (Leon-Mejı et al., 2021). In the same year, DailyMail (2008) reported that nomophobia affects up 53% of mobile phone users, with 48 per cent of women and 58% of men admitting experiencing anxiety when their phones run low on battery, have no network connection or lose their phone.

Several studies (Essel et al.,2021; Sevim-Cirak and Islim, 2020; Yildirim et al., 2016) have been conducted regarding smartphone use and the upsurge of nomophobia. For instance, Essel et al. (2021) surveyed university students in Ghana and discovered they were moderately nomophobic. Looking at preservice teachers, for example, Sevim-Cirak and Islim (2020) discovered that these teachers had developed or exhibited nomophobic behaviours at various levels and explained that gender significantly affected nomophobic behaviour, with the female gender being the majority. This rate was attributed to their inability to access information, losing connectedness, and not communicating when needed. Sevim-Cirak and Islim (2020) also established a link between data usage and data ownership with nomophobia. It was established that those on the data plan model compared to pay-as-you-go showed high levels of nomophobia when it comes to not being able to access information.

Awofala (2020) also studies preservice mathematics teachers in a Nigerian university and found that of the 300 participants, a large proportion (147, 49%) had a high prevalence of nomophobia. He concluded that this higher prevalence rate could be attributed to Nigerian preservice teachers' addiction to mobile phones. Another study by Gezgin et al. (2017) highlighted the ubiquity of nomophobic behaviour among

818 preservice teachers from the Faculty of Education in a Turkish University. The study illustrated that the nomophobia level was higher than the average, attributing these tendencies to factors such as "losing connectedness" as well as "not being able to access information". Regarding age and nomophobia, Gezgin et al. (2017) alluded to the fact that there is a significant difference among preservice teachers' nomophobic levels, with those below 20 years being in the majority.

However, there is a dearth of studies conducted with preservice teachers in Ghana regarding nomophobia. As a result, the goal of the present study is to determine the nomophobic levels of preservice teachers in Ghana, as well as the association with the nomophobia levels and multiple factors in non-technology-related variables such as gender, age, specialization, subjective economic status, sleep/rest hours, and religion, as well as technology-related variables such as the number of smartphones owned, smartphone ownership duration, active internet service and daily Internet use time. The present study is in line with Sevim-Cirak and Islim (2020) notion that preservice teachers are the future role models for young people they will be interacting with and are, therefore, responsible for their proper use of technology. Therefore, it is necessary to study the nomophobic behaviour of preservice teachers since it can negatively affect their future students and careers (Gezgin et al., 2017). To our knowledge, the present study is the initial study to examine the nomophobic behaviour of preservice teachers in Ghana with reflections on technology-related and non-technology-related factors.

3 Materials and methods

In the present study, a quantitative research approach, specifically a descriptive correlational design, was conducted in April 2021 (first semester of the 2020/2021 academic year) in the Kwame Nkrumah.

University of Science and Technology (KNUST) five affiliate Colleges of Education. A descriptive correlational design is a research design that seeks to find relationships among variables in situations where the researchers have no control over the independent variables (Lappe, 2000 & Salkind, 2010). The present study aimed at ascertaining the differences (Fraenkel et al., 2012) among the preservice teachers concerning the nomophobia prevalence. As such, this study sought to ascertain the reasons and implications of variances in the preservice teachers' nomophobic behaviours. KNUST is reputed on the African continent as one of the best universities accredited to build the capacity of graduates in science and technology. The five colleges were affiliated to KNUST in 2018 with the expectation of providing assessment and certification as well as faculty and empower staff development services to the Colleges of Education.

3.1 Study Population and Sample

The target population for the present study involved all preservice teachers in the five affiliate Colleges of Education of KNUST. In the Ghanaian Educational System, public or private school teachers are described as in-service teachers; while students

who are trained in the Colleges of Education or universities (mandated to train initial teachers) to be professional are labelled as preservice teachers (Ministry of Education [MoE], 2012; MoE, 2017). A sample of n=350 pre-service teachers was selected across the colleges using the convenience sampling method. Out of 350, 5 cases were

Table 1 Sociodemographic profiles of the 345 participating pre-service teachers

Variables		M	SD	Frequency (%)
Gender	Male			150 (43.4)
	Female			195 (56.6)
Age		20.8	1.85	
Residential Status	On-Campus			209 (60.5)
	Off-Campus			136 (39.5)
Marital status	Married			60 (17.3)
	Single			235 (68.2)
	Divorced			7 (2.0)
	In a relationship			43 (12.5)
Hours of smartphone usage per day		6.1	3.3	
Times per day checking smartphone		35.3	31.1	
Time of the day phone use is more	Day			142 (41.3)
	Night			203 (58.7)
Smartphone usage (years)		5.81	2.93	
Active internet service	Yes			310 (90.1)
	No			35 (9.9)
Does sleep/rest hours affect you?	Yes			225 (65.2)
	No			120 (34.8)
Daily internet usage time		3.91	1.9	
Wi-Fi Accessibility	Yes			132 (38.4)
	No			213 (61.6)
Ownership of Data package	Yes			236 (68.3)
	No			109 (31.7)
Number of Phones	1			231 (67.1)
	≥2			114 (32.9)
Having work beside the studies	No			194 (56.2)
	Regular			51 (14.8)
	Irregular			100 (30.0)
Subjective economic status	Good			108 (31.3)
	Managing			116 (33.6)
	Poor			121 (35.1)
Religion	Christian			161 (46.7)
	Muslim			109 (31.6)
	Other			75 (21.7)
Programmes/ Specialisms	Early grade			112 (32.5)
	Upper Primary			109 (31.6)
	Junior High School			124 (35.9)
Alcohol Consumption	No			118 (30.7)
	Regular			106 (15.5)
	Irregular			121 (17.0)

omitted based on supplying extreme scores or missing item responses (Mahalanobis Distances of p<.001). Missing one or more of the 20 item scores render the total score of NMP-Q invalid as it is not logical to interpolate scores of missing items. A final sample of $n=345$ students was involved in the present study.

The sociodemographic traits were categorised into technological and non-technological factors. Traits such as age, gender, specialisms, residential status, marital status, having work besides the studies, subjective economic status, and alcohol consumption composed the non-technological factors. At the same time, Wi-Fi connection accessibility, hours of smartphone usage per day, times per day checking smartphone, time of the day phone use is more, active internet service, and the number of phones constituted the technological factors (see Table 1).

The sociodemographic traits of the sample were characterised by 195 (56.6%) female adults and 150 (43.4%) male adults, with ages ranging between 18 and 27 years old with an average age of $m=20.1$ and standard deviation of $SD=2.1$. Regarding the specialisms, the majority were in the Junior High School ($n=175$; 51.0%), and others were specialising in the Early Grades ($n=85$; 24.5%), Primary ($n=85$; 24.5%) specialisms. All the pre-service teachers indicated having at least one mobile phone.

3.2 Study questionnaire and data collection procedure

The nomophobia questionnaire (NMP-Q) is a self-reporting scale devised by Yildirim and Correia (2015) to estimate the nomophobia severity or anxiety of being without a phone. The NMP-Q includes a 20-item Likert scale with each item measured within the range of 1 ("strongly disagree") to 7 ("strongly agree") points (see Table 2). It produces a discrete total score from 20 to 140, with a score of 20 indicating absence; 21–59 indicating mild; 60–99 indicating moderate; and 100–140 indicating severe nomophobia (Yildirim and Correia, 2015). There are four sub-dimensions or primary factors in the scale: not being able to communicate (with 6 items), not being able to access information (with 4 items), losing connectedness (with 5 items), and giving up convenience (with 5 items) (Qutishat et al., 2020; Yildirim and Correia, 2015; Yildirim, 2014). Internal consistency reliability coefficients of the NMP-Q primary factors are established as 0.939, 0.827, 0.874, and 0.814, respectively (Gezgin et al., 2018). The English version of the scale reported a Cronbach's alpha coefficient of $\alpha=0.97$ (Essel et al., 2021) in Ghana, hence, the NMP-Q scale used in the context of

Table 2 The NMP-Q* scale factors and equivalent number of indicators	Factor		Code	Indicators
	1	Not being able to communicate	NMPQ_C01	6
	2	Losing connectedness	NMPQ_L02	5
	3	Not being able to access information	NMPQ_I03	4
	4	Giving up convenience	NMPQ_G04	5
	Total			20
		*NMP-Q=Nomophobia Questionnaire		

the present study is reliable. The Kaiser-Meyer-Olkin (KMO=0.915;) and Bartlett's test of sphericity ($\chi2$=8362; $p<.001$) outcomes for the NMP-Q validated the sample adequacy and factor analysis applicability. The NMP-Q was supported under a four-factor structure, which showed 83.5% of the total variance. We reported internal consistency with Cronbach's alpha (α=0.97) and McDonald's omega (ω_t=0.98) regarding the selected sample in the present study.

The investigators expedited collecting data from the students by redesigning the NMP-Q scale into an e-Survey (Essel et al., 2019; Essel et al., 2018) using Google Forms. Besides, a single-blind data collection was employed. This procedure was to restrict the student not to be cognizant of the study's aims. Before administering the e-questionnaire, the investigators informed the preservice teachers about the purpose of the study and inquired whether or not they desired to engage voluntarily. None of the indicators in the e-questionnaire reported the personal identity of the preservice teachers. We distributed the e-Questionnaire by forming a short uniform resource locator (URL) or link sent via their institutional email and Short Message Services (SMS) to the preservice teachers. The investigators requested them to complete the e-questionnaire with absolute precision. Each preservice teacher required fifteen to twenty minutes to complete the e-questionnaire. Restrictions were implemented in the online survey system to allow a single submission response. All the indicators in the e-questionnaire were marked as required to prevent incomplete submissions. Following the data collection method, the data garnered were entered in an Excel spreadsheet, saved as a comma-separated value (.csv), and imported and coded in Jamovi statistical app by two of the auxiliary investigators. The other investigators controlled the precision of data. The data collection procedure lasted for 1 month.

3.3 Data Analysis

For data estimations and computations, the investigators employed the Jamovi version 2.0.0, an open-source statistical package (The Jamovi project, 2021). All statistical significance for the present study was calculated while the estimated probability (p) was equal to or less than 5% (p≤0 05).

The analysis of data in the present study was conducted in two phases:

Phase I: Data wrangling and cluster analysis.

The investigators estimated the mean scores of indicators in relation to the factors of the NMP-Q to determine the total scores for each preservice teacher. To measure nomophobia prevalence among the teachers, we employed descriptive statistics such as means (m), skewness and kurtosis, standard deviations (SD), and standard error mean (SEM). The data garnered were scrutinised for the sample size adequacy and collinearity within the factors. To avoid distortions of multicollinearity and normality assumptions (Kara et al., 2019), the investigators estimated Mahalanobis distance values to identify outliers and missing data. The Shapiro-Wilks test and histograms, Q-Q plot, skewness, and kurtosis were used to confirm normality. Concerning the nomophobic behaviours of the preservice teachers, the investigators utilised cluster analysis to delimit two clusters based on the concepts of homogeneity or heterogeneity between the preservice teachers (Yildirim et al., 2016). In the cluster analysis, the investigators employed all the 20 items of the NMP-Q as the application of factor

scores induces a lower description of principal clusters (Kaufman and Rousseeuw, 2009; Hair et al., 2006; Romesburg, 2004; Vermunt and Magidson, 2002; Ketchen and Shook, 1996). We used the log-likelihood distance measure (Wendler and Gröttrup, 2016; Anderberg, 2014) to define the cluster solution of the preservice teachers.

Phase II: MANOVA Test.

For the inferential statistics, one-way between-groups MANOVA analyses were administered to correlate the response (dependent) and explanatory (predictor) variables to show the statistically significant difference in the nomophobic behaviour of preservice teachers. The predictors included age, gender, marital status, the span of smartphone ownership, time of the day smartphone use, sleep hours, daily internet usage time, data package usage, Having work beside the studies, subjective economic status, Wi-Fi accessibility, and alcohol consumption. The four sub-dimensions of the NMP-Q represented the response factors for the present study. The median split method was used to categorise continuous variables such as age, daily internet usage time, smartphone usage (years), and smartphones ownership duration.

The investigators used required statistical measurements to verify whether the data garnered satisfied the assumptions (normality of response variables, correlation, covariance matrix equality, outliers and independence of observation) for the MANOVA analysis. Pillai's trace was preferred to assess the differences in statistical significance in clusters on the dimensions of the response variable, regarding its robust nature (Field, 2018; Hair et al., 2006). The investigators utilised a scatterplot to examine the linear relationship between specific response variables for the individual groups of explanatory variables, and the outcome of the scatterplot was a linear shape. The assumption of homoscedasticity-covariance matrices was satisfied as the difference in statistical significance was higher than 5% ($p > .05$). The investigators used Box's M test to examine the homoscedasticity assumption (Box, 1949). Besides, we estimated the correlation between response variables and observed no trace of multicollinearity due to the moderate relationship among the response variables.

3.4 Ethics approval

Ethics approval for the study was acquired from the Centre for Learning, Teaching, and Research (CELTR) ethics committee in the Faculty of Educational Studies, KNUST (Document Ref: CELTR/231/11/4/21). The 20-item nomophobia questionnaire was administered online (Google Forms) to pre-service teachers who willingly consented to partake (Mohammed and Essel, 2018) in the study online (Essel et al., 2021). The teachers obtained information about the aim and content of the study before the collection of data. The questionnaire did not incorporate any personal identifiers, and the students were guaranteed anonymity and confidentiality of their answers.

4 Results

The results of the present study are detailed in this section. We analysed the prevalence of nomophobia among the pre-service teachers, and we also associated the sociodemographic factors with nomophobic behaviour of the preservice teachers.

4.1 Nomophobia prevalence among preservice teachers

The results demonstrate that all the preservice teachers in the present study exhibited nomophobic behaviours. Table 3 illustrates the frequency of nomophobia among preservice teachers. We observed from the data that the preservice teachers exhibited nomophobic behaviour at different levels. The data evidenced that 22.0% (n = 76/345) of them showed mild nomophobia, 54.8% (n = 189/345) of them indicated moderate nomophobia, and 23.2% (n = 80/345) of them had severe nomophobia. Based on the results (m=79.8, SD=25.6), we concluded that the preservice teachers had a moderate grade of nomophobia.

The descriptive analyses of the present study reported adequate ranges of skewness and kurtosis values for the four constructs. Jöreskog (2001) opines that skewness and kurtosis values define the distribution's normality when the value varies from −1.96 to +1.96. Negative and positive values were reported for skewness, while only positive values were derived for kurtosis. The NMP-Q average score was 79.8 showing a moderate nomophobia among the pre-service teachers (see Table 4). Besides, the results showed that two out of the four constructs ("Losing connectedness" and "Not being able to access information") reported an average score higher than the NMP-Q

Table 3 Descriptive statistics of the NMP-Q* levels among preservice teachers

Level of Nomophobia	M	SD	Frequency (%)	Reliability (α, ω_t)
Absence (≤20)			-	
Mild (21–59)			76 (13.0)	
Moderate (60–99)			189 (63.2)	
Severe (100 ≥)			80 (23.2)	
Total score of NMP-Q	79.8	25.6		0.97, 0.97

*NMP-Q=Nomophobia Questionnaire.

Table 4 Descriptive statistics of the constructs of the NMP-Q* scale

Factors		N	M	SD	SEM	Skewness	Kurtosis
1	Not being able to communicate	345	23.4	8.12	0.43	0.19	-0.70
2	Losing connectedness	345	20.2	6.32	0.34	-0.01	-0.42
3	Not being able to access information	345	16.8	5.58	0.30	-0.08	0.31
4	Giving up convenience	345	19.3	7.60	0.41	-0.17	-0.61
	NMP-Q	345	79.8	25.6	1.38	-0.04	0.38

*NMP-Q=Nomophobia Questionnaire.

score. The construct, "Not being able to communicate", reported the highest average (m=23.4, SD=8.2) among the factors (see Table 4).

4.2 Differences between selected sociodemographic profiles and nomophobic behaviour

The researchers garnered data to identify significant differences between nomophobic behaviour and the sociodemographic parameters of the preservice teachers in the present study.

4.2.1 Gender

One of the most studied predictors in other related literature is gender (Sevim-Cirak and Islim, 2020). The investigators performed a one-way between-group MANOVA analysis to determine the influence gender has on the preservice teachers' nomophobia behaviour. The results indicate a significant impact of gender on the nomophobic behaviour of the preservice teachers using the Pillar's trace [$F_{(4,340)}=2.31$, $p<.05$; Pillai's Trace=0.03 $\eta p^2=0.11$]. However, females had a higher composite score of nomophobia than their male counterparts. The results comparing the nomophobic behaviour of male and female preservice teachers are demonstrated in Table 5.

4.2.2 Age

The impact of respondents' age on nomophobic behaviours as a determinant was examined using a one-way between-groups MANOVA. Participants' ages differed between 18 and 23; hence, the median of 21 years was preferred as the study's comparison point (21 years or below, and over 21 years). Using Pillai's trace, age did not have a statistically significant influence on the nomophobic behaviours of the respondents [$F_{(4,340)}=0.66$, $p=.620$; Pillai's Trace=0.007]. According to the respondents' mean score ratings, those aged 21 years or below demonstrated higher nomophobia than those aged above 21 years. Respondents with ages above 21 years reported higher nomophobia scores in "Not being able to communicate" and "Losing connectedness" compared to respondents aged 21 years or below (See Table 6).

Table 5 Gender and nomophobia (Means and Standard Deviations)

Groups	N	Not being able to communicate	Losing connectedness	Not being able to access information	Giving up convenience
		m(SD)	**m(SD)**	**m(SD)**	**m(SD)**
Males	150	24.8 (8.29)	21.0(6.32)	17.5 (5.69)	20.5 (7.61)
Females	195	22.4 (7.84)	19.6 (6.28)	16.3 (5.44)	18.4 (7.49)
m=mean; SD=Standard deviation					

Table 6 Age and nomophobia (Means and Standard Deviations)

Groups	N	Not being able to communicate	Losing connectedness	Not being able to access information	Giving up convenience
		m (SD)	**m (SD)**	**m (SD)**	**m (SD)**
21 years old and below	162	23.2 (8.07)	20.0 (6.29)	16.7 (5.64)	19.4 (7.55)
Above 21 years old	183	23.6 (8.18)	20.5 (6.36)	17.0 (5.52)	19.3 (7.67)

m=mean; SD=Standard deviation

4.2.3 Religion

A one-way MANOVA test between different groups was carried out to analyse whether religious differences affect respondents' nomophobic behaviour. Pillai's Trace's findings demonstrated that religious differences significantly impacted respondents' nomophobic behaviour (F(12,1020)=3.08, p<.05; Pillai's Trace=0.013, ηp^2=0.03). Christians had significantly higher mean scores than Muslims, traditional, and other religions in "Not being able to communicate", "Not being able to reach information", and "Losing Connectedness" (See Table 7).

4.2.4 Subjective economic status

The influence of respondents' subjective economic status on their nomophobic attitudes was examined as part of the overall aim of the present study. A one-way MANOVA test between different groups was applied to observe if respondents' subjective economic status affected their nomophobic behaviours. The results of Pillai's

Table 7 Religion and nomophobia (Means and Standard Deviations)

Groups	N	Not being able to communicate	Losing connectedness	Not being able to access information	Giving up convenience
		m(SD)	**m(SD)**	**m(SD)**	**m(SD)**
Christian	147	24.2(8.28)	23.61(6.37)	21.2(5.54)	19 (7.67)
Muslim	109	23.1 (7.99)	21.2 (6.39)	19.1 (5.70)	20.1(7.70)
Traditional	56	21.8 (8.34)	20.4 (6.38)	19.8 (5.40)	19.8 (7.68)
Others	33	19.6 (7.36)	19.0 (5.94)	18.6 (5.56)	17.8 (6.82)

m=mean; SD=Standard deviation; Others=Hindu, Harekrishna, Eckankar, Budhist, etc.

Table 8 Economic status and nomophobia (Means and Standard Deviations)

Groups	N	Not being able to communicate	Losing connectedness	Not being able to access information	Giving up convenience
		m(SD)	**m(SD)**	**m(SD)**	**m(SD)**
Good	108	24.13(8.55)	22.35(7.05)	21.1(5.55)	22.9 (1.49)
Managing	116	21.23 (8.01)	20.3 (7.1)	19.5 (5.1)	19.9 (1.49)
Poor	121	20.66 (7.51)	19.16 (6.51)	20.5 (5.1)	20.03 (1.60)

m=mean; SD=Standard deviation

Trace reported that respondents' subjective economic status had a substantial impact on their nomophobic behaviour [F(4,340)=2.51, p<.05; Pillai's Trace=0.021, ηp^2=0.09]. Preservice teachers with "good" subjective economic status had significantly larger average scores in the four factors of nomophobia than those with "managing" and "poor" economic status' (See Table 8).

4.2.5 Sleep hours

We conducted a one-way MANOVA test between different groups to examine the effect of sleep hours on preservice teachers' nomophobia. Pillai's trace demonstrates no difference in statistical significance regarding the nomophobic behaviours of preservice teachers who sleep below or 5 h and those who sleep more than 5 h in their nomophobic behaviours [F(4,1060)=0.78, p=.13; Pillai's Trace=0.035].

4.2.6 Specialism

The Colleges of Education in Ghana offer three (3) diverse programmes, also known as specialisms, and include Early grade, Primary School and Junior High School specialisms. In the present study, the investigators wanted to observe whether there is a statistically significant difference between the specialisms. A one-way MANOVA test between different groups was used to ascertain whether preservice teachers' nomophobic behaviour varied depending on the programme/specialism. There was no statistically significant difference in the nomophobic behaviours of preservice teachers in the different study specialisms using Pillai's trace. [F(4, 340)=0.81, p=.29; Pillai's Trace=0.016].

4.2.7 Number of smartphones

A one-way MANOVA test between different groups was used to determine whether the number of smartphones owned influenced the nomophobic behaviours of preservice teachers. The results of Pillai's Trace revealed that having two or more smartphones had a significant impact on the nomophobic behaviours of preservice teachers [F(4, 340)=2.15, p<.05; Pillai's Trace=0.075, ηp^2=0.022]. Preservice teachers with two or more smartphones demonstrated significantly higher nomophobia than those with one, as illustrated in Table 9. They had higher average scores in "Not being able to access information" than those with one smartphone (See Table 9).

Table 9 Number of Smartphones and nomophobia (Means and Standard Deviations)

Groups	N	Not being able to communicate	Losing connectedness	Not being able to access information	Giving up convenience
		m(SD)	**m(SD)**	**m(SD)**	**m(SD)**
One phone (1)	231	21.93(6.55)	20.6(6.29)	19.01 (6.64)	22.9 (7.49)
More than one phone (≥2)	114	22.06 (7.05)	21.11 (6.18)	24.63 (8.58)	22.03 (7.60)
m=mean; SD=Standard deviation					

4.2.8 Duration of smartphone ownership

A one-way MANOVA test between different groups was carried out to examine whether smartphone ownership duration influenced the nomophobic behaviours of the preservice teachers. With Pillai's trace, a statistically significant difference in nomophobic behaviours was observed between preservice teachers who had a smartphone for 7 years or less and those who had a smartphone for more than 7 years [$F(4,340)=2.08$, $p<.05$; Pillai's Trace $=0.027$, $\eta p^2=0.017$]. Preservice teachers who held their smartphones for more than 7 years were significantly more nomophobic than others, with higher average scores in the factor - "Not being able to access information", than those who held their smartphones for less than 7 years (See Table 10).

4.2.9 Active internet service

In terms of the effect of active internet services on nomophobic behaviours, the results revealed, via the Pillai's trace, the difference in statistical significance was observed in nomophobic behaviours between preservice teachers who had active internet access and those who did not [$F(4,340)=2.42$, $p<.05$; Pillai's Trace $=0.011$, $\eta p^2=0.057$]. The result illustrated that preservice teachers with active internet services were highly nomophobic, with higher average scores in "Not being able to access information" than those who did not have active internet services (See Table 11).

Table 10 Duration of Smartphone ownership and nomophobia (Means and Standard Deviations)

Groups	N	Not being able to communicate	Losing connectedness	Not being able to access information	Giving up convenience
		m(SD)	m(SD)	m(SD)	m(SD)
7 years or less	150	21.15(7.18)	21.1(6.92)	20.3 (8.15)	20.45 (6.41)
Above 7 years	195	20.31 (7.07)	20.11 (6.72)	23.63 (7.91)	21.053 (6.3)
m=mean; SD=Standard deviation					

Table 11 Active internet service and nomophobia (Means and Standard Deviations)

Groups	N	Not being able to communicate	Losing connectedness	Not being able to access information	Giving up convenience
		m(SD)	m(SD)	m(SD)	m(SD)
Yes	150	22.6(8.13)	20.2(6.34)	23.8 (5.55)	19.4 (7.6)
No	195	19.3 (7.99)	22.1 (6.24)	19.6 (5.87)	18.9 (7.71)
m=mean; SD=Standard deviation					

4.2.10 Daily internet usage time

To examine if or not daily internet usage time influenced the nomophobia of the preservice teachers, a one-way MANOVA test between different groups was performed. Using Pillai's trace, the outcomes confirmed that daily internet usage time did not show a significant impact on the nomophobic behaviours of preservice teachers [$F(4,1060)=1.25$, $p=.712$; Pillai's Trace$=0.012$].

5 Discussion, limitations and recommendations

Smartphones have become extensively used in our daily lives as smartphone technologies have advanced, making our lives more comfortable. Technostress (Upadhyaya, 2021; Wang et al., 2020; Qi, 2019), problematic smartphone use (Forster et al., 2021; Romero-Rodríguez et al., 2020; Pereira et al., 2020; Eichenberg et al., 2019; Wang et al., 2015), smartphone addiction, nomophobia (Essel et al., 2021; Márquez-Hernández et al., 2020; Moreno-Guerrero et al., 2020; Bartwal & Nathan, 2020; Jilisha et al., 2019; Aguilera-Manrique et al., 2018), cyberbullying (Abaido, 2020; Chan et al., 2020; Wang et al., 2019; Peled, 2019), and cyberslacking (Sharma, 2020; Simanjuntak et al., 2019; Rana et al., 2019) have all emerged due to the widespread use of smartphones. This study aimed to determine the nomophobic behaviours, the anxiety of being without mobile phone contact (SecurEnvoy, 2012), and variables influencing the nomophobia levels of preservice teachers in five Ghanaian colleges of education. The descriptive correlational study was carried out with the voluntary engagement of n=345 preservice teachers. The present study's data was gathered using an e-survey questionnaire which consisted of Nomophobia Scale (NMP-Q) indicators (Yildirim & Correia, 2015).

The present study demonstrated that preservice teachers had manifested and shown moderate nomophobic behaviours. Additionally, the preservice teachers recorded higher nomophobia levels for the "not being able to access information" factor and the "not being able to communicate" factor. This result attests to the significance of communication and information access for the preservice teachers, and the finding is in line with several studies (Essel et al., 2021; Sevim-Cirak & Islim, 2020; Argumosa-Villar et al. 2017; Yildirim et al., 2016; Pavithra et al., 2015; Dixit et al., 2010; Walsh et al., 2010) which identified moderate to higher levels of nomophobia among adolescents (Anshari et al., 2019) and youth as well as students in higher education institutions (Essel et al., 2021; Darvishi et al., 2019; Ahmed et al., 2019; Aguilera-Manrique et al., 2018). As a result, it can be stated that nomophobia is a rising concern among smartphone users, particularly adolescents and that the phenomenon constrains special investigative consideration, essentially developing strategies to lessen and prevent nomophobia.

The study indicated that there were gender disparities in the nomophobic behaviour of preservice teachers in Colleges of Education. Based on the NMP-Q scores, females have demonstrated higher nomophobic behaviour compared to males. This finding supports studies conducted on preservice teachers (Essel et al., 2021; Sevim-Cirak, N., & Islim, 2020; Yildirim et al., 2016; Billieux et al., 2015; Walsh et al.,

2010). Notwithstanding, Farooqui et al. (2018), SecurEnvoy (2012) and Güzeller and Coşguner (2012) studies go contrary to the present study's findings. This finding illustrates that dependency on smartphones cut across gender evenly. Additional studies to unearth the adverse consequence of gender on the disposition of individuals to nomophobia are therefore essential.

Besides, the result of the present study demonstrates that there was no significant variation between age and nomophobic behaviour of the preservice teachers. Some studies align with this finding (Yildirim et al., 2016; SecurEnvoy, 2012). However, other studies have shown significant differences in nomophobic behaviour between younger and older respondents (Sevim-Cirak & Islim, 2020; Çağan et al., 2014; Smetaniuk, 2014; Buckner et al., 2012). The majority of study partakers (91.2%) were between 18 and 23 years of age. With the median split method (median=21), the present study illustrated that preservice teachers aged 21 or below were highly nomophobic than those aged above 21 years. Therefore, this is possible since earlier studies on the association between problematic smartphone use and age provide considerable data for the influence of age on problem-specific smartphone use behaviour, where younger teachers are highly presumed to exhibit such behaviours (Sevim-Cirak & Islim, 2020; Smetaniuk, 2014; Castille & Sheets, 2012; Augner & Hacker, 2012; Walsh et al., 2011; Sanchez-Martinez & Otero, 2009).

The investigators found a significant variation between religion and nomophobic behaviour. It was observed that Christians were significantly more nomophobic than Muslims and other religious bodies. No specific reason could be assigned to this finding. However, future studies could investigate the association between religion and nomophobia to clarify, focusing specifically on main religious setups. There was significant variation found between socioeconomic status and nomophobic behaviour. The finding implied that the preservice teachers who reported higher socioeconomic status were more nomophobic than those with middle or low socioeconomic status. Preservice teachers who could afford internet data spent much time with their smartphones. However, no significant difference was observed between sleep hours and nomophobic behaviour. A vast proportion (65.2%) of the respondents professes fewer sleep hours due to their smartphone use though it does not appear to influence nomophobic behaviour (Moreno-Guerrero et al., 2020). Besides, no significant difference was observed between the specialism offered by preservice teachers and their nomophobic behaviours. Previous studies performed by Tandoğan and Gündüz-Hoşgör (2017), and Deniz and Gezgin (2016) produced similar results.

Regarding the technology-related variables, the present study reported a significant variation between preservice teachers who own one smartphone and those who own more in terms of nomophobic behaviours. It was observed that preservice teachers who had more than one smartphone were highly nomophobic. This finding is because preservice teachers want to multitask; thus, they want to stay connected on the internet and other social media platforms while communicating on their smartphones (Pavithra et al., 2015). The findings showed that having active internet service affected preservice teachers' nomophobic behaviours. This finding reinforces the point that active internet services on smartphones contribute to higher nomophobia (Yildirim & Correia, 2015). As for the effect of smartphone ownership duration, the results indicated significant variations between the nomophobia scores of those who

have owned their smartphones for more than seven years and those less than seven years. Preservice teachers who owned their smartphones for more than seven years were significantly more nomophobic than those who owned their smartphones in lesser years. This finding aligns with the study conducted by Yildirim et al. (2016) and Yildirim and Correia (2015). This finding could be attributed to the fact that smartphone use has become part of the daily lives of preservice teachers. On the contrary, daily internet usage time did not have a statistically significant effect on the nomophobic behaviour of the preservice teachers.

The results of the present study are thought to have made an addition to the existing literature. First and foremost, it summarises smartphone dependence and nomophobia to assist scholars in studying more about them. Furthermore, the present study highlights the sociodemographic traits that may contribute to nomophobic behaviours in preservice teachers. Concerning nomophobia, gender, age, programme specialisms, smartphone ownership, and active internet service generate substantial disparities among preservice teachers in the selected Colleges of Education.

While the study contributes valuable new insights for both practice and theory, it is not without limitations. Data were garnered from preservice teachers of the Kwame Nkrumah University of Science and Technology five affiliate Colleges of Education. Notwithstanding, because the present study evaluated anomalous demeanour, the social desirability bias could have occurred. The preservice teachers may not have desired to expose the actual pattern of smartphone usage to the investigators and instead may have transcribed what was required.

According to the SAGE Encyclopedia of Communication Research Methods (Allen, 2017), descriptive correlational research provides a snapshot of the current state of affairs and discovers relationships among variables, which allow the prediction of future events from present knowledge. For generalizability and repeatability, identification of sample size is essential. The sample size (345) of this research is considered significant and offers statistical power (Polit & Beck, 2010). However, when discussing the results of similar research studies, we don't always find alignment as far as the impact of these technology-related and non-technology-related variables on nomophobic behaviours. For this reason we are not recommending unquestioned acceptance of the generalizability of the results of this study for the whole preservice teacher population. Instead, we highlight the external validity of our work, since we have implemented both strategies for addressing external validity threats. First, we thoroughly engaged with literature to build on previous related studies and we limited the research focus by comparing our findings with existing studies in the literature (Burkholder et al., 2020). In addition, we reflected on ways in which our findings may apply, or generalize, to other settings. Following the principles of Shadish (1995), we consider applicable our findings to another setting, in terms of the sampling size and method, the data collection instrument and duration of the research.

In this context, future studies can be performed on other Colleges of Education in Ghana, since the present study selected only five out of the forty-six Colleges of Education. This is considered necessary for countries like Ghana or other African countries with very high mobile penetration (more than 120% in the case of Ghana according to Butakor, 2021). Also, while teachers (including preservice teachers) got access to smartphones and secure digital cards from governmental and international

initiatives to reduce the digital divide between "advantaged and disadvantaged" and/or to ensure that the learning is not disrupted during the COVID-19 pandemic (Transforming Teaching, Education and Learning, 2020), there is no research on how these technologies are used and the implications of their use in the users' personal and professional lives.

The methodology followed can also be replicated to other countries and Teacher Education institutions, since we provide clear and replicable guidelines on data collection and analysis, as we as information about the duration such studies can have, while we include current and credible similar studies in our literature review.

Finally, we recommend future research to be conducted to stimulate smartphone use patterns on academic productivity and performance of the preservice teachers, and to consider extending the age group to clarify the effect on nomophobia.

6 Conclusions

As demonstrated by the present study, the boundary between regular use of smartphones and addictive behaviour is becoming blurred increasingly among preservice teachers. The present study provides prefatory support for the prevalence of nomophobia among Ghanaian preservice teachers. Furthermore, it was unearthed that preservice teachers' nomophobia levels were associated with gender, age, active internet service, and smartphone ownership.

As a result, teacher education institutions must regulate and take imminent steps to guarantee that this exposed group receives adequate knowledge and literacy about nomophobia and moderate prevailing misconceptions. Providing appropriate counselling methods via awareness by qualified health experts and counsellors can help to reduce nomophobia. There is also a necessity for comprehensive research into preservice teachers' behaviour and perceptions regarding nomophobia to develop effective interventions for teachers at risk. Ultimately, the regulation of smartphone uses to promote educational practices could benefit this situation, which sceptically impairs academic productivity.

Conflict of interest None.

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