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Addictive use of smartphone, depression and anxiety among female undergraduates in Nigeria: a cross-sectional study

Addictive use
of smartphone
and anxiety

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Abstract

Purpose – This study examined the prevalence and relationship between addictive use of smartphones and symptoms of depression and anxiety among female undergraduates.

Design/methodology/approach – Standardized scales were used to measure the addictive use of smartphones, depression and anxiety among 398 female students (mean age 21.75 years, SD = 2.67) at two large higher institutions in southwest Nigeria and were opportunistically sampled. Two hypotheses were tested using Spearman's rho and Mann–Whitney *U* tests.

Findings – The results showed that 1.01% of the respondents were probable smartphone addicts and 17.34% were at-risk, while 14.32% and 16.33% manifested symptoms of anxiety and moderate-to-severe depression, respectively. Depression ($r = 0.24, p < 0.01$) and anxiety ($r = 0.21, p < 0.01$) have significant relationship with addictive use of smartphone. Addictive/at-risk smartphone users significantly scored higher on symptoms of depression (average rank of 233.40) than normal smartphone users (average rank of 191.88); $U = 9387.50; z = -2.81, p < 0.05$; Also, addictive/at-risk smartphone users reported significantly higher level of anxiety (average rank of 229.27) than normal smartphone users (average rank of 192.81); $U = 9689.00; z = -2.46, p < 0.05$.

Research limitations/implications – Generalizing these results to a clinical setting and other at-risk demographic groups might prove difficult due to the respondents' condition of homogeneity.

Practical implications – The findings suggest that relationships exist between the addictive use of smartphones and symptoms of depression and anxiety among undergraduate students in southwest Nigeria. Clinicians should assess smartphone use in the management of depression and anxiety disorders.

Social implications – University administrators should target prevention and intervention strategies that would assist students to be taught positive ways of using their smartphones.

Originality/value – The study contributes to the body of knowledge by revealing relationships between smartphone addiction and mental health in an African sample.

Keywords Smartphone addiction, Depression, Anxiety, Addictive behavior, Mental health

Paper type Research paper

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Introduction

Depression is a mental illness characterized by sadness, loss of interest, feelings of hopelessness, disturbed sleep, poor concentration, thought of attempting or committing suicide and substantial impairment on the ability to cope with daily life [1]. Anxiety disorders are a group of mental illnesses characterized by persistent feelings of worry, fear and anxiety. The symptoms, which can range from mild to severe, interfere with one's daily activities. Addictions are majorly categorized into either substance addiction or behavioral addiction [2], with both having similar symptoms like craving, impulse-control problems, tolerance building, withdrawal, mood modification, daily-life disturbance, relapse and being preoccupied with the addiction [3]. Substance addiction involves the use of a chemical substance such as alcohol, marijuana and tobacco, while behavioral addiction refers to being addicted to smartphone, gambling, pornography, social media and others involving human-machine interaction [4, 5].

Smartphones are real-time information providers with advanced computing capabilities that have shrunk the inequalities in Internet access and provides more equal opportunities for many people [6]. Many smartphone users carry their phones everywhere and use them for an average of 150 times per day [7], while many young people spend more than 6 hours on their smartphones each day [8]. It is postulated that the escalating dependence on smartphones by students and young adults may be indicative of a transition from the habitual use of smartphones into an addictive use of it [9]. The addictive use could result in accidents, psychological detachment, countless negative effects on physical health and various types of mental illness [10, 11]. A 2015 Pew Research study on US smartphone use [12] revealed that 46% of smartphone users reported that they felt they could not live without their phone. The addictive, excessive and compulsive use of smartphones have been described with terms such as "problematic mobile phone use" [13, 14], "smartphone addiction" [15–17], "pathological smartphone use" [18], "overuse of wireless devices" [19], "mobile phone addiction" [20], "mobile phone dependence" [21], "compulsive mobile phone use" [22], and "mobile phone overuse" [23] referred to it. Elhai and colleagues opined that these terms are related and can be used as synonyms [10].

A study on the relationship of smartphone use severity with depression and anxiety among 319 Turkish university students concluded that depression and anxiety were associated with smartphone overuse, and the overuse may, in turn, result in depression and/or anxiety [24]. Furthermore, a positive relationship between smartphone addiction, anxiety and depression was reported among 688 randomly selected undergraduate students in Lebanon [25]. Similarly, a one-year investigation into mobile phone use among 4159 young adults in Sweden revealed that frequent mobile phone use was a risk factor for depressive symptoms [26]. An earlier study conducted in Taiwan also concluded that problematic mobile phone usage is linked with depression [27].

Cheever and colleagues [19] conducted experiments on the impact of separation from the smartphone on anxiety levels among 163 college students. The experimenters revealed that heavy smartphone users showed increasingly aggravated anxiety within 10 min, moderate users reported anxiety halfway through the study and light users showed no increase in anxiety. A similar study showed that the time spent using a smartphone was found to be positively related to anxiety about not checking in often enough with technology [28]. Further studies in South Korea indicate that anxiety and depression were higher among smartphone over-users than normal users [29, 30].

Contrastively, higher smartphone use for calls was associated with higher mental well-being and positive affect among a sample of 514 adults in China [31] and was negatively associated with social anxiety as revealed by an application log study [32]. Similarly, a study among a sample of 308 adults in the United States reported that the frequency of smartphone use was negatively associated with depressive symptoms [33]. While lower level of

smartphone addiction was associated with lower levels of anxiety but higher level of depression scores [34].

Researchers [35,36] indicated that female participants have the tendency to be more self-aware and expressed their problems more openly than the male participants by their higher self-reporting scores [35]. Females reported greater access to a smartphone with Internet access compared with males [37], and smartphone addiction was found to be more prevalent in females than in males [10,24,34]. Researchers have reported contradictory effects of excessive smartphone usage among female participants [14,38] and suggested that further study was necessary on the new possible aspects by gender [39].

Young adults, the “digital natives” and undergraduate students are generally early adopters of new technology [40,41] and are more likely to own smartphones than other age groups [42]. Alas, younger adults are more predisposed to experiencing problematic use of smartphones [40]. Most young people reached for their phone within 15 minutes of waking up [43], and many of them have the tendency to concentrate while using smartphones compared to older people [44]. In other words, young people have a higher risk of smartphone addiction compared to adults [3,8,11,45]. These studies imply that this problem may worsen in the future as these young adults grow older.

Research on the relationship between addictive use of smartphone and mental health is mostly conducted in Western and Asian countries [10,15], but scarce literature on the African population [3,46]. Although industry projections suggest that the smartphone adoption rate in sub-Saharan Africa will increase in the coming years [47]. Therefore, this study will contribute to knowledge by examining the relationship between depression, anxiety and smartphone addiction among female undergraduates in Ibadan, Nigeria.

Statement of hypotheses

- (1) There will be a significant relationship between smartphone addiction and symptoms of depression and anxiety among female undergraduates in Nigeria.
- (2) There will be a significant difference in symptoms of depression and anxiety between normal and addictive smartphone users among female undergraduates in Nigeria.

Methodology

The study was a survey research design. The dependent variables investigated were symptoms of depression and anxiety, while the independent variable is smartphone addiction. The study population was female undergraduate students. The University of Ibadan and The Polytechnic, Ibadan, Nigeria, were purposively selected, while respondents were conveniently recruited within the campuses at relaxation gardens, classrooms and departmental foyers between December 2017 and February 2018. The eligibility criteria were that respondents must be female students of the selected institutions, 16 years or older and must own a smartphone.

The study procedures were carried out in accordance with the Declaration of Helsinki, and the ethical protocol was reviewed and approved by the authors' departmental ethics committee at The Polytechnic, Ibadan, Nigeria.

All respondents were informed about the study protocol and provided written informed consent prior to participation, while those below 18 years, in addition, provided assent. Their participation was voluntary and anonymous, as no identifiers or personal information were collected. Out of the 500 distributed questionnaires, 480 were retrieved; 82 were excluded due to incomplete responses, and 398 correctly filled questionnaires (79.6% response rate) were analyzed.

Instruments

Smartphone Addiction Scale-Short Version (SAS-SV) [11] is a 10-item self-reported screening scale that can be used to help prevent smartphone addiction in communities or schools. A six-point Likert scale (1: “strongly disagree” and 6: “strongly agree”) for items, such as having my smartphone in my mind even when I am not using it won’t be able to stand not having a smartphone, using my smartphone longer than I had intended and so forth, were used to identify the level of the smartphone addiction risk and to distinguish the high-risk group. A Cronbach’s alpha of 0.83 was obtained in this study, although 0.91 was reported by the original author [11]. The total score in the SAS-SV is 60 and the cut off value set at 32 [48], and those who scored higher than the cut-off values are considered as high-risk for smartphone addiction while those in the 90th percentile of SAS-SV score are probably pathological smartphone addicts [46].

Patient Health Questionnaire (PHQ-9) [49] is a 9-item shortened version of the full Patient Health Questionnaire aimed at detecting depression. It has 61% sensitivity and 94% specificity in adults and is also used to monitor the severity of depression and response to treatment among at-risk populations such as those with coronary heart disease or university students. Consistent with the diagnostic criteria of Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) [50], each item is rated according to how persistent symptoms have been in the past two weeks, from 0 (not at all) to 3 (nearly every day), with the total score ranging from 0 to 27. The original authors reported good internal consistency (Cronbach’s $\alpha = 0.89$) and test-retest reliability ($r = 0.84$), while a Cronbach’s alpha of 0.82 was obtained in this study. It has been validated for use in Nigeria [51], specifically Southwest Nigeria, to assess the prevalence and predictors of depression among Nigerian students and reported internal consistency of 0.85 and optimal cut-off score for depressive disorder as 5. A total score between 0–4 suggests minimal depression, that is, the patient may not need treatment, 5–9 is mild, 10–14 is moderate depression, while 15–19 and 20–27 are grouped as moderately severe and severe depression, respectively [49].

Generalized Anxiety Disorder Scale (GAD-7) [52] is a validated 7-item brief screening instrument for GAD in the general population and primary care. This measure was validated in primary care patients, and further in international populations [53] and the general population [54]. A Cronbach’s alpha of 0.85 was obtained in this study, while 0.92 was reported by the authors. Respondents rate the presence of symptoms on a 4-point scale as occurring “not at all” (0), “several days” (1), “more than half the days” (2) or “nearly every day” (3) during the past two weeks to questions such as feeling nervous, anxious, on edge or worrying a lot about different things; and feeling restless so that it is hard to sit still. Items are summed to create a symptom severity score ranging from 0 to 21. Respondents met the measure’s established criteria of GAD if the total score on the GAD-7 was above 11.

Statistical analysis

Demographic information and prevalence rate of smartphone addiction, depression and anxiety are presented using descriptive statistics including mean, standard deviation, frequency and percentages, and the Shapiro–Wilk test of normality. The relationship between depression, anxiety and smartphone addiction was analyzed with the aid of inferential statistics using Statistical Package for the Social Sciences version 22. Spearman’s correlation (ρ) was used to determine the nature and significance of the relationship between depression, anxiety and smartphone addiction, while Mann–Whitney U test was used to analyze the difference between normal and addictive/at-risk smartphone users on symptoms of anxiety and depression. All p -values of <0.01 were considered statistically significant.

Results

Table 1 shows that the age of the 398 female participants ranged from 16 to 32 years with a mean of 21.75 ± 2.67 .

Table 2 shows that 4 (1.01%) manifested with probable smartphone addiction and 69 (17.34%) were at-risk of smartphone addiction as assessed with the Smartphone Addiction Scale-Short Version (SAS-SV). The assessment of depression severity score by the Patient Health Questionnaire (PHQ-9) revealed that 52 (13.07%), 8 (2.01%) and 5 (1.26%) suffer from moderate, moderately severe and severe depression, respectively, while GAD-7 showed that 57 (14.32%) of the respondent's manifest anxiety. The p -value for the Shapiro–Wilk test is 0.001, suggesting that the data are not normally distributed. Therefore, the assumption of normality is violated.

To test the first hypothesis, a Spearman correlation coefficient analysis was used (since the research data are not normally distributed) to assess the strength of the bivariate relationships between smartphone addiction and symptoms of depression and anxiety among female undergraduates in Nigeria. The Spearman correlation coefficients (ρ) result presented in Table 3 revealed significantly positive relationship between smartphone addiction and symptoms of depression ($r_s = 0.24, p < 0.01$) and anxiety ($r_s = 0.21, p < 0.01$). This hypothesis was confirmed and accepted.

The second hypothesis, tested using the Mann–Whitney U test, states that there will be a significant difference in symptoms of depression and anxiety between normal and addictive female undergraduate smartphone users. Results, as presented in Table 4, indicate that addictive/at-risk smartphone users scored higher on symptoms of depression (average rank

	Variables	Freq.	%	Mean	SD
Age (years)	16–20	132	33.17	21.75	2.67
	21–25	230	57.79		
	26–32	36	9.04		
Institutions	University of Ibadan	179	45.00	55.00	
	The Polytechnic, Ibadan	219	55.00		
Class year*	100 / National Diploma I	122	30.65	27.39	
	200 / National Diploma II	109	27.39		
	300 / Higher National Diploma I	118	29.65		
	400 / Higher National Diploma II	49	12.31		

Note(s): *Class year for most courses in Nigerian higher institutions runs for four years, the first two years of study in the polytechnic education system are referred to as National Diploma (ND I & II) and the last two years as Higher National Diploma (HND I & II)

Table 1.
Participants'
demographics
($N = 398$)

Variables	Psychological status	Frequency (%)	W	df	p
Smartphone addiction	Normal user (<32)	325 (81.66)	0.98	398	<0.001
	At-risk of smartphone addiction (32–44)	69 (17.34)			
	Smartphone addicts (>44)	4 (1.00)			
Depression	Minimal depression (0–4)	146 (36.68)	0.92	398	<0.001
	Mild depression (5–9)	187 (46.98)			
	Moderate depression (10–14)	52 (13.07)			
	Moderately severe depression (15–19)	8 (2.01)			
	Severe depression (20–27)	5 (1.26)			
Anxiety	Normal	341 (85.68)	0.94	398	<0.001
	Anxious	57 (14.32)			

Table 2.
Prevalence rates and
Tests of Normality
(Shapiro–Wilk) of
smartphone addiction,
depression and anxiety
among the
participants ($N = 398$)

of 233.40) than normal smartphone users (average rank of 191.88), indicating a significant influence of smartphone usage on symptoms of depression ($U = 9387.50; z = -2.81, p < 0.05$) among female undergraduates.

Table 5 indicates that addictive/at-risk smartphone users scored higher on symptoms of anxiety (average rank of 229.27) than normal smartphone users (average rank of 192.81), indicating a significant influence of smartphone usage on symptoms of anxiety ($U = 9689.00; z = -2.46, p < 0.05$) among female undergraduates. Hypothesis 2 tested and supported.

Discussion

The findings revealed that 18.35% of the respondents are probably smartphone addicts or were at-risk of smartphone addiction, while 81.66% can be considered as non-addicted to smartphone usage. This result is similar to the 16.90% prevalence reported in a sample of 1,519 students in Switzerland [55] and the 2015 Pew Research study on US smartphone use which found that many smartphone users felt they could not live without their phone [12]. However, the result in this study is inverse to the 81% prevalence of slightly or probably addiction to smartphone usage reported by a cross-sectional study conducted in Saudi Arabia [48].

With regard to symptoms of anxiety, it was 14.32% in this sample, and a lower prevalence of 7.00% was reported among US young adults in 2016 [38], while 9.50% of the sampled 240 medical students of Lagos State University, Lagos, Nigeria, manifested anxiety [56]. A similar study conducted in Lebanon reported a 26.50% prevalence of anxiety disorder among undergraduates [25].

The results showed that 46.98% of the respondents suffered mild depression and 16.33% of the respondents suffered from moderate, moderately severe and severe depression

Table 3. Spearman’s rho correlation coefficients of study variables

Variable $N = 398$	1	2	3
1 Smartphone addiction	–		
2 Depression	0.24**	–	
3 Anxiety	0.22**	0.57**	–

Note(s): **Spearman’s rho correlation is significant at the 0.01 (2-tailed)

Table 4. Mann–Whitney U test showing the difference between normal and addictive/at-risk smartphone users on symptoms of depression

Variable	Source	N	Mean ranks	Sum of ranks	Mann–Whitney U	Z	p
Smartphone users	Addictive/at-risk	73	233.40	17038.50	9387.50	–2.81	0.01
	Normal	325	191.88	62362.50			

Note(s): Dependent Variable: Depression

Table 5. Mann–Whitney U test showing the difference between normal and addictive/at-risk smartphone users on symptoms of anxiety

Variable	Source	N	Mean ranks	Sum of ranks	Mann–Whitney U	Z	p
Smartphone users	Addictive/at-risk	73	229.27	16737.00	9689.00	–2.46	0.01
	Normal	325	192.81	62664.00			

Note(s): Dependent Variable: Anxiety

collectively, which is similar to 58.20% prevalence found among 127 undergraduate students of Ahmadu Bello University (ABU), Zaria, Nigeria [57], and 16.6% prevalence of moderate, moderately severe and severe depression in another sample of university students in Nigeria [58]. Although the findings reported are more than the 6% among young adults in the United States [38], they were 21.8% among 688 undergraduate students in Lebanon [25], and 32.20% among 820 students of Obafemi Awolowo University, Ile-Ife, Nigeria [59].

The significantly positive relationship between smartphone addiction and symptoms of depression and anxiety among female undergraduates in Nigeria was confirmed by previous studies that found a positive relationship between smartphone addiction and levels of anxiety and depression [10,24,25,48]. However, the finding contracted a negative association between frequent smartphone use and depressive symptoms found by researchers in China [32], the United States [33] and South Korea [34].

Furthermore, the study found that normal and addictive/at-risk smartphone users reported a significant difference in their scores on symptoms of depression. This result supported previous studies that found individuals with smartphone addiction as more likely to be depressed [24–27,29,30]. This study also revealed a significant difference in symptoms of anxiety between normal and addictive smartphone users. This result corroborated the experiment on the impact of separation from smartphone on anxiety levels of students [19,28] which affirmed that addictive smartphone users showed higher level of anxiety after separation from smartphones, whereas light users showed no increase in anxiety and other studies that examined the relationship between smartphone usage and anxiety [24,25,29,30]. Although there was a significant difference in the scores of symptoms of depression and anxiety between the normal and addictive/at-risk smartphone users, the levels of depression and anxiety are in the same region.

Conclusion

This study investigated and revealed the prevalence and relationship between smartphone addiction and symptoms of depression and anxiety among female undergraduates, as excessive use of smartphones tends to imply negative impacts on mental health. The implications of the study include its ability to show that symptoms of anxiety and depression are associated with smartphone addiction among female undergraduates in Nigeria. As for public health implications, psychotherapy services should be made easily accessible to students in the study area. Students, parents, academic institutions and therapists need to consider new approaches to smartphone use, as results showed that excessive smartphone use is linked to smartphone addiction which is positively correlated to symptoms of depression and anxiety. However, we cannot definitively conclude that smartphone addiction is directly indicative of poor mental health due to the correlational nature of these results. Smartphone users are advised to take “technology breaks” and moderate their use of a smartphone to reduce its adverse effects on mental health. Although depression and anxiety disorders cannot be exclusively linked to smartphone addiction, treatment and management of depression and anxiety disorders should include assessment of smartphone use. As for academic and social implications, university administrators should target prevention and intervention strategies that would assist students to be taught positive ways of using their smartphones, and those with mental health issues can learn to use their smartphone as a coping device.

Limitation

There are a few numbers of the limitation in this research. First of all, generalizing these results to a clinical setting and other at-risk demographic groups might prove difficult due to the respondents’ condition of homogeneity – all the participants were female

undergraduates in the same city. Secondly, the self-report nature of the questionnaire means it is possible that the respondents might experience social desirability and give the socially appropriate answer or skip the question. Thirdly, these results were correlational rather than predictive; therefore, the researchers were only able to show that a trend exists between the variables but were unable to establish a predictive model of their relationship. Fourthly, important confounders such as social support, socio-economic status, academic performance, a preexisting history of mood/or other psychiatric disorders and related psychosocial factors were not examined in this study. A further limitation was that certain mental health measures were brief screenings and may be interpreted only as indicators of poor mental health [59]. However, the strength of our study lies in it assessing for the current prevalence of smartphone addiction and symptoms of depression and anxiety, and our moderately large sample size. Also, the study contributes to the body of knowledge by revealing relationships between smartphone addiction and mental health among female undergraduates in Nigeria.

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