

The Influence of Smartphone Use on Psychological Distress in University Undergraduates

James Ayodele Ogunmodede¹, Bolade Folasade Dele-Ojo^{2*}, Adebunola Jane Ogunmodede³, Oluwabunmi Idera Nimata Buhari⁴, Olalekan Ayodele Agede⁵, Mathew Olumuyiwa Bojuwoye¹, Hamza Abiodun Bello⁶, Abdullahi Ganiyu Olatunji⁷, Louis Okeibunor Odeigah⁸

¹Department of Medicine, University of Ilorin, Ilorin, Kwara State, Nigeria

²Department of Medicine, Ekiti state University, Ado-Ekiti, Ekiti state, Nigeria

³Department of Behavioural Sciences, University of Ilorin Teaching Hospital, Ilorin, Kwara State, Nigeria

⁴Department of Behavioural Sciences, University of Ilorin, Ilorin, Kwara State, Nigeria

⁵Department of Pharmacology and Therapeutics, University of Ilorin, Ilorin, Kwara State, Nigeria

⁶Department of Medicine, University of Ilorin Teaching Hospital, Ilorin, Kwara State, Nigeria

⁷Department of Sociology, University of Ilorin, Ilorin, Kwara State, Nigeria

⁸Department of Family Medicine, University of Ilorin, Ilorin, Kwara State, Nigeria

Article history:

Received: March 13, 2023

Revised: April 25, 2023

Accepted: May 5, 2023

ePublished: June 30, 2023

*Corresponding author:

Bolade Folasade Dele-Ojo,
Email: bolade.dele-ojo@eksu.edu.ng

Abstract

Background: Smartphone use has been shown to have effects on psychological health outcomes. There is evidence that the psychological effects of smartphones on young people are significant. It is associated with anxiety, depression, and psychological distress in various populations. The tendency to spend cumulatively long durations exposed to smartphones is an emerging phenomenon among university undergraduates. This study aimed at determining the relationship between smartphone use and psychological distress in university undergraduates.

Methods: Data for this cross-sectional study were collected from 3,325 undergraduates of the University of Ilorin, Nigeria in September 2021 using a Sociodemographic proforma, Smartphone Addiction Scale-Short version, and psychological distress was measured using the 12-item General Health Questionnaire (GHQ-12). Data were analyzed using SPSS 23.

Results: The mean age of respondents was 21.3+2.59 years, and 1835 (55.2%) of them were females. In addition, 3305 (99.4%) owned smartphones, and 720 (21.7%) had more than one smartphone. Psychological distress was present in 1097 smartphone users (33.2%). The level of study ($P=0.002$), presence of problematic smartphone use (PSU, $P<0.001$), total time spent on the phone per day ($P=0.014$), and the time spent on social media per day ($P<0.001$), as well as leaving the phone data on all day ($P=0.001$) and engaging in overnight calls or social media chats ($P<0.026$), Facebook ($P=0.001$), WeChat ($P=0.001$), and Snapchat ($P=0.001$), were significantly associated with psychological distress. Independent predictors of psychological distress were being in year 5 (OR=0.548, $P=0.008$), presence of PSU (OR=1.586, $P<0.001$), switching on phone data throughout the day (OR=1.388, $P<0.001$), and use of WeChat (OR=1.451, $P<0.027$) and Facebook (OR=0.703, $P<0.001$).

Conclusion: Our findings revealed that important smartphone-related indices such as PSU, switching on phone data access all day, and WeChat were predictive of increased levels of psychological distress. Structured counselling about the productive use of smartphones should be administered in the early years of study for university undergraduates.

Keywords: Psychological distress, Social media addiction, Smartphone addiction



Please cite this article as follows: Ogunmodede JA, Dele-Ojo BF, Ogunmodede AJ, Buhari OIN, Agede OA, Bojuwoye MO, et al. The influence of smartphone use on psychological distress in university undergraduates. J Educ Community Health. 2023; 10(2):78-86. doi:10.34172/jech.2023.2314

Introduction

There has been an upsurge in smartphone ownership in the last ten years (1). Approximately 67% of Africans now own smartphones. Internet penetration also increased concurrently rising from 5.6% to 25.7% between 2006 and 2016 (2). There is no doubt that smartphones enable people to do more and to complete certain tasks more efficiently,

making them appealing to university undergraduates. Smartphone companies also increasingly target adolescents and young adults. The availability of different educational applications (Apps) on smartphones enhances learning, execution of assignments, and research. However, the usage of smartphones for other functions other than educational reasons is also prevalent among university



undergraduates, especially with the availability of cheap internet access (3). Apps abound for many other functions and activities that captivate the youth such as social media and social networking, gambling, and internet access. Thus, despite being useful as a learning aid, smartphones are also a gateway to involvement in many other online or app-based activities and have become a focal object influencing social, psychological, and behavioral aspects of their lives (4). The tendency to spend cumulatively long durations daily exposed to smartphones is an emerging phenomenon. Because of its potential disruptive capacity, the phenomenon of excessive smartphone use or smartphone addiction has been described and termed “problematic smartphone use” (PSU) (5,6). PSU has been shown to have effects on psychological health outcomes. It is associated with anxiety, depression (7), and psychological distress (8) in various populations. In a study of university undergraduates in Iran, Alavi et al underscored the relationship between mental illness and PSU when they showed that students with bipolar spectrum disorders had an increased risk of smartphone addiction by 4.2 folds, and those with anxiety had a 1.2-fold increase in the probability of developing smartphone addiction (9).

University undergraduates in our country are usually teenagers and young adults who are normally impressionable and, in some cases, are still in the process of developing their personalities (10). Evidence abounds that the psychological effects of smartphones on young people is significant (7). It has been identified, for example, that many young people depend on social media platforms to define their identities and express themselves, and it may, therefore, be important to the fulfillment of their perceived emotional and psychological needs and wants (11). The prevalence of PSU is high among university undergraduates. Afe et al (12) and Chen et al (13) reported a prevalence of 34.5% and 29.8% in Sagamu southwestern Nigeria and China, respectively. In addition, the corresponding prevalence was reported 59.8% in Jordan and 27.2% in Saudi Arabia by Alburan et al (14). Undoubtedly, for university undergraduates, smartphones are now an indispensable item of daily living, and their potential link with psychological distress is a relationship that ought to be explored because it will form the basis for any subsequent intervention. However, these negative effects have not been studied in large numbers of African university undergraduates. Most of the studies in the African context are of small samples of undergraduates. This study sought to determine the relationship between smartphone ownership, smartphone use, and psychological distress in a large sample of university undergraduates.

Materials and Methods

Study Design and Participants

This was a cross-sectional study among the students of the University of Ilorin (UNILORIN). UNILORIN is a federal government-owned institution located in Ilorin, North

Central Nigeria. It has 16 faculties and an undergraduate population of 44 897 recruited from all of the country's 36 states. The sample size was determined as recommended for surveys on addiction among students in schools. About 10% of the sampling frame population is recommended by United Nations Office on Drugs and Crime but a population of between two thousand and three thousand is recommended where this appears too large to achieve (15). After giving room for attrition, a sample size of 3325 undergraduate students was considered for the study using the multistage sampling technique ensuring proportional representation across the selected faculties and departments in 3 stages:

Stage 1

Two-thirds [11] of the 16 faculties were randomly selected by balloting without replacement. A sampling-by-size approach (proportional allocation) was employed to determine the number of respondents in each faculty.

Stage 2

A list of the departments in each of the selected faculties was obtained, and two-thirds of the number of departments in each faculty was randomly selected using balloting without replacement. A sampling-by-size approach (proportional allocation) was also applied to determine the number of respondents in each department.

The allocation of respondents at the faculty and departmental level (Stages 1 and 2) was based on the sampling-by-size approach (proportional allocation) using the following formula:

At the level of faculty:

$$\text{Sample} = n/N \times n_i$$

n = The total number of students at the specific faculty.

N = The total number of students for all participating faculties.

n_i = The total sample size required for the study at the institution.

Stage 3

In each of the selected departments, eligible respondents were randomly selected balloting without replacement until obtaining the desired sample size for the department. The inclusion criterion was all consenting to full-time undergraduate students of UNILORIN to study for a first degree. On the other hand, the first-year undergraduate students were excluded because they did not have the university's statutory cumulative grade point average (CGPA) yet. The study instruments were self-administered after obtaining informed consent.

Measurements

The data were collected using:

i) A socio-demographic questionnaire with questions on the student biodata, level of study, use of various smartphone ownership, duration of smartphone usage per day, social media app usage, and specific smartphone usage habits such as data usage, bedtime phone usage, and engagement in overnight phone calls or social media chats. It also recorded academic performance using the university's statutory CGPA. The CGPA is graded from 1 to 5 correlating to increasing order of academic performance.

ii) Smartphone addiction scale-short version (SAS-SV), developed by Kwon et al with internal consistency and concurrent validity verified with a Cronbach's alpha of 0.82 (16), was used to examine smartphone addiction. It consists of 6 factors (loss of control, daily-life disturbance, disregard for consequence, withdrawal, preoccupation, and tolerance) which are accessed through 10 questions based on self-reporting six-point Likert-type scale (1: "Strongly disagree", 2: "Disagree", 3: "Weakly disagree", 4: "Weakly agree", 5: "Agree", and 6: "Strongly agree"). The cut-off value for males was >43 and >42 for females according to norms established by Akpunne and Akinnawo in Nigerian undergraduates (16).

iii) The 12-item General Health Questionnaire (GHQ-12), which has been shown to have internal consistency and concurrent validity verified with a Cronbach's alpha of 0.87, was employed to measure psychological distress (17,18). It measures factors such as being able to concentrate, experiencing loss of sleep over worry, playing a useful part in society, being capable of making decisions, being constantly under strain, and being unable to overcome difficulties. The other factors are enjoying normal activities, facing up to problems, being unhappy and depressed, losing confidence in yourself, thinking of yourself as worthless, and feeling reasonably happy. The items are scored on a 4-point severity scale (0-3) to indicate the extent to which respondents have experienced each symptom over the past two weeks. Items' scores are added to create a total score of distress. A total score of >3 is regarded as the presence of psychological distress according to locally established norms (19).

Data Analysis

Data were analyzed using SPSS, version 23 (SPSS Inc., Chicago, Illinois). Normally distributed continuous variables were expressed as means \pm standard deviations (SD), while continuous variables which were skewed were expressed as medians and interquartile ranges (IQR). Categorical variables were expressed as percentages. The chi-square test was used to assess the relationship between categorical variables and the presence of psychological distress. The Student's *t* test was employed to test for an association between normally distributed continuous variables and psychological distress. The association between skewed variables and psychological distress was tested using the Mann-Whitney U test. Variables that had a significant association with the presence of psychological distress were inputted into a binary logistic

regression model using the enter method in order to identify independent predictors of psychological distress. The confidence interval was set at 95%, and statistical significance was set at $P < 0.05$.

Results

Based on the data in Table 1, the mean \pm SD age of respondents was 21.3 \pm 2.59 years (range 16-40 years), mostly females (55.2%). Smartphone ownership prevalence was 99.4% (3305), and 720 students (21.7%) had more than 1 smartphone. The median duration of time spent on the

Table 1. Socio-demographic Variables of Study Participants (N=3325)

Variable	No. (%) / Mean \pm SD / Median (IQR)
Age (y)	21.3 \pm 2.59
Gender	
Male	1491 (44.8)
Female	1834 (55.2)
Level of study	
Year 2	1064 (32.1)
Year 3	1309 (39.4)
Year 4	790 (23.7)
Year 5	145 (4.3)
Year 6	17 (0.5)
CGPA rank	
< 1.5	7 (0.2)
1.5-2.39	290 (8.8)
2.4-3.49	1363 (41)
3.5-4.49	1368 (41.1)
4.5-5.0	297 (8.9)
Type of course of study	
Humanities	1271 (38.2)
Science	2054 (61.8)
Owens at least one smartphone	3305 (99.4)
Owens > 1 smartphone	720 (21.7)
Problematic smartphone usage present (n=3305)	458 (13.9)
Presence of psychological distress among smartphone owners	1097 (33.2)
Number of phone calls made or received in a day	5 (IQR: 4-10)
Total time spent with the phone per day (min)	540 (IQR: 300-900)
Time spent on phone calls per day (min)	30 (IQR: 10-60)
Time spent on social media per day (min)	300 (IQR: 120-600)
Use of social media apps	
WhatsApp	3255 (98.5)
Facebook	2542 (76.9)
YouTube	2528 (76.4)
Instagram	2421 (73.3)
Snapchat	2027 (61.3)
Twitter	1767 (53.5)
WeChat	219 (6.6)

Note. CGPA: Cumulative grade point average; SD: Standard deviation; IQR: Interquartile range.

phone per day was 540 minutes (IQR: 300-900, range: 30-1080 minutes). The median time spent on phone calls and social media per day was 30 minutes (IQR: 10-60, range: 5-90 minutes) and 300 minutes (IQR: 120-600, range: 20-900 minutes), respectively. PSU and psychological distress were present in 13.9% (458) and 1097 smartphone users (33.2%), respectively.

Cumulative Grade Point Average and Interquartile Range

Table 2 lists factors associated with psychological distress among students who owned smartphones, including the level of study ($P=0.002$), presence of PSU ($P<0.001$), total time spent on the phone per day ($P=0.014$), the time spent on social media per day ($P<0.001$), and experience of headaches during or within one hour of smartphone usage ($P<0.001$). Specific habits such as leaving the phone data on all day ($P=0.001$) and engaging in overnight calls or social media chats ($P<0.026$) were also significantly associated with psychological distress. Social media apps that were significantly associated with psychological distress were Facebook ($P=0.001$), WeChat ($P=0.001$), and Snapchat ($P=0.001$).

According to the results (Table 3), the independent predictors of psychological distress in this study included being in year 5 (OR=0.548, $P=0.008$), the presence of PSU (OR=1.586, $P<0.001$), switching on phone data throughout the day (OR=1.388, $P<0.001$), use of social media app WeChat (OR=1.451, $P<0.027$), use of Facebook (OR=0.703, $P<0.001$), an experience of headache during or within 1 hour of phone use (OR=0.597, $P<0.001$).

Discussion

University undergraduates, though being young adults, have been reported to experience psychological distress. Although university life comes with exciting experiences, it could also feature several challenging experiences such as problems with adjustment to the new environment of the school, problems with adjustment to independent living, long hours of study, irregular sleep patterns, and academic pressure, which all can exacerbate the risk of mental illness. Smartphones, given that they are now used for a wide variety of functions, are perceived as a necessity in personal and work lives but could also be a contributor to psychological distress potentially experienced by undergraduates.

The mean age of our respondents was similar to that observed by other researchers such as Chen et al in China (13), Asibong et al in Nigeria and (20), Al Battashi et al in Oman (21), and Alavi et al in Iran (9). The prevalence of psychological distress in our study is in line with the findings of Asibong et al (20) and Uwadiae et al (22) in neighbouring universities. However, a higher value of 41.1% was reported among Iranian students by Poorolajal et al among Iranian undergraduates (23). The variation may be related to the different social and cultural milieu of these studies (24).

The study level of students was significantly associated

with the presence of psychological distress in our respondents. Specifically, students in year 5 were only about half as likely as students in the reference group year 2 to experience psychological distress. It is possible that students of year 5 may be better psychologically adjusted to school life and thus experience less distress. Additionally, except for students of Medicine and Pharmacy, students in year 5 are in their final year, thus the feeling of being close to completing university education may enhance their psychological well-being.

The presence of PSU is also predictive of psychological distress in our student cohort. Students with PSU are one and half times as likely as those who are not smartphone addicted to have psychological distress, which conforms to the findings of a study performed by Lei et al on Malaysian undergraduates (25). They reported higher depression scores in undergraduates who had PSU. Similarly, Ithnain et al found high depression scores in their evaluation of undergraduates who were addicted to smartphones (26), suggesting that PSU negatively affects students' psychological health. The explanation for this is at least two-fold, and a bi-directional relationship between PSU and psychological distress has been reported in the literature. On the one hand, PSU can lead to psychological distress and illnesses; on the other hand, pre-existing psychological illness or certain personality traits can predispose an undergraduate to PSU.

Thomé et al opined that spending too much time on it can lead to a diminished sense of volitional control and mental health symptoms such as sleep disturbances and psychological distress. This diminished sense of volitional control is believed to induce the persistent smartphone activity found in PSU (27). Another perspective reinforcing of a bi-directional relationship between excessive smartphone use and psychological distress was proposed by Kardefelt-Winther; they posited that excessive smartphone use leads to psychological distress. Furthermore, pre-existing life problems and psychological stress may actually make smartphone users to repeatedly go online as a temporary "escape" to help them cope with psychosocial problems (28). Other workers have drawn similar deductions. Zhang et al stated that mood disorders make people more prone to addiction to smartphones (29). Lemola et al also concluded that excessive nocturnal use of smartphones and related devices was associated with depressive symptoms (30).

The relationship between PSU and the occurrence of psychological distress appears to be mediated in part through internet access. The habit of leaving the smartphone data on for internet access throughout the day and the use of the internet-based social media app WeChat were predictive of psychological distress. Leaving the phone's internet access on throughout the day will expose the student to the non-stop punctuations of his daily activities by the distraction of notifications from various apps on the phone. The inability to keep up with the requirement of responding to every notification may in

Table 2. Factors Associated With Psychological Distress Among Undergraduate Smartphone Owners (n=3305)

Variable	Psychological Distress Present No. (%) / Mean \pm SD / Median (IQR) (n=1097)	Psychological Distress Absent No. (%) / Mean \pm SD / Median (IQR) (n=2208)	Test Statistic χ^2 / t	P Value
Age (y)	21.26 \pm 2.58	21.31 \pm 2.58	0.521	0.603
Gender				
Male	507 (34.3)	973 (65.7)	1.377	0.242
Female	590 (32.3)	1235 (67.7)		
Level of study				
Year 2	353 (33.5)	702 (66.5)	16.661	0.002*
Year 3	462 (35.6)	836 (64.4)		
Year 4	243 (31.0)	542 (69.0)		
Year 5	30 (21.0)	113 (79.0)		
Year 6	3 (17.6)	14 (82.4)		
Current CGPA rank				
< 1.5	3 (50.0)	3 (50.0)	8.279	0.082
1.5-2.39	103 (38.0)	168 (62.0)		
2.4-3.49	433 (33.9)	844 (66.1)		
3.5-4.49	406 (31.7)	875 (68.3)		
4.5-5.0	107 (33.8)	170 (61.4)		
Course of study				
Humanities	439 (34.9)	819 (65.1)	2.661	0.103
Sciences	658 (32.1)	1389 (67.9)		
Problematic smartphone usage				
Present	207 (45.2)	251 (54.8)	34.828	<0.001*
Absent	895 (31.2)	1972 (68.8)		
Number of smartphones owned				
1	837 (32.7)	1722 (67.3)	0.892	0.347
>1	249 (34.6)	471 (65.4)		
Number of phone calls made or received in a day	5 (3-10)	5 (4-10)		0.299
Time spent on phone calls per day (min)	30 (10-60)	25 (10-60)		0.862
Time spent surfing social media per day (min)	300 (100-600)	300 (120-540)		0.044*
Total time spent with phone per day (min)	600 (300-900)	480 (300-840)		0.014*
Do you switch on phone data throughout the day?				
Yes	1561 (70.2)	663 (29.8)	36.4	<0.001*
No	607 (59.5)	414 (40.5)		
Do you use your smartphone in the bed when unable to sleep at night?				
Never	173 (67.6)	83 (32.4)	0.553	0.758
Sometimes	1072 (67.3)	521 (32.7)		
Most times	954 (66.1)	489 (33.9)		
Do you surf social media in the bed when about to sleep?				
Never	84 (65.1)	45 (34.9)	2.253	0.324
Sometimes	1053 (68.1)	493 (31.9)		
Most times	1057 (65.7)	552 (34.3)		
Do you engage in overnight calls or social media chats?				
Never	394 (71.5)	157 (28.5)	7.268	0.026*
Sometimes	1261 (66.3)	640 (33.7)		
Most times	542 (64.8)	295 (35.2)		
Headaches during or within 1 hour of Phone usage				
Yes	490 (42.2)	671 (57.8)	66.238	<0.001*
No	596 (28.2)	1517 (71.8)		

Table 2. Continued.

Variable	Psychological Distress Present No. (%) / Mean \pm SD / Median (IQR) (n = 1097)	Psychological Distress Absent No. (%) / Mean \pm SD / Median (IQR) (n = 2208)	Test Statistic χ^2 / t	P Value
Use of WhatsApp				
Yes	1083 (33.3)	2172 (66.7)	0.617	0.545
No	14 (28.0)	36 (72.0)		
Use of Facebook				
Yes	806 (31.7)	1736 (68.3)	10.947	0.001*
No	291 (38.1)	472 (61.9)		
Use of Twitter				
Yes	581 (32.9)	1186 (67.1)	0.166	0.684
No	516 (33.6)	1022 (66.4)		
Use of Instagram				
Yes	789 (32.6)	1632 (67.4)	1.481	0.226
No	308 (34.8)	576 (65.2)		
Use of WeChat				
Yes	94 (42.9)	125 (57.1)	10.014	0.002*
No	1003 (32.5)	2083 (67.5)		
Use of Snapchat				
Yes	716 (35.3)	1311 (64.7)	10.735	0.001*
No	381 (29.8)	897 (70.2)		
Use of YouTube				
Yes	845 (33.4)	1683 (66.6)	0.264	0.632
No	252 (32.4)	525 (67.6)		
Playing of online games				
Yes	589 (33.0)	1198 (67.0)	0.094	0.767
No	508 (33.5)	1010 (66.5)		

Note. SD: Standard deviation; IQR: Interquartile range; CGPA: Cumulative grade point average; Y: Yates corrected Chi-square, * $P < 0.05$ is considered statistically significant.

itself lead to a sense of distress. One suggested mechanism by Gupta et al through which the use of social media apps engenders psychological distress was that students who overused social media may neglect their school work and assignments and thereafter feel nervous and experience a sense of loss of control of themselves, both of which could increase psychological distress (31).

Interestingly the use of Facebook predicted a 30% less likelihood of psychological distress among users compared to non-users. The difference between the effects of WeChat and Facebook may be related to the different inherent nature of both media. WeChat is a calling and messaging app in which communication is restricted to the contacts of the owner. Facebook, on the other hand, in addition to the above-mentioned explanation, allows the viewing of a larger spectrum of media from the primary and secondary contacts of the user. Often media and posts from unknown sources can be available to a user once one of the user's contacts is tagged on such media. Facebook may also give an individual access to virtual content which may be educative and positively stimulating mentally. These contents could be shared through virtual live chats, and Facebook groups with contents that reduce distress can promote psychological wellness. Thus, in comparison,

Facebook content being more diverse may contain more entertainment and relaxation and educative factors than WeChat which contains information originating from known sources and specifically targeted at the user.

The effect of leaving the smartphone internet browsing data on all was found to predict psychological distress. In our respondents' circumstances, leaving smartphone browsing data on all day means non-stop access to internet-based and social media app-based notifications. This will predispose the user to frequent phone checks. Phone checking frequency has been found by Tng and Yang to predict the occurrence of psychological distress in the form of depression, anxiety, and stress levels (32). Frequent phone checks are one of the features of PSU and one of the means by which PSU causes users to incur frequent screen time. In the study by Tng and Yang, smartphone screen time was predictive of depression. Frequent phone checks occasioned by having notifications popping up all day on account of continuous internet access can be disruptive to an individual's daily schedule. It can cause anxiety by setting up heightened expectations in the smartphone user. It also increases the chance of getting distractive notifications. When expected messages or replies to messages do not come in, it could cause a

Table 3. Multivariate Analysis Showing the Predictors of Psychological Distress Among Participants

Variables	B	Odds Ratio	P Value	95% Confidence Interval	
				Lower	Upper
Level of study					
Year 2 (Ref)					
Year 3	0.099	1.105	0.314	0.910	1.314
Year 4	-0.074	0.929	0.520	0.741	1.163
Year 5	-0.601	0.548	0.008*	0.352	0.854
Year 6	-0.984	0.374	0.204	0.082	1.709
Problematic smartphone use present?					
No (Ref)					
Yes	0.461	1.586	<0.001*	1.258	2.000
Switching on phone data throughout the day					
No (Ref)					
Yes	0.328	1.388	<0.001*	1.160	1.660
Total time spent on the phone per day	0.001	1.000	0.646	1.000	1.002
Do you engage in overnight calls or social media chats?					
Never (Ref)					
Sometimes	0.081	1.085	0.503	0.855	1.376
Most times	-0.014	0.986	0.922	0.746	1.304
Total time spent on social media per day	0.001	1.000	0.998	1.000	1.004
Use of Snapchat					
No (Ref)					
Yes	0.113	1.119	0.215	0.937	1.337
Use of WeChat					
No (Ref)					
Yes	0.372	1.451	0.027*	1.004	2.017
Use of Facebook					
No (Ref)					
Yes	-0.352	0.703	<0.001*	0.580	0.853
Do you experience headache within 1 hour of phone use					
No (Ref)					
Yes	-0.517	0.597	<0.001*	0.503	0.707

Note. REF, Reference category, * $P < 0.05$ is statistically significant.

sense of despondency. Attending to notifications from internet-based apps all day will also increase the amount of time spent using the phone. For an undergraduate, this will come at the expense of time meant for studying, doing assignments, or building profitable social or academic networks. When this becomes a habit, the sense of loss can cause psychological distress.

Our study has a large and representative sample size but because of its cross-sectional design, it is limited in its exploration of causal relationships between PSU and psychological distress.

Conclusion

Our study findings demonstrated that important smartphone-related indices such as PSU, switching on phone data access all day, and the use of WeChat were predictive of increased levels of psychological distress. This underscores the importance of structured counselling

about the productive use of smartphones in the early years of study for the university undergraduate.

The findings of this study support the need for an intervention program to promote the responsible use of smartphones as part of strategies to reduce psychological distress among university students.

Acknowledgements

The authors thank the students who participated in the research and Dr. Emmanuel Kokori and Mr. Femi Ajayi for their editorial support.

Authors' Contribution

Conceptualization: James Ayodele Ogunmodede, Bolade Folasade Dele-Ojo, Adebisola Jane Ogunmodede, Oluwabunmi Idera Nimata Buhari, Olalekan Ayodele Agede.

Data curation: James Ayodele Ogunmodede, Bolade Folasade Dele-Ojo, Adebisola Jane Ogunmodede, Oluwabunmi Idera Nimata Buhari, Olalekan Ayodele Agede, Mathew Olumuyiwa Bojuwoye, Hamza Abiodun Bello, Louis Okeibunor Odeigah.

Formal analysis: James Ayodele Ogunmodede, Bolade Folasade

Dele-Ojo, Adebisola Jane Ogunmodede, Oluwabunmi Idera Nimata Buhari, Olalekan Ayodele Agede, Mathew Olumuyiwa Bojuwoye, Hamza Abiodun Bello, Abdullahi Ganiyu Olatunji, Louis Okeibunor Odeigah.

Methodology: James Ayodele Ogunmodede, Bolade Folasade Dele-Ojo, Adebisola Jane Ogunmodede, Oluwabunmi Idera Nimata Buhari, Olalekan Ayodele Agede, Mathew Olumuyiwa Bojuwoye, Hamza Abiodun Bello, Abdullahi Ganiyu Olatunji.

Project administration: James Ayodele Ogunmodede, Bolade Folasade Dele-Ojo, Adebisola Jane Ogunmodede, Oluwabunmi Idera Nimata Buhari, Hamza Abiodun Bello, Abdullahi Ganiyu Olatunji, Louis Okeibunor Odeigah.

Resources: James Ayodele Ogunmodede, Bolade Folasade Dele-Ojo, Adebisola Jane Ogunmodede, Oluwabunmi Idera Nimata Buhari, Olalekan Ayodele Agede, Mathew Olumuyiwa Bojuwoye, Hamza Abiodun Bello, Abdullahi Ganiyu Olatunji, Louis Okeibunor Odeigah.

Visualization: James Ayodele Ogunmodede, Bolade Folasade Dele-Ojo, Adebisola Jane Ogunmodede, Mathew Olumuyiwa Bojuwoye, Hamza Abiodun Bello, Abdullahi Ganiyu Olatunji, and Louis Okeibunor Odeigah.

Writing—original draft: James Ayodele Ogunmodede, Bolade Folasade Dele-Ojo, Adebisola Jane Ogunmodede, Oluwabunmi Idera Nimata Buhari.

Writing—review & editing: James Ayodele Ogunmodede, Bolade Folasade Dele-Ojo, Adebisola Jane Ogunmodede, Oluwabunmi Idera Nimata Buhari, Olalekan Ayodele Agede, Mathew Olumuyiwa Bojuwoye, Hamza Abiodun Bello, Abdullahi Ganiyu Olatunji, Louis Okeibunor Odeigah.

Competing Interests

The authors declare no conflict of interests.

Ethical Approval

The study was approved by the Ethics and Research Committee of the Kwara State Ministry of Health, Ilorin, Nigeria (Approval code: ERC/MOH/2022/07/064).

Funding

This research received no external funding.

References

- Elhai JD, Dvorak RD, Levine JC, Hall BJ. Problematic smartphone use: a conceptual overview and systematic review of relations with anxiety and depression psychopathology. *J Affect Disord.* 2017;207:251-9. doi: [10.1016/j.jad.2016.08.030](https://doi.org/10.1016/j.jad.2016.08.030).
- Balogun FM, Olatunde OE. Prevalence and predictors of problematic smart phone use among pre-varsity young people in Ibadan, Nigeria. *Pan Afr Med J.* 2020;36:285. doi: [10.11604/pamj.2020.36.285.18858](https://doi.org/10.11604/pamj.2020.36.285.18858).
- Olatunde O, Balogun F. Sexting: prevalence, predictors, and associated sexual risk behaviors among postsecondary school young people in Ibadan, Nigeria. *Front Public Health.* 2017;5:96. doi: [10.3389/fpubh.2017.00096](https://doi.org/10.3389/fpubh.2017.00096).
- Akpunne BC, Akinnawo OE. Internet addiction, problematic smartphone use and psychological health of Nigerian university undergraduates. *Int Neuropsychiatr Dis J.* 2018;12(3):1-13. doi: [10.9734/indj/2018/v12i330093](https://doi.org/10.9734/indj/2018/v12i330093).
- Lee H, Ahn H, Nguyen TG, Choi SW, Kim DJ. Comparing the self-report and measured smartphone usage of college students: a pilot study. *Psychiatry Investig.* 2017;14(2):198-204. doi: [10.4306/pi.2017.14.2.198](https://doi.org/10.4306/pi.2017.14.2.198).
- Panova T, Carbonell X. Is smartphone addiction really an addiction? *J Behav Addict.* 2018;7(2):252-9. doi: [10.1556/2006.7.2018.49](https://doi.org/10.1556/2006.7.2018.49).
- Matar Boumosleh J, Jaalouk D. Depression, anxiety, and smartphone addiction in university students- a cross sectional study. *PLoS One.* 2017;12(8):e0182239. doi: [10.1371/journal.pone.0182239](https://doi.org/10.1371/journal.pone.0182239).
- Samaha M, Hawi NS. Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Comput Human Behav.* 2016;57:321-5. doi: [10.1016/j.chb.2015.12.045](https://doi.org/10.1016/j.chb.2015.12.045).
- Alavi SS, Ghanizadeh M, Farahani M, Jannatifard F, Esmaili Alamuti S, Mohammadi MR. Addictive use of smartphones and mental disorders in university students. *Iran J Psychiatry.* 2020;15(2):96-104.
- Buhari OIN, Bolarinwa OA, Adegoke AA, Ogunmodede AJ, Oyeleke J, Oguntayo R, et al. Comprehensive and integrative tertiary institution mental health (TIM-HEALTH) care: developing a protocol for Nigerian Universities. *Int J Public Health Clin Sci.* 2021;8(2):51-65.
- Kuss DJ, Griffiths MD. Online social networking and addiction- a review of the psychological literature. *Int J Environ Res Public Health.* 2011;8(9):3528-52. doi: [10.3390/ijerph8093528](https://doi.org/10.3390/ijerph8093528).
- Afe TO, Ogunsemi OO, Osalusi BS, Adeleye OO, Ale AO. Age and gender demographics in social media use, smartphone addiction and psychological morbidity among university undergraduates in Southwest Nigeria. *Ann Health Res.* 2020;6(1):22-33. doi: [10.30442/ahr.0601-03-63](https://doi.org/10.30442/ahr.0601-03-63).
- Chen B, Liu F, Ding S, Ying X, Wang L, Wen Y. Gender differences in factors associated with smartphone addiction: a cross-sectional study among medical college students. *BMC Psychiatry.* 2017;17(1):341. doi: [10.1186/s12888-017-1503-z](https://doi.org/10.1186/s12888-017-1503-z).
- Albursan IS, Al Qudah MF, Dutton E, Hassan E, Bakhiet SFA, Alfnan AA, et al. National, sex and academic discipline difference in smartphone addiction: a study of students in Jordan, Saudi Arabia, Yemen and Sudan. *Community Ment Health J.* 2019;55(5):825-30. doi: [10.1007/s10597-019-00368-x](https://doi.org/10.1007/s10597-019-00368-x).
- Hibell B, Adlaf EM, Andersson B, Bjarnason T, Delapenha C, Hasbun J, et al. Conducting School Surveys on Drug Abuse. New York: United Nations Office on Drugs and Crime (UNODC); 2003.
- Akpunne BC, Akinnawo OE. Validation of smartphone addiction scale-short version on Nigerian university undergraduates. *Int J Comput Sci Mob Computing.* 2018;7(11):136-41.
- Goldberg D, Williams P. A User's Guide to the General Health Questionnaire. Windsor: NFER-Nelson; 1988.
- Gureje O, Obikoya B. The GHQ-12 as a screening tool in a primary care setting. *Soc Psychiatry Psychiatr Epidemiol.* 1990;25(5):276-80. doi: [10.1007/bf00788650](https://doi.org/10.1007/bf00788650).
- Abiodun OA. A study of mental morbidity among primary care patients in Nigeria. *Compr Psychiatry.* 1993;34(1):10-3. doi: [10.1016/0010-440x\(93\)90030-8](https://doi.org/10.1016/0010-440x(93)90030-8).
- Asibong U, Okafor CJ, Asibong I, Ayi E, Omoronyia O, Owoidoho U. Psychological distress and social media usage: a survey among undergraduates of a university in Calabar, Nigeria. *Niger Postgrad Med J.* 2020;27(2):115-21. doi: [10.4103/npmj.npmj_169_19](https://doi.org/10.4103/npmj.npmj_169_19).
- Al Battashi N, Al Omari O, Sawalha M, Al Maktoumi S, Alsuleitini A, Al Qadire M. The relationship between smartphone use, insomnia, stress, and anxiety among university students: a cross-sectional study. *Clin Nurs Res.* 2021;30(6):734-40. doi: [10.1177/1054773820983161](https://doi.org/10.1177/1054773820983161).
- Uwadiae E, Osasona SO. Psychological distress amongst undergraduate students of a Nigerian University. *Central African Journal of Medicine* 2016;62:5-8
- Poorolajal J, Ghaleiha A, Darvishi N, Daryaei S, Panahi S. The prevalence of psychiatric distress and associated risk factors among college students using GHQ-28 questionnaire. *Iran J Public Health.* 2017;46(7):957-63.
- Sharp J, Theiler S. A review of psychological distress among university students: pervasiveness, implications and potential points of intervention. *Int J Adv Couns.* 2018;40(3):193-212. doi: [10.1007/s10447-018-9321-7](https://doi.org/10.1007/s10447-018-9321-7).

25. Lei LY, Ismail MA, Mohammad JA, Yusoff MSB. The relationship of smartphone addiction with psychological distress and neuroticism among university medical students. *BMC Psychol.* 2020;8(1):97. doi: [10.1186/s40359-020-00466-6](https://doi.org/10.1186/s40359-020-00466-6).
26. Ithnain N, Ghazali SE, Jaafar N. Relationship between smartphone addiction with anxiety and depression among undergraduate students in Malaysia. *Int J Health Sci Res.* 2018;8(1):163-71.
27. Thomée S, Härenstam A, Hagberg M. Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults--a prospective cohort study. *BMC Public Health.* 2011;11:66. doi: [10.1186/1471-2458-11-66](https://doi.org/10.1186/1471-2458-11-66).
28. Kardefelt-Winther D. A conceptual and methodological critique of internet addiction research: Towards a model of compensatory internet use. *Comput Human Behav.* 2014;31:351-4. doi: [10.1016/j.chb.2013.10.059](https://doi.org/10.1016/j.chb.2013.10.059).
29. Zhang KZ, Chen C, Lee MK. Understanding the Role of Motives in Smartphone Addiction. Pacific Asia Conference on Information Systems (PACIS). PACIS 2014 Proceedings. Available at: <https://aisel.aisnet.org/pacis2014/131>.
30. Lemola S, Perkinson-Gloor N, Brand S, Dewald-Kaufmann JF, Grob A. Adolescents' electronic media use at night, sleep disturbance, and depressive symptoms in the smartphone age. *J Youth Adolesc.* 2015;44(2):405-18. doi: [10.1007/s10964-014-0176-x](https://doi.org/10.1007/s10964-014-0176-x).
31. Gupta N, Garg S, Arora K. Pattern of mobile phone usage and its effects on psychological health, sleep, and academic performance in students of a medical university. *Natl J Physiol Pharm Pharmacol.* 2016;6(2):132-9. doi: [10.5455/njppp.2016.6.0311201599](https://doi.org/10.5455/njppp.2016.6.0311201599).
32. Tng GY, Yang H. Nuanced relationships between indices of smartphone use and psychological distress: distinguishing problematic smartphone use, phone checking, and screen time. *Behav Inf Technol.* 2023:1-14. doi: [10.1080/0144929x.2023.2196573](https://doi.org/10.1080/0144929x.2023.2196573).