



# Linking Psychological Attributes and Gender to Smartphone Addiction among University Undergraduates: A Nigerian Study

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## **Authors' contributions**

*This work was carried out in collaboration between authors UCO and BVB. Author UCO designed the study, performed the statistical analysis, wrote the protocol, and the first draft of the manuscript. Author BVB managed the analyses of the data and literature search. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

The study examined the relative contributions of psychological attributes (loneliness, extraversion and self-esteem) and gender to smartphone addiction. The study was a survey that utilized a cross-sectional design that purposively sampled 271 in-school smartphone users. The sample was made up of 165 male and 106 female undergraduates selected from three public tertiary institutions in southwest Nigeria. Data were collected with a questionnaire that contained standardized scales that measured the study variables. These were revalidated to ascertain their suitability for use in the present study and all yielded acceptable alpha coefficients: loneliness ( $\alpha = .88$ ), extraversion ( $\alpha = .61$ ), self-esteem ( $\alpha = .80$ ), and Test of mobile-phone dependence use ( $\alpha = .94$ ). Also examined in the study was the influence of gender on smartphone addiction. Result indicated significant positive

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relationships among loneliness ( $r = .29$ ;  $P < .05$ ), extraversion ( $r = .43$ ;  $P < .001$ ), self-esteem ( $r = .48$ ;  $P < .001$ ) and smartphone addiction respectively. Result further revealed significant joint influence of loneliness, extraversion and self-esteem on smartphone addiction ( $R^2 = .33$ ;  $P < .01$ ). There was no significant gender influence on smartphone addiction ( $p > .05$ ). Personality profile of smartphone addicts should form a cardinal ingredient of treatment and management protocols of the condition.

*Keywords: Smartphone addiction; loneliness; self-esteem; extraversion; undergraduates.*

## 1. INTRODUCTION

Significant increase in global smartphone penetration has generated concern about the negative consequences of their uncontrolled use. Past studies reported the negative consequences to include physical problems (such as musculoskeletal disorders of the hand, wrist and neck), ocular symptoms and psychopathologies (such as attention deficit), aggression and sleep disturbance [1-5]. However, the potentially addictive consequence associated with uncontrolled use of smartphone among younger persons should be of more concern.

Addiction can be explained as unhealthy dependence on a substance or behavior that an individual has lost control over. Smartphone addiction may thus be considered a form of technological addiction [6], and manifests as compulsive behaviours, tolerance, withdrawal, and functional impairment [7]. In other words, an addicted smartphone user is a person who feels an irresistible urge to use his/her smartphone, endures its use for a prolonged period and experiences difficulty in relationship due to excessive preoccupation with the smartphone.

Demographic data indicated that comparatively, smartphone penetration is highest among younger persons [8,9,10,11]. This segment of the population believe the smartphone is designed to enhance enjoyment of leisure activities such as social networking, surfing the internet, watching videos, and playing games [12,13]. This view of smartphone coupled with lack of psychological maturity essential for controlling behaviour may significantly increase the risk of smartphone addiction among younger persons. Research findings in addiction literature established a strong relationship between behavior-based addiction (such as smartphone addiction) and personality traits [14,15].

A personality trait believed to be strongly predictive of smartphone addiction is

extraversion. Personality scholars characterize an extravert as a person who is generally outgoing, easily aroused, and adventurous-attributes that signify extraverts have a high need to socialize [16]. For instance, when in an environment with low level of arousal, an extraverted student seeking stimulation is likely to turn to the smartphone for socially stimulating activities that could satisfy his/her need to socialize. Higher level of stimulation may lead to uncontrolled use, thereby significantly increasing the risk of smartphone addiction.

There has been a significant increase in empirical evidence showing that extraverts are at a higher risk for problematic smartphone use [17, 18]. Evidence that high level of extraversion positively influenced addictive tendency to social networking sites via smartphone was established in a sample of 201 teenagers [19], with the authors explaining that their result reflected extraverts' use of social networking sites to satisfy a strong urge to socialize. Further review indicated that extraverted persons were also at a higher risk for other forms of addiction, particularly those related to excessive alcohol intake and drug addiction [20,21,22,23]. A plausible explanation for the positive relationship between extraversion and problem drinking is that extraverts' liberal attitude to accommodate others' drinking preference increases the risks of engaging in the same problem behavior themselves.

Loneliness is another trait with the potential to predict smartphone addiction. Loneliness can be described as expression of an actual or perceived shortcoming in meaningful interpersonal relationships accompanied by distressing and unpleasant experiences [24]. A lonely person is typically deficient on social contact since he/she only can access only a limited number of persons or socially stimulating activities. School environments in which there are inadequate infrastructural facilities (lack of electricity) can cause students to experience loneliness. Felt loneliness is psychologically discomfoting and one way students may reduce

the tension is to seek stimulation in activities that can bridge the 'social gap' using the smartphone as a medium.

Research endeavors have studied how loneliness is related to various forms of addiction, with the findings indicating significant relationship between both variables. Sung, Kang & Lee [25] surveyed three hundred and sixteen (n = 316) adolescents in order to establish how loneliness was related to binge-watched TV (an addictive behavior). The authors reported positive association between loneliness and binge-watched TV, such that lonelier participants were more likely to binge-watch TV. In a related study that examined how personal attribute (loneliness), mental health (depression) and self-control related to addiction (internet addiction), finding revealed significant influence of these variables on internet addiction among undergraduates [26]. The finding is consistent with earlier studies which consistently reported significant positive association between loneliness and internet addiction in young persons [27,28].

Significant correlation between problematic use of smartphone and levels of loneliness was reported by Bian & Leung [29] - a finding which suggests that feeling lonely 'at all' is a significant risk factor for becoming addicted to smart phone. Studies examined the hypothesis that loneliness is a universal predictor of all forms of addiction and revealed mixed findings in the relationship between loneliness and problem drinking and smoking [30,31,32]. Based on these findings, it can be argued that loneliness is probably a weak predictor of life-style related addiction. Similarly, the contradictory findings might also be as a result of differences in the study samples and method of data collection adopted.

As a personality trait, self-esteem can predispose an individual to addiction because of its influence on how individuals rate their self-worth. Self-esteem refers to a person's global evaluation of his/her worth as a person [33]. Whereas high self-esteem persons are sure of who they are, individuals with low self-esteem are relatively confused about their self-concept, and generally tend to have a self-view that is primarily negative [33]. Some research findings suggest that self-esteem is significantly related to many forms of addictive behaviors including self-reported problem drinking [34]. To bolster their self-concept, low self-esteem individuals engage in various self-defeating behaviors including

addiction to smart phones. A study by Aydm & Volkan [35] reported significant negative correlation between dimensions of self-esteem and internet addiction. In a recent study, Bahrainian, Alizaadeh, Raeisoon, Gorji & Khazaee [36] reported that self-esteem and depression predicted the variance in internet addiction measure used in their study. This means that besides depression, there was significant contribution of self-esteem to internet addiction among the participants surveyed.

In addition, previous studies [37, 38, 39] revealed a positive association between low self-esteem and excessive internet use. Studies that examined the influence of level of self-esteem on addiction to face book found that lower general self-esteem predicted excessive face book use [40, 41]. The finding is supported by the outcome of a related study which showed that low self-esteem predicted alcohol-abuse [42]. In what seems as a surprise finding, no significant relation was found between self-esteem and problem drinking [43], even though uncontrolled alcohol use is generally regarded as an addictive behavior. However, the finding of a recent study which showed a significant negative influence of self-esteem on face book addiction [44] is an indication of the need for further research to elaborate on the direction of the relationship between self-esteem and addictive behaviors.

The idea that sex difference in addiction existed was important enough to stimulate research, much, but not all, of which supported the claim. Recent studies focused on gendered difference in the patterns of information communication and technology (ICT) use, with smartphone enjoying robust debate [45]. While substantial portion of these studies explored sex difference in smartphone usage, findings have been generally mixed. Studies that investigated gender difference on 'pattern of mobile phone problem use' highlighted a translucent pattern in which females displayed higher likelihood of mobile phone dependency, mobile phone abuse and mobile phone involvement [46, 47, 48, 49]. Further analysis showed that females were more likely to use camera on smart phone, while males were more likely to make more phone calls as well as utilize other applications [50].

But research focused on gender difference in smartphone 'application use' found that males displayed a higher likelihood of smartphone internet addiction compared to females [51, 52]. The finding was corroborated by Gnisci, Perugini,

Pedone, & Di Conza [53] who established that males displayed higher likelihood of internet dependence. However, these findings were contradicted by research that found no significant gender difference in smartphone internet addiction [46, 54], thus underscoring the need for additional studies on gender difference to be conducted. An understanding of how gender is related to smartphone addiction, to a large extent can enhance the effectiveness of intervention and treatment designed for the most vulnerable sex.

The behavioral perspective (Watson, 1878-1958) serves as the major theoretical plank for this study. Among its salient propositions, it argued that the intensity of a behavior is significantly increased so far a person derives satisfaction performing the behavior, or if the behavior is believed to be instrumental in eliminating or decreasing a negative situation. When applied to smartphone addiction, the argument is that younger persons excessive use of smartphone happens because the device is employed to assist the user escape negative or aversive social situations such as boredom, with uncontrolled use leading to psychological dependence on the device.

A noticeable sociological change in contemporary Nigeria since the advent of cellular technology is the significantly high number of young persons who use smart phones for goals related to academic, social, business and entertainment pursuits. With smart phones becoming increasingly popular, its problematic use has also observed. This include loss of control, use in prohibited places (such as classrooms, worship places), deterioration of social and family relationships, loss of interests in non-smartphone related activities, poor academic performance, and feeling handicapped when separated from the device. With significant increase in smartphone usage among younger persons, and the associated negative impact this might have on their socio-psychological functioning, the need to examine psychological attributes that would aid in profiling personality most vulnerable to develop problematic smartphone use is compelling, and warrants further investigation by scholars. Surprisingly, extensive review of extant literature revealed that personality predictor of smartphone addiction is an under-researched area in Nigeria, and especially among younger persons. This poses a problem of significant impact on wellbeing as smartphone usage has increased significantly

among young persons in Nigeria in the last few years.

The study tested the following hypotheses:

- i. There will be significant positive relationships among extraversion, loneliness, self-esteem and smartphone addiction
- ii. There will be significant independent and joint influence of extraversion, loneliness and self-esteem on smartphone addiction
- iii. There will be significant influence of sex on smartphone addiction

## 2. METHODS

### 2.1 Design and Participants

The study was a survey that adopted cross-sectional research design. Participants consisted of two hundred and seventy-one in-school smartphone users. The 271 participants were selected from three institutions of higher learning in southwest Nigeria. Sex distribution indicated that there were 165 male and 106 female, and their ages ranged between 15-35 years. All participants had owned a smartphone at least one year preceding the study, which was either bought for them by a sponsor or was bought with personal savings. Majority were in the final year of their various programs.

### 2.2 Study Instrument

The study used a questionnaire with four sections that comprised standardized self-report scales for data collection. All the scales were scored along the same direction to ensure uniformity in the scoring of items.

#### 2.2.1 Loneliness

Loneliness was measured with R-UCLA scale [55]. It is a 20-item scale on which participants rated their responses on a 5-point Likert rating scale (1= disagree strongly, and 5= agree strongly). The scale is widely used by researchers to investigate loneliness in diverse settings. Sample items on the scale were: I lack companionship, and I feel completely alone. The authors reported a strong internal consistency of .94 for the scale. In the present study, the scale yielded reliability coefficient alpha of .88.

### **2.2.2 Extraversion**

Extraversion was assessed with 8 items extracted from the extraversion subscale of the Big five inventory [56]. Responses were rated on a 5-point Likert rating scale with options ranging from 1(disagree strongly) to 5 (agree strongly). This scale is referenced in relatively large number of personality studies. Sample item contained in the scale included: I am outgoing and sociable. The Cronbach alpha coefficient of the scale in the study was .61. Omoluabi (1997) reported high alpha coefficient when the scale for used in a Nigerian study.

### **2.2.3 Self-esteem**

Adanijo and Oyefeso [57] self-esteem scale was used to assess respondents' level of self-esteem. It is a 15-item scale with response options rated on a 5-point Likert-type format such that disagree strongly was rated 1, while agree strongly was rated 5 with other scores in between. The scale has high reliability and has been used in a large number of indigenous behavioral science studies in Nigeria. Sample items were: My effort always produces poor result, and I do not believe much in my ability. The authors reported internal consistency of .79 for the scale, and it yielded Cronbach alpha of .80 in the present study. Adanijo [58] reported an internal consistency of 0.78 (bank employees) and 0.76 (government employees) for the scale in a Nigerian study.

### **2.2.4 Smartphone addiction**

Smartphone addiction was measured with the Test of mobile phone dependence use [59]. It contained 22 items written in short narratives for enhanced comprehension. Items were rated on a 5-point rating scale such that respondents checked 1 to a statement that was not typical of them (Never), but checked 5 to an item that was very typical of the individual (frequently).

### **2.3 Procedure**

Prospective participants were approached in the classroom in between lectures to avoid interruption. In every classroom visited, the researcher first introduced himself before requesting cooperation from the students to participate in the study. Simple random sampling technique (ballot method) was used to select participants. Firstly, students who owned smart phones (defined as any 'internet-enabled' mobile phone) were purposively selected. These were then issued ballot papers consisting of plain

sheets of paper with predetermined inscriptions of Yes or No which had been written on them before they were folded to conceal the inscription. Those who picked a 'Yes' ballot paper were identified, tagged and selected for the next stage of the study.

The researcher explained the purpose of the study to those selected and gave them questionnaires to complete after expressing commitment to, and willingness to participate in the study. It took approximately 17 minutes to read through the instructions and respond to all items in the various sections of the questionnaire. Class/course representatives were enlisted as research assistants after they had been duly briefed on the procedure for data collection. Three hundred and ten (n=310) questionnaires were originally administered while two hundred and eighty-nine (n=289) were returned, representing a non-response rate of 6.77%. Of this figure, only 271 were adjudged suitable for data analysis as the remaining 18 questionnaires were discarded for reasons that included missing information and selection of multiple options. The entire process covering questionnaire administration, collection and collation spanned almost 9 weeks from inception.

### **2.4 Data Analysis**

Hypothesis one of the study was tested with Pearson r moment correlation. The reason for the choice of statistics is because the interest here is to examine the magnitude and direction of relationship among the variables. Hypothesis two was tested using simple multiple regression statistical analysis to establish the independent and joint influence of loneliness, extraversion, and self-esteem on smartphone addiction, while hypothesis three was tested using the t-test for independent samples.

### **3. RESULTS**

Table 1 indicated significant positive relationships among all the variables of the study. The result revealed significant positive relationship between loneliness and smartphone addiction ( $r = .29, P < .05$ ), suggesting that as loneliness increased, smartphone addiction increased also. There is also a significant positive relationship between extraversion and smartphone addiction ( $r = .43, P < .01$ ), signifying that when an individual's level of extraversion increases, there is a higher tendency of smartphone addiction. Result further revealed

**Table 1. Correlation matrix showing relationships among loneliness, extraversion, self-esteem, and smartphone addiction**

Variables	Mean	SD	1	2	3	4
Loneliness	47.50	13.56	1			
Extraversion	25.06	7.03	.02	1	1	
Self-esteem	42.85	9.50	.37**	.35**	.48**	
Smartphone addiction	37.24	11.22	.29*	.43**		1

**Table 2. Simple multiple regression predicting smartphone addiction from loneliness, extraversion, and self-esteem**

Predictors	B	t	P	R	R <sup>2</sup>	F	P
Loneliness	.18	3.37	<.05				
Extraversion	.32	5.82	<.01	.58	.33	44.04	<.01
Self-esteem	.30	5.12	<.01				

**Table 3. Summary of t-test showing gender difference on smartphone addiction**

Variable	N	Mean	SD	Df	T	p
Male	165	36.37	11.57	269	-1.58	>.05
Female	106	38.60	10.58			

significant positive relationship between self-esteem and smartphone addiction ( $r = .48$ ,  $P < .01$ ), indicating that individuals with higher level of self-esteem were more likely to report smartphone addiction. Therefore, hypothesis one is supported as predicted.

Results presented in Table 2 indicated a significant joint influence of loneliness, extraversion and self-esteem on smartphone addiction ( $R^2 = .33$ ;  $F(3, 257) = 44.04$ ;  $p < .01$ ). The result suggests that loneliness, extraversion and self-esteem jointly accounted for 33% of variance in smartphone addiction. The independent contributions showed that loneliness contributed significantly to smartphone addiction ( $\beta = .18$ ;  $t = 3.37$ ;  $p < .05$ ), implying that when feeling of loneliness increased, smartphone addiction would likely increase. There was significant independent contribution of extraversion to smartphone addiction ( $\beta = .32$ ;  $t = 5.87$ ;  $p < .01$ ), signifying that when the level of extraversion increased, smartphone addiction also tended to increase. Self-esteem contributed significantly to smartphone addiction ( $\beta = .30$ ;  $t = 5.12$ ;  $p < .01$ ), suggesting that as an individual's level of self-esteem increased, smartphone addiction is likely to increase also. Therefore, hypothesis two is supported.

As shown in Table 3, the result of t-test analysis revealed no significant difference in smartphone

addiction between male and female ( $t = -1.58$ ;  $df = 269$ ;  $p > .05$ ), implying that both male (Mean = 36.37; SD = 11.57) and female (Mean = 38.60; SD = 10.58) smartphone users reported comparable levels of smartphone addiction. With this result, hypothesis three is rejected.

#### 4. DISCUSSION

The study investigated the relationship between psychological attributes (extraversion, loneliness, self-esteem) and smartphone addiction among undergraduates in public tertiary institutions in southwest Nigeria. Gender influence on smartphone addiction was also examined. There was a positive association between self-esteem and smartphone addiction among undergraduates. The finding showed that higher level of self-esteem was associated with higher tendency to excessively use smartphone. However, this finding contradicted previous studies and does not fit into the pattern generally reported in majority of past studies concerning the association between self-esteem and smartphone addiction (26, 35). A plausible explanation that may suffix for the finding in the present study is that people with high self esteem tend to also have high egos, and when they felt threatened, they might have resorted to ego-boosting behaviours that are nevertheless self-defeating, such as excessive use of the smartphone.

Consistent with findings in previous research, the study found significant positive relationship between extraversion and smartphone addiction. The finding fit into the trend of past research that reported significant association between extraversion and smartphone addiction (3,18) in diverse cultural settings. Data for this study was collected among individuals schooling in a rural setting with significant infrastructural and social deficits. These deficiencies in the locality of the participants may have induced a feeling of social inadequacy among extraverts which may have triggered excessive use of smartphone applications (such as whatsapp and face book) as a strategy to overcome the defects.

The relationship between loneliness and smartphone addiction was also explored, with the finding indicating significant positive association between both variables. This finding supported previous studies which reported a strong correlation between loneliness and smartphone addiction [27,28, 26]. A plausible explanation for this finding taking into consideration the peculiarity of the study participants' social context (that is, an environment with significant infrastructural and social deficits) is that without the desired level of social interaction and association, feeling of loneliness may have increased, leading lonelier persons to increased involvement in smart phone-based activities which they used as a strategy to reduce boredom.

Additional analysis which examined independent and joint prediction of extraversion, loneliness and self-esteem found significant influence of the three variables on smartphone addiction. The finding agrees with prior studies that reported significant influence of specific personality traits on addictive behavior among young persons [29, 18, 40,60]. In addition, the three psychological attributes examined in the study had significant independent contributions in the explanation of smartphone addiction.

A case by case analysis revealed that independently, extraversion contributed the most (i.e. 32%) in explaining smartphone addiction, a finding consistent with results reported in prior studies which showed that extraverts generally tend to have difficulty regulating their behavior [23,19,22]. The finding in the present study supported the notion that extraversion plays an important role in smartphone addiction. Similarly, the finding showed that loneliness independently influenced smartphone addiction confirming findings of past research [27,28,25].

Gender difference in smartphone addiction was also examined in the study. Finding revealed that gender had no significant influence on smartphone addiction. This means that male and female adolescent smartphone users were comparable on level of smartphone addiction. The finding is in tandem with previous studies that established that male and female mobile phone users were not different in their level of problematic use of smart phones [46, 60]. The finding however contradicted Park & Lee [50] who established gender difference related to use of smartphone applications such as social networking sites (SNSs). But gender uniformity in level of smartphone addiction as found in this study may be attributed to similarity in both sexes perception of the utility of smartphone applications for satisfying personal needs and enhancing social relational contacts, which may be especially so in a setting with significant infrastructural deficits as were data was collected for this study.

## **5. CONCLUSION**

Findings of this study suggest that psychological attributes contribute to smartphone addiction among undergraduate smartphone users. On the whole, the study showed that extraversion, self-esteem and loneliness were found to have strong influence on smartphone addiction. Specifically, the study found that extraversion contributed the most to smartphone addiction. In effect, the findings of the study has helped in identifying predictors of smartphone addiction with, extraversion as the psychological attribute requiring more consideration in the design of intervention to manage smartphone problematic use. Similarly, the study found that both sexes were not significantly different in smartphone addiction, thus making a case for a non-gendered ICT education for healthy use of smart phone.

## **6. IMPLICATIONS AND RECOMMENDATIONS**

The findings showed that smartphone addiction exists among undergraduate smartphone users, and that psychological traits contribute to smartphone addiction. These findings imply that individual differences that explain self-regulation have strong influence on self-defeating behavior such as smartphone addiction. It is recommended that undergraduates be availed assertiveness training by school counselors and mental health professionals, and they should be

trained on how to self-monitor their behavior in environments with different peculiarities to avoid maladjusted behavior such as getting hooked on their smart phone. The finding that male and female undergraduates were not significantly different in smartphone addiction implies that it is not a gender-related mental health issue, implying that interventions be focused on both sexes.

## 7. LIMITATIONS

The study participants were selected among young adults schooling in poorly funded public universities in rural settings. This implies that the findings may not be generalizable to young adults in urban setting who may be exposed to a heterogeneous cultural and social environment. Similarly, another limitation arises from selecting participants only from state/government managed universities. The findings may have been different had data collection included institutions managed by the federal/central government. In addition, the design of the study could not allow for cause-effect relationship to be determined, implying that causal relationship cannot be inferred. Finally, data were collected through self-report questionnaires which have negative reputation for social desirability and response biases. Thus, the reliability of the findings might have been affected by the extent to which participants' gave honest responses to the items.

## DISCLAIMER

The study was subjected to scrutiny before a panel of academics who scrutinized the proposal and approved the research with minor correction. This panel is statutory charged with the responsibility to review and approve research proposals involving human subjects before data collection.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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