It is illegal to post this copyrighted PDF on any website. Boredom Proneness, Lonelmess, and Smartphone Addiction Among Lebanese Young Adults: The Mediating Role of Depression, Anxiety, and Stress

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ABSTRACT

Objective: To evaluate the association between boredom proneness, loneliness, and smartphone addiction among Lebanese young adults and examine the mediating role of depression, anxiety, and stress in this association.

Methods: This cross-sectional study was conducted between August and September 2020 during the lockdown period of the coronavirus disease 2019 pandemic. An online survey was completed by 461 young adults aged 18 to 29 years.

Results: The results showed that 66 of 134 males (49.3%, scores \geq 31) and 143 of 327 females (43.7%, scores \geq 33) had smartphone addiction. Smartphone addiction was significantly associated with higher boredom proneness (P < .001), anxiety (P = .012), and loneliness (P = .025). Anxiety mediated the association between boredom proneness and smartphone addiction and between loneliness and smartphone addiction, whereas depression and stress did not mediate the association between boredom/ loneliness and smartphone addiction.

Conclusions: Smartphone addiction is highly associated with psychological disorders, and screening strategies are needed to minimize addiction. This study emphasizes the importance of investigating the relation between smartphone addiction and psychological disorders.

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martphones are ubiquitous in society, and the prevalence of use among adults is 77% in the United States and 59% globally.¹ Smartphones offer many advantages including boosting productivity among employees, facilitating mobile access to calendars, building social capital, easing information retrieval through web searching, and enhancing the learning process among students.²⁻⁵ In addition, smartphones are often used for entertainment, as they are portable and easily accessible.⁶ Moreover, smartphones provide easy access to electronic platforms and applications such as Instagram, Facebook, and WhatsApp, which are considered an integral part of everyday life.⁷ The excessive use of smartphones among young adults can be explained by the services they offer, low cost compared to other devices, and mobile access to many different types of content.8-10 These social network applications are designed specifically to encourage increased usage, with recent statistics showing that 81% and 69% of Americans report using YouTube and Facebook, respectively.¹¹ Higher social media use was found to lower self-esteem^{12,13} and to be associated with lower memory performance¹⁴ and addiction (alcohol and smoking).¹⁵

Despite the advantages of smartphones, addiction is one of the numerous adverse consequences that may arise from overreliance on the device, although there is no consensus on the terms used to describe addiction.^{10,16,17} Smartphone addiction is an overwhelming obsession with the use of smartphones, regardless of the detrimental consequences to the addicted person and the surrounding community.¹⁸ According to recent literature,¹⁹ it is considered a specific online addiction that shares similar features with generalized internet addiction but is related to poor health outcomes. Gradually, users fall into a pattern of repetitive behavior arising from emergent rewards and subsequent mood enhancement. The level of psychological dependency increases if the repetitive behavior is reinforced, resulting in addiction.²⁰ Those most vulnerable to addiction are often neglected or have a poor social life.²¹

Young adults are at higher risk of developing smartphone addiction and are more vulnerable to addictive behaviors, especially in the absence or limited monitoring of smartphone use.^{22–24} Previous research assessed the association between smartphone addiction and various activities such as videogame addiction,²⁵ excessive exercise,²⁶ online sex addiction,²⁷ excessive appetite,²⁸ compulsive shopping,^{29,30} workaholism,³¹ and Internet addiction.^{32–36} One study³⁷ analyzed the association of psychosocial It is illegal to post this copyrighted PDF on any website.

Clinical Points

- Smartphone addiction was significantly associated with higher boredom proneness, anxiety, and loneliness.
- Anxiety mediated the association between boredom proneness and smartphone addiction and between loneliness and smartphone addiction; depression and stress did not mediate those associations.
- Smartphone addiction is highly associated with psychological disorders, and screening strategies are needed to minimize addiction.

symptoms (attention problems, physical problems, anxiety and depression, and social problems) and internet addiction.

Research has shown that boredom, loneliness, anxiety, stress, and depression increase the propensity to develop smartphone addiction.³⁸⁻⁴³ Individuals with concurrent psychological problems use their smartphones to build relationships and satisfy the feeling of belonging.^{38,39} Boredom proneness, defined as an inability to engage and maintain attention on any object despite being free to do so, was found to be associated with higher smartphone addiction,⁴⁴ similar to anxiety and depression.^{45,46} Excessive smartphone use was also shown to have a negative psychological effect characterized by increased vulnerability to stress.47

Previous studies⁴⁸⁻⁵¹ found that individuals diagnosed with addictions such as smartphone addiction had notable psychological disorders such as poor sleep quality, stress, anxiety, and depression. Furthermore, research conducted in Lebanon showed that depression and anxiety were positive predictor factors of smartphone addiction.⁵²

Research has established a connection between various mediating factors and smartphone addiction.48-51 The presence of psychological disorders is a common variable in the existing research on addictive behaviors, including smartphone addiction, and suggests the possibility of anxiety and depression playing an intermediate role between loneliness, boredom proneness, and smartphone addiction. Thus, the objective of this study was to evaluate the association between boredom proneness, loneliness, and smartphone addiction among Lebanese young adults and examine the mediating role of depression, anxiety, and stress in this association.

METHODS

General Study Design

A cross-sectional study was conducted between August and September 2020 during the lockdown period imposed by the government for the COVID-19 pandemic, which also coincides with the summer vacation season for most Lebanese citizens. The sample was comprised of community-dwelling participants aged 18 to 29 years. Due to the restrictions on gatherings and the impracticality and risk associated with face-to-face interviews, a survey was created in Google forms as a link. The link was shared among

(Beirut, Mount Lebanon, North Lebanon, South Lebanon, and Bekaa) using the snowball technique. Participants were asked to fill out the survey online and send the link to other friends and family members. All participants who had a mobile phone were eligible to participate. This study shares the same methodology as that of previous research.^{53–55}

Minimal Sample Size Calculation

According to the G-power software and based on an effect size of f2 = 2%, an α error of 5%, a power of 80%, and taking into consideration 10 factors to be entered in the multivariable analysis, the results showed that a minimal number of 395 was needed.

Translation Procedure

The scales were forward and back translated. Forward translation (English to Arabic) was performed by 1 translator, whereas the back translation from Arabic to English was performed by another translator. Minor discrepancies were solved by consensus. A pilot study was conducted with 15 people to ensure all questions were clear and understandable, and no subsequent changes were made. Data related to participants of the pilot study were included in the final database.

Questionnaire and Variables

The self-administered questionnaire with closed-ended questions was anonymous, available in Arabic and English, and required approximately 25-30 minutes to complete. An introduction explained the objectives of the study and asked for informed consent from the participants. The first section assessed sociodemographic characteristics such as age, sex, marital status, education level, and Household Crowding Index (HCI).⁵⁶ The HCI reflects the socioeconomic status of the family and was calculated by dividing the number of persons in the house by the number of rooms in the house, excluding the bathrooms and kitchen. The higher the HCI, the lower the socioeconomic status.⁵⁶ The second part of the questionnaire included the following scales.

Smartphone Addiction Scale

Validated in Lebanon,⁵⁷ the Smartphone Addiction Scale (SAS) is a 10-item scale used to evaluate smartphone addiction among South Korean adolescents⁵⁸ and Chinese adults.⁵⁹ The total score was computed by adding the answers of these 10 items, with higher scores reflecting higher smartphone addiction. The cutoff value for determining the presence of smartphone addiction in the original study was 31 in boys and 33 in girls.⁵⁸ In this study, the SAS Cronbach a was 0.886.

Short Boredom Proneness Scale

The Short Boredom Proneness Scale⁶⁰ is used to evaluate boredom proneness. It includes 28 items with a 6-point Likert scale: 1 (strongly disagree) and 6 (strongly agree) based on self-reporting. The total score is calculated

Table 1. Sociodemographic Characteristics of the Study Sample (N = 461)

Characteristic	Sample
Sex, n (%)	
Male	134 (29.1)
Female	327 (70.9)
Marital status, n (%)	
Single/widowed/divorced	421 (91.3)
Married	40 (8.7)
Education level, n (%)	
School education	26 (5.6)
University education	435 (94.4)
Age, mean \pm SD, y	22.25 ± 2.87
Household Crowding Index, mean \pm SD	1.08 ± 0.61

by summing the 28 items. Higher scores indicate higher boredom proneness. In this study, the Cronbach a was 0.935.

Beirut Distress Scale

The Beirut Distress Scale⁶¹ is a 10-item stress assessment instrument. The scale asks about feelings and thoughts during the last month, with answers measured on a 4-point Likert scale: 0 (never) to 3 (very often). Higher scores indicate higher perceived stress. The Cronbach α was 0.877.

Montgomery-Asberg Depression Rating Scale

The Montgomery-Asberg Depression Rating Scale,⁶² validated in Lebanon,⁶³ is a 10-item scale that evaluates the core symptoms of depression by focusing on mood symptoms such as sadness, tension, pessimism, and suicidal thoughts. Responses are graded from 0, indicating no abnormality, to 6, indicating more depressive symptoms. The Cronbach α was 0.822.

Lebanese Anxiety Scale

The Lebanese Anxiety Scale⁶⁴ screens for anxiety in adults, and higher scores indicate more anxious attitude. The Cronbach α for this scale was 0.886.

Jong-Gierveld Loneliness Scale

Subjective loneliness was assessed with the modified version of the Jong-Gierveld Loneliness Scale, comprised of 5 items.⁶⁵ One point is given for a "yes" answer and zero for a "no" answer. Higher scores indicate more loneliness. The Cronbach α was α = 0.815.

Statistical Analysis

SPSS software version 23 was used to conduct the data analysis. We had no missing data, since all questions were required in the Google form. Weighting to the general population was done according to sex and education level. The normality of distribution of the SAS score was confirmed via a calculation of the skewness and kurtosis; values for asymmetry and kurtosis between -1 and +1 are considered acceptable to prove normal univariate distribution.⁶⁶ These conditions consolidate the assumptions of normality in samples larger than 300.⁶⁷ The Student *t* and analysis of variance tests were used to compare 2 and ≥ 3 means, respectively, whereas the Pearson correlation test was used to

Table 2. Bivariate Analysis of Categorical Variables Associated With the Smartphone Addiction Score^{a,b}

	Smartphone Addiction	P Value	Effect Size
Sex		.053	0.197
Male	30.54 ± 8.69		
Female	32.30±9.18		
Marital status		<.001	0.732
Single	32.68 ± 8.70		
Married	26.06 ± 9.37		
Education level		.462	0.086
Secondary or less	31.94±9.12		
University	31.16±8.84		
^a Values are presented a	as mean±SD.		

^DBolding indicates significance.

compare 2 continuous variables. A forward linear regression was conducted to check for correlates associated with smartphone addiction. Cronbach α values were recorded for reliability analysis of all scales and subscales. Significance was set at P < .05.

Mediation Analysis

The PROCESS SPSS Macro version 3.4 model 4^{68} was used to calculate 3 pathways. Pathway A determined the regression coefficient for the effect of boredom/loneliness on depression/anxiety/stress, pathway B examined the association between depression/anxiety/stress on smartphone addiction, and pathway C estimated the total and direct effect of boredom/loneliness on smartphone addiction. Pathway AB calculated the indirect intervention effects. To test the significance of the indirect effect, the macro generated biascorrected bootstrapped 95% CIs.⁶⁸ A significant mediation was determined if the CI around the indirect effect did not include zero.⁶⁸ All factors that showed an effect size or correlation > 0.24 in the bivariate analysis were entered as independent variables in the linear and mediation models to have parsimonious models.⁶⁹ Significance was set at *P* < .05.

RESULTS

Sociodemographic and Other Characteristics

The results showed that the mean \pm SD age of the participants was 22.25 \pm 2.87 years, with 70.9% female. Almost all the participants were single (91.3%) and had a university education level (94.4%). The mean \pm SD HCI was 1.08 \pm 0.61 (Table 1). In addition, the mean \pm SD scores of the scales were smartphone addiction: 31.19 ± 8.80 , boredom proneness: 107.48 ± 30.20 , loneliness: 13.66 ± 4.50 , stress: 12.11 ± 6.63 , anxiety: 13.91 ± 7.51 , and depression: 15.92 ± 10.83 . The results showed that 66 of 134 males (49.3%, scores \geq 31) and 143 of 327 females (43.7%, scores \geq 33) had smartphone addiction.

Bivariate Analysis

The bivariate analysis results are summarized in Tables 2 and 3. Higher boredom proneness, loneliness, stress, anxiety, and HCI were significantly associated with more smartphone addiction. Single participants had more smartphone addiction than those who were married.

t ic il Table 3. Bivariate Analysis of Continuous Variables Associated With the Smartphone Addiction Score^a

Variable	Pearson Correlation Coefficient	P Value
Boredom proneness	0.672	<.001
Loneliness	0.570	<.001
Stress	0.577	<.001
Anxiety	0.540	<.001
Depression	0.009	.851
Age	-0.008	.861
Household Crowding Index	-0.378	<.001
^a Bolding indicates significance		

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Table 4. Multivariable Analysis: Linear Regression Taking the Smartphone Addiction Score as the Dependent Variable^{a,k}

	Unstandardized	Standardized		95%	% CI	
Variable	β (Β)	β (β)	P Value	Lower	Upper	
Boredom	0.14	0.47	< .001	0.12	0.16	
proneness						
Loneliness	0.20	0.10	.025	0.03	0.38	
Stress	0.30	0.19	< .001	0.13	0.47	
Anxiety	0.14	0.13	.012	0.03	0.26	
Household	-1.25	-0.19	< .001	-1.66	-0.83	
Crowding						
Index						
Marital status	1.63	0.06	.07	-0.13	3.40	
(married vs						
single)						
^a Adjusted $R^2 = 6$	50.6%, P<.001.					
^b Bolding indicates significance.						

Table 5. Mediation Analysis: Direct and Indirect Effects of the Association Between Boredom Proneness and Smartphone Addiction, Taking Depression, Anxiety, and **Stress as Mediators**

	Direct Effect ^a			Indirect Effect ^b		
Mediator	Effect	SE	P Value	Effect	SE	95% BC _a
Stress	0.07	0.01	<.001	0.0001	0.001	-0.002 to 0.002
Anxiety	0.07	0.01	<.001	0.003	0.002	0.0001 to 0.008
Depression	0.07	0.01	<.001	-0.002	0.003	-0.01 to 0.005
-						

^aEffect of boredom proneness on smartphone addiction in the absence of the mediator.

^bEffect of boredom proneness on smartphone addiction in the presence of the mediator.

Abbreviations: $BC_a = bootstrap$ confidence interval, SE = standard error.

Multivariable Analysis

The results of the linear regression (using the enter method), taking smartphone addiction as the dependent variable, showed that more boredom proneness (B = 0.14), loneliness (B = 0.20), stress (B = 0.30), and anxiety (B = 0.14) were significantly associated with more smartphone addiction, whereas higher HCI (B = -1.25) was significantly associated with less smartphone addiction (Table 4).

Mediation Analysis

The results of the mediation analysis are summarized in terms of direct and indirect effects in Tables 5 and 6 and in terms of regression coefficients and standard errors in Figures 1 and 2. Anxiety mediated the association between boredom proneness and smartphone addiction and between

Table 6. Mediation Analysis: Direct and Indirect Effects of the Association Between Loneliness and Smartphone Addiction, Taking Depression, Anxiety, and Stress as Mediators

	Direct Effect ^a			Indirect Effect ^b		
Mediator	Effect	SE	P Value	Effect	SE	95% BCa
Stress	0.28	0.09	.002	0.002	0.01	-0.02 to 0.03
Anxiety	0.28	0.09	.002	0.03	0.02	0.005 to 0.08
Depression	0.28	0.10	.003	0.005	0.01	-0.01 to 0.03
^a Effect of loneliness on smartphone addiction in the absence of the						

mediator.

^bEffect of loneliness on smartphone addiction in the presence of the mediator.

Abbreviations: BCa = bootstrap confidence interval, SE = standard error.





^aValues are displayed as regression coefficients (standard error). *P=.046. **P=.008. ***P<.001.

Figure 2. (A) Relation Between Loneliness and Anxiety, (B) Between Anxiety and Smartphone Addiction, and (C) Between Loneliness and Smartphone Addiction^a



^aValues are displayed as regression coefficients (standard error). *P=.003. **P=.008. ***P<.001.

loneliness and smartphone addiction, whereas depression and stress did not mediate those associations.

DISCUSSION

The study results showed that higher boredom proneness, anxiety, and loneliness were significantly associated with

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It is illegal to post this copyr higher smartphone addiction. On the other hand, anxiety,

but not depression or stress, mediated the association between boredom proneness and smartphone addiction and between loneliness and smartphone addiction. We note that the study was conducted during the COVID-19 lockdown, and previous literature highlighted that smartphone addiction was high during the pandemic.^{70,71}

Boredom Proneness and Smartphone Addiction

Boredom proneness was significantly associated with higher smartphone addiction in this study, which is consistent with the results of previous literature.⁷² Sommers and Vodanovich⁷³ found that boredom proneness is highly linked with psychological health indices such as anxiety and depression. It is documented that high internet use and greater access to communication and entertainment through smartphones increase psychological problems and the core characteristics of boredom.⁷⁴ Avoiding feelings of boredom, seeking excitement and pleasure, and socializing through social media seem to be the main trigger factors for internet misuse and thus smartphone addiction.⁷⁵ In addition, it was previously shown that depression, anxiety, and interpersonal sensitivity can lead to a greater susceptibility to boredom and higher risk of excessive use of online communication applications.⁷² This behavior is further increased mainly when individuals encounter smartphone stimuli that provide an extraordinary experience and desire to use the smartphone after seeing or listening to the sound of an incoming message.⁷⁶ Thus, users of online communication applications develop smartphone addiction as a means to cope with unpleasant feelings such as boredom and to escape from the understimulation.

Anxiety and Smartphone Addiction

In our study, anxiety was significantly associated with higher smartphone addiction, in agreement with a study conducted by Demirci et al.⁵¹ Excessive smartphone use coupled with negative attitudes and feelings of anxiety and dependence may increase the risk for depression.^{45,77} Jones et al⁴⁶ concluded that students' addiction to their mobile phones seems to be high and that excessive use had a negative psychological effect. Also, a study⁵² conducted with Lebanese undergraduate students showed that both depression and anxiety were positive predictors of smartphone addiction. The user's emotional attachment to mobile phones is considered a means of survival, exerting both physical and mental deterioration, including anxiety. Specifically, the addiction to text messages is highly associated with anxiety, nervousness, and unstable personality traits.⁷⁸

Loneliness and Smartphone Addiction

In this study, loneliness was significantly associated with higher smartphone addiction, which is consistent with a study conducted by Bhardwaj and Ashok.⁷⁹ On the other hand, Takao et al⁸⁰ found no relation between loneliness and smartphone addiction. Smartphone use and loneliness have a strong positive relation because smartphone use provides

the opportunity for social links and connections between people with limited social lives, since their social ties are increasingly spatially dispersed.⁸¹

Thus, use of smartphones maintains bonds, creates new connections, aids in coping with various challenges, and is considered a means to combat the fear of missing out.⁸² People who experience the fear of missing out rely heavily on smartphones to access social networks so as not to miss something on the sites or the activities of others.⁸³ Smartphones are often used to obtain emotional support and alleviate negative feelings including loneliness.^{84,85} In addition, smartphone addicts who spend a lot of time on their phones are forced to reduce their face-to-face contact time and thus have poor social support and higher levels of loneliness.⁸⁶ Therefore, the higher the loneliness, the greater the likelihood of smartphone addiction.⁸⁷

Mediation of Depression, Anxiety, and Stress Between Smartphone Addiction, Loneliness, and Boredom Proneness

In our study, anxiety, but not depression or stress, partially mediated the relation between smartphone addiction, boredom proneness, and loneliness. A previous study⁷² found that anxiety mediated the relation between boredom proneness and problematic smartphone use severity. The explanation for the mediating effect of anxiety is that anxious individuals compensate for their negative emotions and loneliness by engaging in increased smartphone use and consequently addiction. However, no past study has examined the possible mediating effect of depression and stress between smartphone addicts and boredom proneness, yet both variables were found to be significantly related to higher smartphone addiction.¹⁶ In addition, a combination of stress and psychological dysregulation such as depression and anxiety predispose individuals to behavioral addiction.⁸⁸ Conversely, previous findings showed that boredom proneness mediates the associations between both depression and anxiety with problematic smartphone use.⁸⁹

Clinical Implications

Our findings emphasize the importance of investigating the relation between smartphone addiction and psychological disorders. Smartphone addiction should become a target interest among young adults, as they are at higher risk for addiction. Given that smartphone addiction is a novel introduction to the addictive behavior domain, its significant association with psychological disorders requires serious consideration in the community setting.

Limitations

This study was conducted using a survey that relies on self-reported behavior assessment through questionnaires reflecting the interviewee's own perspective and is suitable only for evaluating subjective disorders.⁹⁰ In addition, due to the cross-sectional nature of this study, causality cannot be determined, and there was no evaluation of the symptoms before and after the lockdown. A major limitation is that the

Malaeb et al It is illegal to post this copyrighted PDF on any website. study was conducted during the COVID-19 lockdown,

study was conducted during the COVID-19 lockdown, and research indicates that internet addiction including smartphone use was particularly high during this time.⁷¹ Furthermore, the study sample is not representative of the whole Lebanese population (ie, low mean age, high number of female participants, most had a university education level). The Smartphone Addiction Scale, Short Boredom Proneness Scale, and Jong-Gierveld Loneliness Scale have not been validated in Lebanon. Residual confounding bias is possible, since not all factors associated with smartphone addiction were considered in this study. Selection bias is also present because of the snowball sampling technique used.

The study findings indicate that boredom proneness, loneliness, and anxiety were associated with higher smartphone addiction. The results confirm that anxiety, but not depression or stress, mediated the association between boredom proneness and smartphone addiction and between loneliness and smartphone addiction. Further investigations should focus on examining the relation between smartphone addiction and mental health, which could clarify why the use of smartphones can be beneficial for some people, while exposing others to the risk of developing psychological disorders.

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