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The Moderating Effect of Psychological Distress in the Relationship between Loneliness and Shyness with Smartphone Addiction in Students

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Abstract

Introduction: Research evidence shows that smartphone addiction leads to a series of issues which necessitates the investigation of possible factors affecting it. The present study aimed to investigate the moderating role of psychological distress in the relationship between loneliness and shyness with smartphone addiction in students.

Method: This study was a descriptive correlational study. The statistical population included all students of Lorestan University in the second semester of 2023-2024, from which 400 students were selected through cluster sampling method. Data collection instruments included the Cell-phone Over-use Scale (COS), UCLA Loneliness Scale (Version 3), The Revised Cheek and Buss Shyness Scale (RCBS), and the Kessler Psychological Distress Scale (K10). Pearson correlation and hierarchical regression statistical methods were conducted using SPSS software (version 24).

Results: The results showed that there were significant positive relationships between psychological distress and smartphone addiction ($P< 0.01$, $r= 0.49$), loneliness and smartphone addiction ($P < 0.01$, $r= 0.31$), and shyness and smartphone addiction ($P< 0.01$, $r= 0.34$). Moreover, the results of the hierarchical regression analysis confirmed the moderating role of psychological distress in the relationship between loneliness and smartphone addiction ($P < 0.01$, $\beta =0.20$) and shyness and smartphone addiction ($P< 0.01$, $\beta= 0.16$).

Conclusion: Considering these factors for formulating effective preventive and therapeutic programs for students' smartphone addiction will increase the effectiveness of these programs.

Keywords: Psychological Distress, Loneliness, Shyness, Smartphone Addiction

Introduction

Smartphone addiction has become a global problem [1, 2]. It is a type of problematic smartphone use [3]. Research evidence shows that smartphone addiction leads to a series of issues such as negative emotions, dependence and isolation, decreased self-esteem, interpersonal problems, decreased sleep quality, and physical problems such as muscle pain and eye diseases [4]. According to research studies, at least 25% of students experience smartphone addiction, which necessitates the investigation of possible factors affecting it [1].

Psychological distress is significant contributors in smartphone addiction [5, 6]. Psychological distress is a general term used to describe an individual's state of emotional distress and suffering, characterized by symptoms of depression and anxiety [7]. Research evidence shows that psychological distress is associated with smartphone addiction among college students [5, 6]. According to the

Compensatory Internet Use Theory, individuals may be more inclined to use technology to avoid and relieve negative emotions [8]. Accordingly, in this theory, negative emotions can be considered antecedents for using technologies such as smartphones, and their excessive use is a compensatory behavior to regulate negative emotions. Depressed individuals are more inclined to use smartphones to escape problems, feelings of guilt, low mood, and anxiety than non-depressed individuals [9]. The research results of Hawi and Samaha [10] and Chen [11] also reported a relationship between anxiety and smartphone use.

According to research evidence, loneliness is a predictor of smartphone addiction [12, 13]. Loneliness, an important determinant of mental health, is associated with various negative mental health outcomes such as anxiety, depression, and stress, and overcoming loneliness leads to increased distress management [14]. Loneliness is an unpleasant and negative experience that an individual perceives regarding the desirability of social relationships. Loneliness is a subjective experience in the sense that an individual can feel lonely in the presence of others [15]. Loneliness in societies is caused by the fact that people have fewer social relationships with each other and spend more time entertaining themselves with new tools and technologies such as smartphones than interacting with each other. In this case, people feel alienated from social relationships and suffer from severe emotional loneliness [16]. Research studies have also reported a positive correlation between loneliness and smartphone addiction [17].

Shyness can also make people vulnerable to smartphone addiction [18]. Shyness has been described as a personality trait and a feeling of tension and discomfort when facing new social environments or when responding to social evaluations [19]. Shy people often experience negative emotions such as stress and anxiety in real-life social situations [20]. They are sensitive and vulnerable to negative evaluations from others; in social situations, they think that their appearance and behaviors will be negatively evaluated by others. They prefer to avoid face-to-face social interactions [21]. Shy people use smartphones to relieve their negative emotions and satisfy their need to socialize without face-to-face communication with others [1]; the anonymity and convenience of virtual space on smartphones create a relatively safe environment for shy people [2]. In this vein, the results of a study on students showed that shyness can predict smartphone addiction [22]. The results of Tian et al.'s [18] study also reported that problematic smartphone use can be positively associated with shyness in students.

In general, in the era of information technology, smartphones are a necessity in students' lives, and excessive and uncontrolled use of them is associated with negative consequences. Therefore, with the increasing prevalence of smartphone addiction and its negative consequences at various psychological, social, and educational levels in students, there is a need to conduct research studies to investigate the variables affecting smartphone addiction. Despite copious research on smartphone addiction, there is a substantial information gap persisting in understanding how loneliness and shyness relate to smartphone addiction in students. Given that previous research studies have examined the relationships between loneliness and shyness with smartphone addiction [20, 21, 23-25], there is a research gap in detecting the role of moderator variables in this relationship. Accordingly, the objective of the present study was to determine the moderating role of psychological distress in the relationship between loneliness and shyness with smartphone addiction.

Method

The present study was a descriptive correlational study. All students of Lorestan University in Khorramabad in the second semester of 2023-2024 constituted the statistical population. In this study, the cluster sampling method was used; students were randomly selected from the faculties of Lorestan University (i.e., the Faculty of Literature and Humanities and the Faculty of Engineering and Technology). The Cochran formula was used to estimate the sample size. Based on the Cochran formula, 362 students should be selected as a sample, and considering the possible dropout of participants, 400 students were considered; after collecting the questionnaires, the data of 376 students were finally analyzed. The inclusion criteria were studying at the university at the time of the study and the students' willingness to participate. In addition, the exclusion criterion was a failure to respond to more than 5 percent of the research questions. To analyze the collected data, Pearson correlation and hierarchical regression statistical methods were conducted using SPSS software (version 24). In this study, the following tools were used to collect data:

Cell-phone Over-use Scale (COS): Jenaro et al. [26] developed this 23-item scale based on ten psychological indicators from the Diagnostic and Classification Guide for Mental Disorders. Each item is scored on a six-point Likert scale (never = 1, rarely = 2, sometimes = 3, often = 4, almost always = 5, always = 6); a higher score indicates problematic and excessive use of the smartphone. The range of the total score on the scale is 23 to 138. Subjects with scores above 75 were rated as excessive users and less than 25 were assigned to be sparingly users. This scale includes no subscales. Jenaro et al. [26] reported the validity of this scale using Cronbach's alpha in male and female students as 0.87. Having investigated the psychometric properties of this scale in Iran, Yasminejad and Golmohammadian [27] confirmed the content validity of the scale; the internal consistency of the scale using the test-retest method was 0.71 and its Cronbach's alpha was 0.90. In the present study, the validity of the scale using Cronbach's alpha method turned out to be 0.84.

UCLA Loneliness Scale (Version 3): This 20-item scale was developed by Russell [28]. It consists of 10 negative and 10 positive items. It is scored on a four-point Likert scale from never [score 1) to always (score 4). In this scale, items 1, 5, 6, 9, 10, 15, 16, 19, and 20 are scored inversely. The total score range of this scale is 20 to 80, with higher

scores indicating greater loneliness. The most commonly used categorization is the following: 20–34 denotes a low degree of loneliness, 35–49 a moderate degree of loneliness, 50–64 a moderately high degree of loneliness, and 65–80 a high degree of loneliness. To examine the convergent validity of the UCLA Loneliness Scale, Russell reported the correlation of this scale with the NYU Loneliness Scale as 0.65, which was at a desirable level. Also, the validity of this scale using the test-retest method a 12-month interval was reported to be 0.89 [28]. In Iran, the validity of the Loneliness Scale was confirmed by Khoshdel Daryasari et al. [29]; the validity of this scale was obtained through Cronbach's alpha coefficient and test-retest coefficient as 0.88 and 0.89, respectively. In the present study, the validity of the scale was obtained using Cronbach's alpha method as 0.85.

The Revised Cheek and Buss Shyness Scale (RCBS): This 14-item scale was developed by Cheek and Buss in 1990. The scoring of this scale is based on a Likert scale (i.e., 1 = strongly disagree, 2 = disagree, 3 = no opinion, 4 = agree, and 5 = strongly agree) [30]. The validity and reliability of the scale were examined and confirmed [31]. Rajabi and Abbasi [30] reported the correlation coefficients of each item of the scale with the total score of the scale, except for item 12, ranging from 0.10 to 0.60 which were significant at the 0.01 level. This finding indicates that the scale items have adequate internal consistency. Furthermore, the discriminant validity coefficient between this scale and Rosenberg's Self-esteem scale was -0.23 which was significant at the 0.001 level. In the present study, the validity of this scale was 0.83 using Cronbach's alpha method.

Kessler Psychological Distress Scale (K10): This 10-item scale was designed by Kessler et al. [32] to assess the psychological status of the population. This scale does not assess a specific psychological disorder but determines the overall level of anxiety and depressive symptoms experienced by the individual over the past few weeks [33]. The scoring of the responses to the items is based on a Likert scale ranging from zero to four (i.e., always to never) [32]. The range of the scores is between 0 and 40. The cutoff point, considering maximum sensitivity is 1 and maximum specificity is 27.The validity and reliability of the scale were examined and confirmed [34]. Vaziri and Lotfi Kashani [35] reported the validity of this scale using Cronbach's alpha and split-half as 0.904 and 0.868, respectively. They also obtained the correlation of the scores of this scale with those of the General Health Scale as 0.80. In the present study, the validity of the questionnaire was 0.87 using Cronbach's alpha method.

Results

In this study, 376 students (175 males and 201 females) from Lorestan University in the academic year of 2023-2024 were studied. The mean and standard deviation of students' age were 20.46 and 6.34, respectively. By examining the amount of smartphone use, it became clear that 41.8% of students was sparingly users, and 15.3% was excessive users.

Descriptive statistics (i.e., mean, standard deviation, skewness, and kurtosis) as well as the correlation coefficient matrix related to the research variables are reported in Table 1.

Table 1 indicates that the skewness was in the range of 2 and -2 and the kurtosis was in the range of 3 and -3, which indicates the normality of the data distribution. Moreover, the results of the correlation coefficients indicated that there were significant positive relationships between psychological distress and smartphone addiction ($p < 0.01$, $r = 0.49$), loneliness and smartphone addiction ($p < 0.01$, $r = 0.31$), and shyness and smartphone addiction ($p < 0.01$, $r = 0.34$).

Then, hierarchical regression was used to examine the moderating role of psychological distress in the relationship between loneliness and smartphone addiction (see Table 2).

Table 1. Mean, SD, Skewness, Kurtosis, and Correlation Matrix

Variables	Mean	SD	Skewness	Kurtosis	Correlation coefficients			
					1	2	3	4
Psychological distress	29.4	5.86	0.49	0.51	-			
Loneliness	44.67	4.38	-0.84	-1.28	0.46**	-		
Shyness	48.47	5.26	0.53	0.058	0.35**	0.52**	-	
Smartphone addiction	72.81	8.34	0.61	0.64	0.49**	0.31**	0.34**	-

P <0 .01 **

Table 2. Results of Regression Analysis based on Loneliness, Psychological Distress, and their Interaction to Predict Smartphone Addiction

Variables	B	SE_B	B	T	R	R^2	F
Phase one					0.61	0.39	125.45**
Loneliness	0.62	0.04	0.63	9.87**			
Phase two					0.68	0.46	104.72**
Loneliness	0.49	0.03	0.54	9.31**			
Psychological distress	0.24	0.02	0.27	4.46**			
Phase three					0.70	0.49	91.39**
Loneliness	0.43	0.03	0.51	7.96**			
Psychological distress	0.24	0.03	0.32	5.84**			
Loneliness * psychological distress	0.15	0.02	0.20	4.93**			

P <0 .01 **

According to Table 2, loneliness explained 39% of the variance in smartphone addiction. In the second step, the moderating variable psychological distress, when added to the regression equation along with loneliness, explained a total of 46% of the variance in smartphone addiction. In the next phase, the interaction between loneliness and psychological distress was added to the regression equation, and this interaction explained 49% of smartphone addiction. A significant interaction means that the relationship between loneliness and smartphone addiction is different at high and low levels of the moderating variable. Accordingly, considering the increase in the explained variance of smartphone addiction as a result of the inclusion of the interactive variables of loneliness and psychological distress, it can be concluded that psychological distress could moderate the relationship between loneliness and smartphone addiction.

Table 3 presents the results of the regression analysis to investigate the moderating role of psychological distress in the relationship between shyness and smartphone addiction.

Table 3 shows that shyness alone explained 31% of the variance of smartphone addiction. In the second phase, the moderating variable of psychological distress, when added to the regression equation along with shyness, explained 36% of the variance of smartphone addiction. Finally, in the third phase, the interaction between shyness and psychological distress was added to the regression equation; this interaction could explain 39% of smartphone addiction. A significant interaction means that the relationship between loneliness and smartphone addiction is different at high and low levels of the moderating variable. Therefore, considering the increase in the explained variance of smartphone addiction as a result of the interactive variables of shyness and psychological distress, it can be concluded that psychological distress moderated the relationship between shyness and smartphone addiction.

Table 3. Results of the regression analysis based on shyness, psychological distress, and their interaction to predict smartphone addiction

Variables	B	SE_B	B	T	R	R^2	F
Phase one					0.53	0.31	114.25**
Shyness	0.52	0.038	0.54	10.32**			
Phase two					0.57	0.26	97.63**
Shyness	0.39	0.034	0.42	8.49**			
Psychological distress	0.16	0.019	0.21	4.54**			
Phase three					0.59	0.39	80.37**
Shyness	0.35	0.029	0.38	7.39**			
Psychological distress	0.15	0.021	0.23	5.13**			
Shyness * psychological distress	0.14	0.015	0.16	4.37**			

P <0 .01 **

Discussion

The objective of the present study was to examine the moderating role of psychological distress in the relationship between loneliness and shyness with smartphone addiction in students. The findings showed that loneliness had a significant positive relationship with smartphone addiction. This finding is consistent with research results [12, 13, 17]. However, research evidence was not found that was inconsistent with the results of the present study. People who feel lonely often suffer from a series of interpersonal problems and even social isolation in collective societies. Loneliness causes sadness and detachment in individuals and affects their social relationships, lifestyle, and physical and mental health. Loneliness is a negative and unpleasant feeling that is created due to the lack of desirable and satisfying social relationships in an individual [36]. These people turn to the virtual space to fill the emotional gap and receive social and emotional support to relieve their loneliness [37]. On the other hand, the need to connect with others and have intimacy with others is a basic human need that helps people to share their feelings and emotions with others. People who cannot establish friendly and close relationships with others in the real world turn to creating relationships in the virtual world, which provides them with the opportunity to overcome these negative and unpleasant feelings [38]. In this vein, the results of Kara et al.'s [17] study have also reported a positive correlation between loneliness and smartphone addiction.

Another finding of the study indicated that shyness had a significant positive relationship with smartphone addiction. This finding is consistent with the results of research [18, 22]. However, research evidence was not found that was inconsistent with the results of the present study. Shy people are rejected by others due to their poor social skills [39]. As a result, they satisfy their need for socialization without face-to-face contact with others through cyberspace [1]. The anonymity and comfort of the virtual space provide a relatively safe environment for them [2]. Accordingly, smartphones are an alternative communication tool for shy people to compensate for their emotional needs [40]. The results of Tian et al.'s [18] study also reported that problematic smartphone use can be positively associated with shyness.

The results of the regression analysis showed that psychological distress could be a moderating factor in the relationship between loneliness and smartphone addiction. Research evidence on the moderating role was not found. In explaining this finding, it can be stated that when people who feel lonely for a long time have a lower tendency to social relationships in the real world, they avoid social activities that require face-to-face interaction, and are more likely to experience depression and anxiety [41, 42]. In this vein, people will look for a remedy to

relieve their negative emotional states so that they can experience positive emotions and feelings. Therefore, they may look for this remedy in smartphones. Moreover, due to withdrawal from social relationships, they are lonely and isolated most of the time and become dependent on their smartphones to have a supportive social network [43]. Accordingly, in situations where people cannot avoid negative emotions, they will look for situations that, even temporarily, reduce these negative emotions; cyberspace can be a way to relieve their negative emotions. Due to the temporary effectiveness of cyberspace in relieving negative emotions, it acts as a reinforcer; when people are faced with negative situations and emotions, they turn to cyberspace [12].

The results of the regression analysis showed that psychological distress could play a moderating role in the relationship between shyness and smartphone addiction. Research evidence on the moderating role was not found. Shy people are timid and usually experience negative emotions such as stress and anxiety in real social situations [20]. If they do not use adaptive methods to solve problems and negative emotions, they may turn to their phones to escape from the problems and emotions they experience. Compared to sociable people, they express more negative emotions and feelings through cyberspace. On the other hand, searching in cyberspace allows them to temporarily get rid of anxious thoughts, and this temporary relief increases their tendencies to use the phone [44].

In this study, due to the use of self-report questionnaires, subjects' responses may be affected by deliberate false distortions and responses. Accordingly, it is suggested that researchers use methods such as interviews and observation in addition to the questionnaires. The results are based on cross-sectional data that cannot show a cause-and-effect relationship, and the results should be examined with caution. Therefore, it is suggested that future research use different methods such as experimental and longitudinal studies to examine causal relationships. Finally, the present study had a demographic limit in such a way that its participants were all students from Lorestan University of Medical Sciences. Therefore, there should be caution in generalizing the findings of this study to other statistical communities. Accordingly, it is suggested to carry out similar studies on other statistical societies.

Conclusion

In summary, the present study emphasized the moderating role of psychological distress as an important variable in the relationship between loneliness and shyness with smartphone addiction in students. Therefore, considering these factors for formulating effective preventive and therapeutic programs for students' smartphone addiction will increase the effectiveness of these programs. In addition, to support shy individuals or individuals with high levels of loneliness in establishing family and social relationships, it is necessary to conduct therapeutic interventions to teach social and communication skills through educational videos, brochures, and practical classes under the supervision of psychological and counseling specialists. Psychoeducation will be beneficial for the management of smartphone addiction.

Conflict of Interest

The authors declare no conflicts of interest.

Ethical Approval

Ethical principles in writing the article have been observed according to the instructions of the National Ethics Committee and the COPE regulations.

Declaration of Generative AI and AI-Assisted Technologies

During the preparation of this work, the authors did not use any AI tools.

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