

Correlation of Loneliness and Impulsivity with Academic Adjustment of Female Students: Mediated by Smartphone Addiction

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Abstract

Background: The transition to school brings about changes in a student's self-perception and relationships with others, which can make adjustment difficult. This research aimed to investigate the mediating role of smartphone addiction in the correlation between loneliness and impulsivity with academic adjustment in female high school students.

Methods: The statistical population of this descriptive-correlational study included all female high school students in Ahvaz, Iran, during 2022-23 academic year. The stratified cluster sampling method was employed to select 406 students as the research sample. The research instruments included the Academic Adjustment Scale, Loneliness Scale, Impulsivity Inventory, and Mobile Phone Addiction Scale. The proposed model was evaluated through path analysis in SPSS version 26 and AMOS version 25, while the indirect paths were tested through bootstrapping.

Results: There was a negative correlation between smartphone addiction ($r=-0.43$, $P=0.001$), loneliness ($r=-0.32$, $P=0.001$), and impulsivity ($r=-0.27$, $P=0.001$) with academic adjustment in the students. In contrast, there was a positive correlation between smartphone addiction and loneliness ($r=0.31$, $P=0.001$) as well as impulsivity ($r=0.32$, $P=0.001$). Moreover, there was a positive correlation between impulsivity and loneliness in the students ($r=0.45$, $P=0.001$). The results showed that all direct paths, except loneliness, were significantly correlated with academic adjustment ($P<0.001$). Indirect paths to academic adjustment were also significant when mediated by smartphone addiction ($P<0.001$). According to the results, the research model had a good fit ($TLI=0.94$, $CFI=0.96$, $NFI=0.96$, and $RMSEA=0.059$).

Conclusion: Based on the research model, impulsivity and smartphone addiction had a negative correlation with the academic adjustment of female students. Smartphone addiction played a mediating role in the correlation between loneliness and impulsivity with the adjustment of female students. The results can provide a good model for designing and developing specific plans to prevent academic failure and improve academic adjustment.

Keywords: Loneliness, Impulsive behavior, Acclimatization, Internet addiction disorder, Students

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1. Introduction

Schools and academic environments are now among the most common settings for adolescents. Researchers believed that the transition to school can significantly impact an adolescent's perception of themselves and others, making adjustment difficult (1). The literature suggested that successful adjustment is crucial for a student's academic and social development, thereby greatly influencing their academic success (2, 3). As a significant social environment in their lives, students' experiences and adaptation to school can have positive or negative effects on their overall development. These effects often extend beyond typical school behaviors such as academic performance and attendance, encompassing antisocial or prosocial behaviors (4).

Loneliness is one of the factors that influence a student's academic adjustment. Adolescents who lack parental affection, attention, and adequate social skills for effective communication struggle to find partners who can fulfill their emotional, educational, and support needs (5, 6). Consequently, they experience feelings of loneliness, as humans have a fundamental need for interpersonal communication (7). Insufficient social skills can lead to social isolation, compelling individuals to seek alternative means to meet their needs. Researchers attributed loneliness to the inability to establish emotional connections or the uncertainty and insecurity associated with social interactions (8).

Research has also indicated that engaging in impulsive decision-making or disregarding immediate situations can hinder optimal academic

adjustment (9). This behavioral tendency is commonly referred to as impulsivity. Psychology recognizes impulsivity as an underlying factor in high-risk behaviors, addiction, smoking, reckless driving, early sexual activity, aggression, communication problems, and diminished career and academic success (10). Impulsivity is a multidimensional personal construct with fundamental neurobiological mechanisms (11). It is defined as a propensity to react hastily and without prior planning to internal or external stimuli, regardless of the potential consequences (12, 13). Marriott and colleagues (14) found a negative correlation between impulsivity and academic performance in their study.

Smartphone addiction is a significant factor that can impact students' loneliness and impulsivity, as well as hinder their academic adjustment. The rapid advancements in smartphone technology, along with its widespread social influence and internet connectivity, have even altered the perception and study of modern technologies, such as personal computers (15). In addition to voice communication, smartphones now offer a wide range of features, including Internet connectivity, messaging, photo and video sharing, online streaming, data and personal information management. They also serve as a platform for accessing information and entertainment (16). These features make smartphones particularly appealing to users of all age groups, especially adolescents (17). Although initially seen as specialized tools for senior managers and businesses, or as expensive technologies for the affluent classes when introduced in Iran, smartphones have now become increasingly prevalent and important across various social groups, integrated into everyday life (18). Literature suggested that the growing use of smartphones leads to increased psychological dependence and decreased social interactions among adolescents (19, 20).

Academic adjustment plays a crucial role in the academic lives of students. While this period provides individuals with scientific knowledge, skills, and personal growth, students also encounter a wide range of unique challenges, opportunities, obstacles, and pressures. Since students are pivotal to social development but often face difficulties and issues within the academic environment, it is essential to develop strategies to address their academic problems. Considering the provided information and research background,

the purpose of this study was to examine the relationship between loneliness and impulsivity and the academic adjustment of high school students, with a particular focus on the mediating role of smartphone addiction.

2. Methods

The statistical population of this descriptive-correlational study included all female high school students in District 2 of Ahvaz, Iran, during 2022–23 academic year. The sample for the study was selected using the cluster sampling method. The sample size was estimated based on the research variables (21). Considering the number of variables in this study, 380 samples were deemed sufficient. However, to account for a potential attrition rate of 10%, the sample size was estimated at 418. After eliminating incomplete questionnaires, the final sample size was determined to be 406 (12 questionnaires were removed due to incompleteness).

The inclusion criteria for participants were as follows: an age range between 16 and 18 years, being a high school student, providing written informed consent for participation in the study, and not suffering from any physical or mental illnesses. The exclusion criteria included unwillingness to continue cooperating in the research and providing an incomplete questionnaire.

Following an inquiry from the regional Department of Education regarding the number of senior high schools and obtaining the necessary research permission, an education district was randomly selected. Subsequently, five female high schools were randomly chosen. After coordination with principals and teachers, three classes were randomly selected from each school. Ultimately, 406 questionnaires were completed by participants and included in the study.

2.1. Instruments

Academic Adjustment Scale: The Academic Adjustment Scale, designed by Anderson and colleagues (22), is a 9-item questionnaire that is scored on a 5-point Likert scale, ranging from 1 (very low) to 5 (very high). It is important to note that items 2 and 3 are scored inversely. This questionnaire has a minimum score of 9 and a maximum score of 45. Higher scores on this scale indicate a higher perceived level of academic adjustment. Baharvand

and colleagues (23) reported a reliability coefficient of 0.80 for this scale, measured using Cronbach's alpha. The validity of the Academic Adjustment Scale was confirmed with a content validity index (CVI) of 0.97 and a content validity ratio (CVR) of 0.94 (23). In this study, the scale demonstrated a reliability coefficient of 0.83, as measured by Cronbach's alpha.

Loneliness Scale (UCLA): The UCLA Loneliness Scale, developed by Russell (24), consists of 20 items. Participants rate descriptive phrases by selecting one of four response options: never, rarely, sometimes, and often. Items 1, 4, 5, 6, 9, 10, 15, 16, 19, and 20 are scored inversely. The remaining items are scored directly. Scores on the UCLA Loneliness Scale range from 20 to 80, with higher scores indicating a stronger perception of loneliness. Zarei and colleagues (25) reported a reliability coefficient of 0.91 for this scale, measured using Cronbach's alpha. The validity of the UCLA Loneliness Scale was confirmed with a CVI of 0.95 and a CVR of 0.93 (25). In the current research, the scale demonstrated a reliability coefficient of 0.89, as measured by Cronbach's alpha.

Impulsivity Inventory: The Impulsivity Inventory, created by Dickman (26), is used to assess two factors: functional impulsivity and dysfunctional impulsivity. It consists of 23 yes/no questions, with scores of 1 and 0 assigned to "yes" and "no" responses, respectively. Higher scores on this questionnaire indicate greater impulsivity. The range of scores for this inventory is between 0 and 23. Ekhtiari and colleagues (27) reported a reliability coefficient of 0.75 for this questionnaire, measured using Cronbach's alpha. The validity of the Impulsivity Inventory was confirmed with a CVI of 0.91 and a CVR of 0.88 (27). In this study, the questionnaire demonstrated a reliability coefficient of 0.80, as measured by Cronbach's alpha.

Mobile Phone Addiction Scale (MPAIS): The Smartphone Addiction Scale, developed by Leung (28), is a 17-item self-report instrument based on a

5-point Likert scale (always, often, sometimes, rarely, and never), with scores ranging from 1 (never) to 5 (always). This questionnaire has a minimum score of 17 and a maximum score of 85, with higher scores indicating higher smartphone addiction. Mazaheri and Karbasi (29) reported a Cronbach's alpha coefficient of 0.86 for the MPAIS, indicating good internal consistency. The validity of the MPAIS was confirmed with a CVI of 0.96 and a CVR of 0.93 (29). In this study, the reliability of the MPAIS was assessed with a Cronbach's alpha coefficient of 0.85.

2.2. Data Analysis

To evaluate the correlation of variables, the Pearson correlation coefficient and path analysis were employed. The proposed model was evaluated through path analysis using SPSS version 26 and AMOS version 25.

3. Results

The demographic results revealed that the average age of the students was 17.34 ± 2.19 years. Among the participants, 121 (29.80%) individuals were in the 10th grade, 127 (31.28%) were in the 11th grade, and 158 (38.92%) were in the 12th grade. Table 1 presents the mean, standard deviation (SD), and Pearson correlation coefficient of the research variables.

The Pearson correlation coefficient indicated a significant correlation between all research variables ($P < 0.001$). The results showed a negative correlation between smartphone addiction ($r = -0.43$), loneliness ($r = -0.32$), and impulsivity ($r = -0.27$) with academic adjustment. In contrast, there was a positive correlation between smartphone addiction and loneliness ($r = 0.31$) as well as impulsivity ($r = 0.32$). Furthermore, there was a positive correlation between impulsivity and loneliness in the students ($r = 0.45$). Figure 1 illustrates the preliminary model proposed to explain academic adjustment based on loneliness, impulsivity, and smartphone addiction.

Table 1: Mean, standard deviation (SD), and Pearson correlation coefficients of the study variables

Variables	Mean	SD	1	2	3	4
1- Academic adjustment	27.26	5.53	1			
2- Loneliness	50.06	8.13	-0.27**	1		
3- Impulsivity	14.43	1.92	-0.32**	0.45**	1	
4- Smartphone addiction	49.60	10.04	-0.43**	0.31**	0.32**	1

** $P < 0.01$

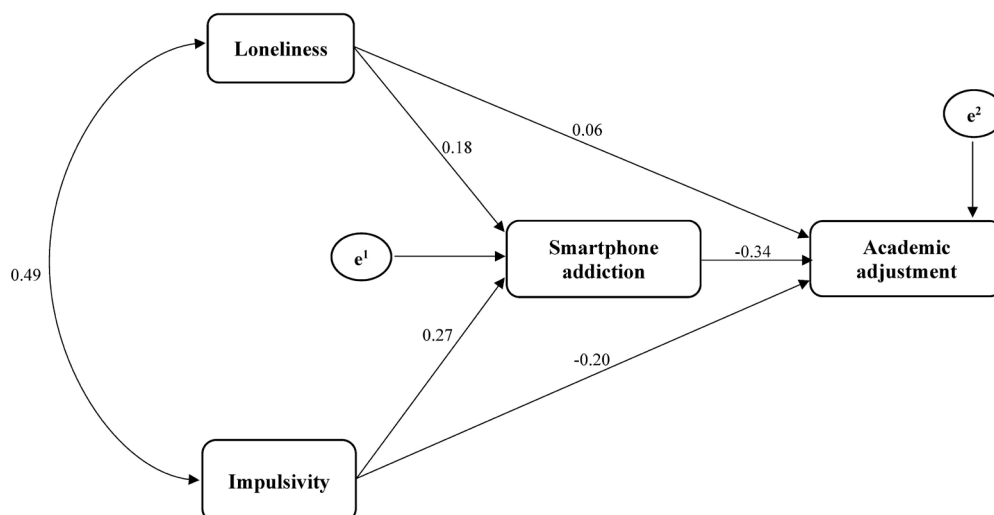


Figure 1: The figure shows the initial proposed model.

Table 2: Fit indicators in the initial and final models

Fit indicators	Initial model	Final model
χ^2	15.52	16.81
df	6	1
(χ^2/df)	2.58	2.40
TLI	0.94	0.95
CFI	0.96	0.98
RFI	0.92	0.92
NFI	0.95	0.96
RMSEA	0.083	0.059

TLI: Tucker–Lewis Index; CFI: Comparative Fit Index; RFI: Relative Fit Index; NFI: Normed Fit Index; RMSEA: Root Mean Square Error of Approximation

The root means square error of approximation (RMSEA=0.083) in Table 2 indicated that the preliminary model required modification. After removing the path from loneliness to academic adjustment, the final model achieved an RMSEA of 0.059, suggesting a good fit. Figure 2 shows the

modified model.

Table 3 reports the estimated path coefficients for evaluating the direct and indirect hypotheses. The results indicated a direct correlation between loneliness and academic adjustment in the students

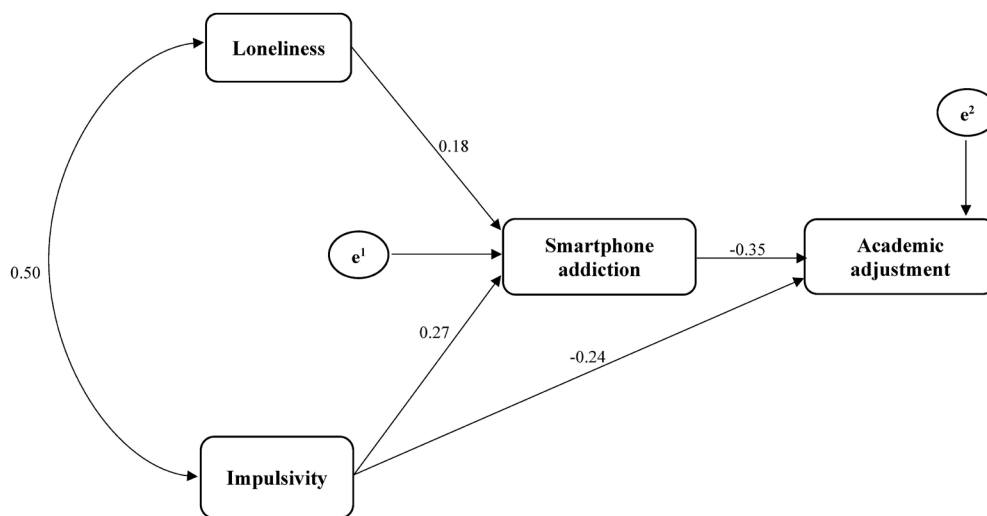


Figure 2: The figure shows the final modified model.

Table 3: Path coefficients of direct and indirect correlation between research variables in the initial and final models

Path	Initial model			Final model	
	Path type	β	P	β	P
Loneliness to academic adjustment	Direct	-0.06	0.254	-	-
Loneliness to smartphone addiction	Direct	0.18	0.001	0.18	0.001
Impulsivity to academic adjustment	Direct	-0.20	0.002	-0.24	0.001
Impulsivity to smartphone addiction	Direct	0.27	0.001	0.27	0.001
Smartphone addiction to academic adjustment	Direct	-0.31	0.001	-0.35	0.001
Impulsivity to academic adjustment through smartphone addiction	Indirect	-0.043	0.001	-0.043	0.001
Loneliness to academic adjustment through smartphone addiction	Indirect	-0.128	0.001	-0.131	0.001

($\beta=0.18$, $P=0.001$). There was a negative correlation between impulsivity and academic adjustment ($\beta=-0.24$, $P=0.001$), as well as between smartphone addiction and academic adjustment in the students ($\beta=-0.35$, $P=0.001$). Moreover, there was a direct correlation between impulsivity and smartphone addiction in the students ($\beta=0.27$, $P=0.001$). The results also demonstrated no correlation between loneliness and academic adjustment ($\beta=-0.06$, $P=0.254$). Additionally, Table 3 illustrates that the indirect path from loneliness to academic adjustment was significant when mediated by smartphone addiction ($\beta=-0.131$, $P=0.001$), and the indirect path from impulsivity to academic adjustment was also significant ($\beta=-0.043$, $P=0.001$).

4. Discussion

This study aimed to investigate the mediating role of smartphone addiction in the correlation between loneliness and impulsivity with academic adjustment in high school students. The first finding showed a statistically insignificant correlation between loneliness and academic adjustment. This finding is inconsistent with the research results of Behamin and Kouroshnia (30). This inconsistency could be due to different research population, sample size, and different instruments used for checking research variables. Loneliness is a distressing and unpleasant experience that causes humiliation, unpleasant moods, and emotional states, creating numerous academic and behavioral problems (29). Quan and colleagues (31) reported that loneliness had a direct negative impact on adjustment in high school students. In their research, Garavand and colleagues (32) showed that the feeling of loneliness has a negative correlation with the educational and social participation of female high school students. The components of loneliness, such as failure, aimlessness, weak social relations, blame and criticism from others, and inability to express one's

wishes, can degrade students' academic adaptation and self-efficacy (6). There are factors in contrast to the negative factors of loneliness that prevent the development of academic adjustments, such as confidence and flexibility.

The results also indicated a negative correlation between impulsivity and academic adjustment. This finding is consistent with the research results of previous study (14). Ranjbakhsh and colleagues (33) reported that there was a correlation between impulsivity and academic performance of female students aged 16 to 18. Theories define impulsivity as a predisposition that is part of a behavioral model instead of a single act. Impulsivity is an unplanned hasty action, i.e., one that occurs before deliberation. This distinguishes impulsivity from poor judgment or obsessive behaviors that are planned. Finally, impulsivity is action without consideration of outcomes (11). It is typically risky, yet the results of various risks associated with sensation-seeking are not considered. The multidimensional impulsivity perspective suggests that impulsive students behave undesirably due to their failure to learn the correct approaches (10). Hence, the main problem is that these people's inability to evaluate and monitor their behavior makes them impatient to act without considering possible consequences and leads to social and psychological isolation. Impulse control, which guarantees self-supervision, self-evaluation, and self-reinforcement, allows students to strengthen these skills, complete their tasks without assistance, and handle social responsibilities.

The results also indicated a correlation between smartphone addiction and academic adjustment. In other words, smartphone addiction has a significant negative correlation with academic adjustment. This finding is consistent with the research results of previous study (34). Heo and Lee (35) reported that preventing smartphone

addiction seems important for improving school adjustment among high school students. The advent of smartphones with internet connectivity has transformed the lives of its users. In recent years, the ease of use and affordability of smartphones has led to a massive rise in the number of users (15). People use smartphones for various purposes, such as establishing communication, looking up information, finding entertainment, sharing videos and photos, and reading different materials (18). The attractions and breakthroughs of smartphones, especially in applications such as messengers and social media, have led to an ever-increasing adoption by adolescents. The irrational use of smartphones has led to a dependence on social media (16).

According to the results, there is a correlation between loneliness and academic adjustment when mediated by smartphone addiction. First, there are no correlations between loneliness and academic adjustment. Indirectly; however, loneliness only affects academic adjustment by worsening students' smartphone addiction. Naturally, numerous factors affect students' academic progress, adjustment, and performance. Some of these factors improve academic adjustment, whereas others have adverse effects. Smartphone addiction is a factor that negatively affects students' academic progress, adjustment, and performance (35). The results also indicated a correlation between impulsivity and academic adjustment when mediated by smartphone addiction. Moreover, there is a significant direct correlation between impulsivity and academic adjustment. At the same time, the indirect results indicated that impulsivity reduces academic adjustment by increasing students' smartphone addiction. Highly impulsive students have lower academic self-regulation, are less hopeful in the face of academic problems, and have weaker learning management and less tolerance of obstacles and social pressures (10). Meanwhile, adolescents with weaker impulse control are likely to underperform in executive functions and have lower academic performance (33). Thus, smartphone addiction mediates the correlation between impulsivity and academic adjustment.

4.1. Limitations

Since the statistical population was limited to female students in senior high schools in Ahvaz, Iran, caution should be taken when generalizing

the results to male or female students in other cities. This study, like other descriptive-correlation studies, has limitations in the field of data collection. Since the data were obtained through self-report instruments by the students, it is possible that the participants exhibited defensiveness, self-censorship, and distanced themselves from stating the facts. Also, since the current research was cross-sectional, it did not provide the possibility of establishing a causal correlation between the research variables.

5. Conclusion

The proposed conceptual model demonstrates a strong fit, making it a significant scientific breakthrough in gaining insights into and enhancing factors related to students' academic adjustment. It is highly recommended that experts and officials take measures to cultivate an academic atmosphere within schools that enables students to effectively leverage their positive personal and behavioral attributes, while simultaneously addressing issues such as impulsivity, loneliness, and smartphone addiction. This approach aims to promote and enhance students' academic adjustment.

Given the acquisitive nature of impulsivity and smartphone addiction, it is suggested that families and teachers prioritize addressing these variables to improve students' academic adjustment. Furthermore, it is important for parents, alongside other essential organizations, to exercise greater supervision over students' peers, schools, and media exposure to reduce their reliance on social media platforms. In order to comprehensively understand the relationship between mobile phone addiction and other variables, it is advisable for future research to explore this correlation while taking into account relevant demographic factors. Additionally, conducting similar studies involving male students would contribute to a more comprehensive understanding of the subject matter.

Ethical Approval

The study was approved by the Ethical Committee of Islamic Azad University- Ahvaz Branch with the code of IR.IAU.AHVAZ.REC.1402.029. Also, written informed consent was obtained from the participants.

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Authors' Contribution

MB: Substantial contributions to the conception and design of the work, acquisition, analysis, and interpretation of data for the work, reviewing the manuscript critically for important intellectual content. ZES: Substantial contributions to the conception and design of the work, acquisition, analysis, and interpretation of data for the work, reviewing the manuscript critically for important intellectual content. RH: Substantial contributions to the design of the work, drafting the work and reviewing it critically for important intellectual content. AH: Substantial contributions to the design of the work, reviewing the manuscript critically for important intellectual content. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, such that the questions related to the accuracy or integrity of any part of the work.

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