






Structural Relationships of Attachment Styles with Social Anxiety in Adolescents Dependent on Internet Games: The Mediating Role of Loneliness

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ABSTRACT

This study aimed to examine the structural relationships between attachment styles and social anxiety in adolescents dependent on internet games, considering the mediating role of loneliness. A random sample of 200 adolescents dependent on internet games was selected, and questionnaires on attachment style, social anxiety, and loneliness were completed for them. The results showed that a secure attachment style directly and indirectly leads to reduced social anxiety through decreased loneliness. Additionally, avoidant and anxious-ambivalent attachment styles directly and indirectly lead to increased social anxiety through heightened loneliness. These findings indicate that loneliness plays a significant mediating role in the relationship between attachment styles and social anxiety in adolescents dependent on internet games.

Keywords: Attachment styles, social anxiety, loneliness, adolescents, internet games.

1. Introduction

Internet addiction is characterized by excessive and uncontrolled use of the internet, which affects daily life (1-3). Adolescents are the primary risk group for internet addiction (4). Research has shown that internet addiction in adolescence can have multiple negative effects, including cognitive problems (5), loneliness (6), family and

interpersonal relationship issues (3, 7, 8), school performance (9, 10), low self-esteem (11, 12), depression (11, 13), and anxiety (14). Individual characteristics, family and school-related variables, and environmental factors are equally important in understanding internet addiction (14).

Many studies have found a significant correlation between internet addiction and psychological problems among adolescents (2, 11). The study by Servidio et al.

(2021), based on a sample of 454 Italian students, confirmed a significant and positive relationship between anxiety and internet addiction (15). Some theories offer a conceptual framework emphasizing the link between internet addiction and mental health problems. For example, the problem-behavior theory presented by DiLeo and Wolfert (2013) shows a composite theoretical framework where individuals lacking a social network and showing worse internal psychological problems, such as social anxiety and depression, are more prone to problematic internet use (16).

Social anxiety, the most common anxiety disorder in adolescence, is the state of tension or discomfort individuals experience in social situations (17). Examining the potential effects of mobile game addiction and social anxiety in adolescents is important, given that nearly one-third of adolescents meet the criteria for an anxiety disorder (14, 18). Some literature suggests that internet addiction, smartphone addiction, and online game addiction are all related to an individual's social anxiety. For instance, individuals with a strong tendency towards online game addiction have significantly higher levels of social anxiety than those who use online games normally (17, 19). Prior results indicated that when adolescents spend more time playing online games, the quality of interpersonal relationships may deteriorate, and social anxiety levels may increase (20). Previous research has also shown that one of the causes of adolescents' excessive tendency towards computer games is pervasive stress and anxiety, social anxiety, high sensation-seeking, and lack of internal control, which can affect their academic performance. For example, social anxiety is one of the main emotional problems affecting students' academic performance and can disrupt various domains of individual functioning (14, 18, 21). Several theoretical models have also shown that problematic internet use can lead to social anxiety. The cognitive-behavioral model suggests that individuals with social anxiety may resort to social networks or video games as an avoidance strategy, potentially leading to problematic internet use (20). The compensatory internet use theory states that individuals with social anxiety use the internet as a substitute for offline social and emotional interactions, exacerbating social anxiety symptoms and potentially leading to problematic internet use (22, 23). Furthermore, social anxiety affects 7% to 13% of the general population, with higher prevalence among adolescents and

young adults. Studies show that up to 15% to 20% of students experience social anxiety symptoms (24). Although a significant number of studies have established a positive correlation between social anxiety and problematic internet use among adolescents and young adults, there is considerable variation in the effect sizes reported in these studies (25).

Adolescence leads to communication problems, tension, depression, and loneliness (9, 13). A person who feels lonely seeks different environments to escape these problems and similar issues. Adolescents who see themselves as socially isolated from a group try to eliminate this loneliness through the internet in virtual environments, gradually becoming addicted to the internet (26). It has been stated that internet addiction is linearly correlated with social isolation and loneliness (13). Loneliness is defined as an unpleasant experience resulting from significant deficiencies in one's social network (27, 28). In fact, loneliness is the inability to establish and maintain satisfactory relationships with others, possibly leading to a sense of deprivation. Loneliness involves feelings of emptiness, sadness, and detachment, impacting social interactions, lifestyle, and physical and mental health in various ways (29). Previous studies have consistently confirmed the relationship between loneliness and online game addiction (6, 9, 13, 26, 28, 30). Additionally, loneliness is not only a cause but also a consequence of online game addiction. There is a potential reciprocal relationship (26). Previous research has shown that although online gaming may temporarily escape negative feelings associated with social deficiencies, excessive gaming does little to develop or maintain real-life relationships. Instead, substituting for real-life interpersonal interactions may worsen existing social relationships and, consequently, increase loneliness (13). Therefore, a person with high social anxiety, due to the inability to establish social relationships in the real world, turns more to virtual social networks. This anxiety prevents them from forming desirable relationships in the real world, so they seek refuge in their phones to conform with peers they want to connect with in real life, leading to greater dependency and addiction to smartphones (28). Researchers have found that adolescents' social anxiety is strongly related to internet addiction, but this relationship is moderated by extraverted personality traits (13, 27). Social anxiety levels in

adolescents are very useful for predicting internet addiction (19), and adolescent loneliness is significantly positively correlated with internet addiction (22). In summary, social anxiety and loneliness both impact internet addiction among students (17). Multiple studies have also indicated that early child-parent attachment bonds are linked to later peer relationships. Adolescents securely attached to their parents exhibit more social behaviors, have higher emotional and social competence, experience higher relationship quality and less conflict, and are more accepted by their peers, resulting in less loneliness (11, 24, 31).

Among the risk and protective factors for addiction in adolescence, the relationship with family and peers is particularly important (32). Another crucial predictor of social anxiety is attachment style. This implies dispositional differences in the functioning of the attachment system and reflects cognitions and emotions, thus influencing various ways of interacting with acquaintances and strangers (33). It has been shown that internet addiction is related to insecure attachment (34, 35), with anxious and avoidant styles (Shine et al., 2011). Little attention has been given to the relationship between attachment styles and other forms of online addiction (e.g., internet gaming disorder and social network addiction). Recent studies have shown the predictive role of attachment in excessive Facebook use and online social networking sites (35). Similarly, researchers suggest that addictive behaviors in adolescence may be linked to the need for relational satisfaction. In fact, some researchers consider addictive behaviors a form of attachment disorder, finding negative relationships between secure attachment style and acting-out behaviors in adolescents (33-35). Sometimes, the attachment figure is emotionally unavailable, or the infant may perceive that the attachment figure is unavailable for their needs. Due to the failure to seek security from the caregiver, the infant's attachment system may develop secondary monitoring strategies. In addition, the self-medication theory suggests that addictive behaviors are a way to alleviate and regulate mood states, even as a form of emotional avoidance (34). Insecure attachment styles are also directly related to social anxiety. In fact, avoidant and anxious attachments lead to dysfunctional interpersonal relationships, maladaptive coping mechanisms, and negative self-thought processes. Additionally, insecure attachment styles, through

mechanisms similar to depression, such as negative self-criticism, vulnerability, and dependence, are associated with higher anxiety symptoms (35). Moreover, loneliness is a subjective feeling of the quality of intimate emotional attachment to the attachment figure and has a much greater impact than the absence of others. Therefore, ambivalent individuals, unlike avoidant individuals, are very dependent on others to fulfill their sense of self-worth and are expected to experience more loneliness than avoidant individuals. Although attachment and loneliness are not considered related in Bowlby's theory, some researchers believe that attachment theory can provide a framework for examining the formation of loneliness in childhood (28).

Attachment styles, influenced by early interactions with caregivers, can affect how individuals cope with anxiety and regulate emotions throughout life. Studies show that insecure attachment styles, particularly anxious and avoidant attachment, are positively related to internet and social media addiction among adolescents and young adults. Individuals with insecure attachment styles seem to use online activities, including gaming, to compensate for attachment deficits in the real world and social connections (35). Additionally, results indicate that social anxiety, loneliness, and deficits in emotion regulation are also related to problematic internet and gaming behaviors. Specifically, insecure attachment styles can contribute to social anxiety and loneliness, which in turn increase the risk of developing addictive internet and gaming habits as a maladaptive coping mechanism (35).

Given the research literature, the present study aims to fill the gap in the topic of addiction, particularly by examining computer game addiction among adolescents based on variables with individual and interpersonal structures and psychological characteristics. Therefore, the researcher seeks to answer the question of whether the model of attachment styles with social anxiety mediated by loneliness in adolescents dependent on internet games has an appropriate fit.

2. Methods and Materials

2.1. Study Design and Participants

The present study is applied in terms of purpose and descriptive-correlational in terms of execution nature,

specifically based on structural equation modeling. The statistical population of the present study included all first-grade high school students studying in the 2023-2024 academic year in Babol, totaling 19,000 students according to the education department's statistics. In determining the sample size, considering the optimal sample in structural equation modeling research, many researchers argue that the minimum required sample size is 200. Since structural equation modeling methodology is somewhat similar to certain aspects of multivariate regression, principles of sample size determination in multivariate regression analysis can be used for determining sample size in structural equation modeling. In general, sample size determination in structural equation modeling can range between 5 to 15 observations per measured variable ($Q_{15} > n > Q_5$). Therefore, given the total items in the present study's questionnaires, i.e., 62 items or questions, the minimum sample size was estimated to be 310. The sample selection was such that five schools in Babol, namely Alborz Omid, Shahid Sani, Nikan, Sepehr, and Khwarazmi, were randomly selected through the education department. In the present study, sampling was such that, after obtaining introduction letters from the education organization to the schools, the researcher initially prepared and provided the questionnaire links to the school principals and related authorities using a Porseline URL, and thus students completed the questionnaires. After reviewing 350 questionnaires completed over several months, initially, the online game addiction questionnaire was examined, and based on entry and exit criteria, if students' scores in this questionnaire were above 53, the remaining questionnaires were reviewed. Finally, the sample size for analysis was estimated to be 310.

Entry criteria included access to the internet, having a tablet, laptop, or smartphone, familiarity with online games, no history of psychiatric disorders (how and by whom will it be determined?), physical illness, and disabilities affecting life based on parents' reports and school enrollment records. Exit criteria included incomplete responses to questionnaires and not obtaining a cutoff score on the online game addiction test.

To gather information for the theoretical background section, articles from reputable domestic and international journals, books, and registered master's and doctoral theses

from IranDoc were used. In the field studies section, which includes sampling and administering questionnaires, the researcher initially obtained a list of first-grade high schools from the Babol education department. Five boys' high schools (Alborz Omid, Shahid Sani, Nikan, Sepehr, and Khwarazmi) were randomly selected for the 2023-2024 academic year. After the researcher visited the schools and received approval from the principals, the questionnaire link was provided to the site manager and posted in the school channels, allowing students to access the questionnaire link. Given that the questionnaires were administered online, initial screening was conducted using the Internet Gaming Addiction Questionnaire, and adolescents who met the cut-off score (a score above 53 indicates online game addiction and requires measures to control online game usage) were included in the main sampling based on entry criteria and completed the remaining questionnaires online.

2.2. Measures

2.2.1. Attachment Styles

Attachment Styles Questionnaire by Simpson (1990) was used. This test includes 13 Likert scale statements (with 10 statements provided) where the respondent must choose one of the five-degree options (from completely agree to completely disagree) for each question. Of these 13 statements, 5 assess secure attachment style, 4 assess avoidant attachment style, and 4 assess anxious-ambivalent attachment style. Simpson used Rubin's Love Scale (1970; as cited in Simpson, 1990) and the Dependency Scale by Berscheid and Fei (1977) to examine the validity of this questionnaire. The correlation between Rubin's Love Scale and secure, avoidant, and anxious-ambivalent attachment styles was 0.22, -0.22, and -0.12, respectively. The correlation between Berscheid and Fei's Dependency Scale and secure, avoidant, and anxious-ambivalent attachment styles was 0.26, 0.28, and -0.12, respectively. Atar et al. (2006) used three researcher-made questions to examine the validity of this test, obtaining correlations of 0.59, 0.54, and -0.24 for secure, avoidant, and anxious-ambivalent attachment styles, respectively. The reliability of this questionnaire was estimated to be approximately 0.70 based on Cronbach's alpha and re-testing over a one-week to two-year period. Simpson (1992) and Atar et al. (2006) reported

Cronbach's alpha and split-half coefficients of 0.70 and 0.62 for this questionnaire, respectively (34).

2.2.2. Loneliness

The Loneliness Questionnaire by Asher (1984) was designed by Asher, Hymel, and Renshaw (1984) to assess a child's sense of loneliness and social dissatisfaction. This scale includes 24 questions for children aged 8 to 15 years. Eight items (items 2, 4, 5, 11, 13, 15, 19, 23) relate to the child's hobbies and interests and are not scored. They are included to make the child feel more comfortable and relaxed during the test. The questionnaire items are scored on a Likert scale, with each statement receiving a score between 1 and 5. Sixteen items are scored, ranging from 16 to 80. The reliability of this test was 0.83 using the split-half method, 0.91 using the Spearman-Brown method, and 0.91 using the Guttman split-half method (29).

2.2.3. Internet Gaming Addiction

The Internet Gaming Addiction Questionnaire was developed by Wang and Chang (2002). This tool, created with modifications to Young's (1996) Internet Addiction Questionnaire, includes 20 items, each rated on a five-point Likert scale (rarely = 1, occasionally = 2, frequently = 3, often = 4, always = 5). The individual's score for internet gaming addiction is obtained by summing the total item scores. The score range for this questionnaire is 20-100, with higher scores indicating a greater tendency toward online gaming. Scores between 20-49 indicate moderate online game users who occasionally spend much time gaming but generally control their usage; scores of 50-79 indicate individuals who sometimes have problems with gaming; and scores of 80-100 indicate individuals whose excessive gaming causes serious life problems. These individuals should recognize the impact of gaming on their lives and seek ways to address the issue. In general, a score above 53 indicates online game addiction, and these individuals should take measures to control their gaming. Wang and Chang (2002) reported a Cronbach's alpha coefficient of 0.90 for this tool. Yoon et al. (2008) calculated the convergent validity, finding a high correlation ($p < 0.001$, $r = 0.71$) between this questionnaire and the Internet Addiction Questionnaire (19).

2.2.4. Social Anxiety

The Social Anxiety Scale for Adolescents by La Greca (1999) consists of 18 items and three subscales: fear of negative evaluation includes 8 items, social avoidance and distress in new situations include 6 items, and social avoidance and general distress include 4 items. The Social Anxiety Scale for Adolescents is a five-point Likert scale (from completely like me = 5 to completely unlike me = 1). Minimum scores are 18, and maximum scores are 90. Higher scores on this scale indicate higher anxiety. The creators identified three factors using factor analysis: fear of negative evaluation by peers, social avoidance and distress in new situations, and social avoidance and general distress. Esteva et al. (2003) confirmed the three-factor structure of this scale in a sample of Iranian adolescents and reported satisfactory validity, obtaining a test-retest reliability coefficient of 0.88 over one to four weeks. Additionally, they reported internal consistency for the subscales of fear of negative evaluation, social avoidance and distress in new situations, and social avoidance and general distress as 0.84, 0.74, and 0.77, respectively. Khwaja et al. (2011) used Cronbach's alpha method to calculate reliability, reporting alpha coefficients of 0.86, 0.70, and 0.58 for the subscales of fear of negative evaluation, social avoidance and distress in new situations, and social avoidance and general distress, respectively (19).

2.3. Data Analysis

In this study, descriptive statistics (frequency, percentage, mean, standard deviation, skewness, and kurtosis) and inferential statistics (structural equation modeling) were used to analyze the data using SPSS version 26 and AMOS version 25. Initially, in the descriptive statistics section, two dispersion indices and the central tendency index, including mean and standard deviation, as well as the minimum and maximum variables of attachment styles, loneliness, social anxiety, and cognitive emotion regulation, can be observed.

3. Findings and Results

Table 1 shows the mean, standard deviation, maximum, and minimum values obtained for research variables

Table 1

Demographic Variables

Variable	Minimum	Maximum	Mean	Standard Deviation
Secure	5	20	11.07	1.63
Avoidant	4	13	8.65	0.87
Anxious-Ambivalent	4	15	9.43	0.93
Fear of Negative Evaluation	8	30	16.53	2.37
Social Avoidance and New Distress	6	24	13.82	1.47
Social Avoidance and General Distress	4	16	8.11	0.86
Social Anxiety	18	70	38.46	5.52
Loneliness	16	63	35.27	4.10

Skewness is a measure of the asymmetry of the distribution of values. For a perfectly symmetrical distribution, skewness is zero. Positive skewness indicates a distribution with a longer tail on the right, while negative skewness indicates a distribution with a longer tail on the left. Generally, if skewness and kurtosis are within the range

of -2 to 2, the data distribution is considered normal. Several samples showed non-normal distributions, indicating outliers. Therefore, the Mahalanobis test was used for normalization, and outlier data were removed to achieve a normal distribution.

Table 2

Correlation Matrix of Attachment Styles, Loneliness, Cognitive Emotion Regulation with Social Anxiety

Variable	1	2	3	4	5	6	7	8	9
Secure	1								
Avoidant	-.31*	1							
Anxious-Ambivalent	-.20*	.28*	1						
Loneliness	-.28*	.25*	.23*	1					
Cognitive Emotion Regulation	-.25*	.21*	.19*	.27*	1				
Fear of Negative Evaluation	-.23*	.21*	.22*	.21*	.25*	1			
Social Avoidance and New Distress	-.27*	.24*	.19*	.24*	.27*	.69*	1		
Social Avoidance and General Distress	-.24*	.22*	.21*	.22*	.24*	.71*	.71*	1	
Social Anxiety	-.30*	.26*	.24*	.25*	.28*	.77*	.75*	.80*	1

*p < .01

The results in [Table 2](#) show significant correlations between attachment styles, loneliness, cognitive emotion regulation, and social anxiety. Specifically, there is a significant negative correlation between secure attachment style and social anxiety among the subjects. Positive significant correlations were found between avoidant and anxious-ambivalent attachment styles, loneliness, and social anxiety (including fear of negative evaluation, social

avoidance and new distress, social avoidance and general distress) among the subjects.

Following the initial model evaluation, it was determined that some modifications were necessary for the model to fit adequately according to acceptable criteria. After evaluating the final model and making corrections by fixing free parameters in the first stage, the values obtained from three indices—absolute, comparative, and parsimonious—indicated an appropriate fit, as shown in [Table 3](#).

Table 3

Fit Indices from Data Analysis and Variables after One-Step Correction

Conclusion	Obtained Values	Desired Values	Goodness of Fit Indices	Index
-	580.650	Nil	Chi-Square Goodness of Fit	Absolute
Acceptable fit	0.999	≥.90	Goodness of Fit Index (GFI)	Comparative
Acceptable fit	0.995	≥.90	Adjusted Goodness of Fit Index (AGFI)	Comparative
Acceptable fit	0.996	≥.90	Normed Fit Index (NFI)	Comparative
Acceptable fit	0.990	≥.90	Comparative Fit Index (CFI)	Comparative
Acceptable fit	0.996	≥.90	Tucker-Lewis Index (TLI)	Comparative
Acceptable fit	0.994	≥.90	Relative Fit Index (RFI)	Comparative
Acceptable fit	0.524	≤.50	Parsimonious Normed Fit Index (PNFI)	Parsimonious
Acceptable fit	0.041	≥.08	Root Mean Square Error of Approximation (RMSEA)	Absolute
Acceptable fit	2.765	≥.3	Chi-Square to Degrees of Freedom Ratio (χ^2/df)	Absolute
-	210	≤.0	Degrees of Freedom (df)	-
Acceptable fit	0.001	≥.05	(p-value)	-

As indicated in Table 3, the fit indices from the three main indices—absolute, comparative, and parsimonious—show

that the corrected model has acceptable fits, and the model is appropriate in terms of errors and variances obtained.

Table 4

Regression Weights and Critical Ratios for Research Variables

Exogenous Variable	Direction	Endogenous Variable	b (Unstandardized Effect)	β (Standardized Effect)	t-value	p-value
Secure	→	Social Anxiety	-0.352	-0.294	4.435	0.001
Avoidant	→	Social Anxiety	0.287	0.241	4.026	0.001
Anxious-Ambivalent	→	Social Anxiety	0.250	0.235	3.932	0.001
Loneliness	→	Social Anxiety	0.289	0.231	3.878	0.001

In Table 4, the values obtained from the regression weights to determine the effect values (B) based on the significance level obtained from the t-value are shown. The obtained values indicate a significant effect of the exogenous variable (attachment styles) on the final endogenous variable

(social anxiety). Additionally, the values show a significant effect of the exogenous variable (loneliness) on the final endogenous variable (social anxiety). Generally, the obtained t-test values indicate significant effects at the 0.01 level.

Table 5

Direct Estimates of the Model Using Maximum Likelihood (ML) Method

Variable	b	β	R ²
Secure on Social Anxiety	-0.352	-0.294	0.103
Avoidant on Social Anxiety	0.287	0.241	0.069
Anxious-Ambivalent on Social Anxiety	0.250	0.235	0.058
Loneliness on Social Anxiety	0.289	0.231	0.066

As shown in Table 5, the direct effects of secure, avoidant, and anxious-ambivalent attachment styles on social anxiety are -0.294, 0.241, and 0.235, respectively. The common variance (R²) of secure, avoidant, and anxious-ambivalent attachment styles on social anxiety is 0.103, 0.069, and 0.058, respectively. Additionally, the direct effect of loneliness on social anxiety is 0.231, with a common variance (R²) of 0.066.

Specifically, the obtained standard effect values of attachment styles and loneliness on social anxiety are -0.295 and 0.244, respectively. The standard effect of attachment styles on loneliness is 0.516. The overall determination coefficient is 0.48. Based on the obtained statistics from the three main indices—absolute, comparative, and parsimonious—the research model is confirmed, indicating that the two variables can predict social anxiety (R² = 0.48),

explaining 48% of social anxiety through attachment styles and loneliness in direct and indirect paths.

Table 6

Indirect Estimates of the Model Using Bootstrap Method

Variable	B	R ²	Lower Bound	Upper Bound	p
Secure Attachment on Social Anxiety with Mediating Role of Loneliness	0.420	0.355	0.340	0.473	0.01
Avoidant Attachment on Social Anxiety with Mediating Role of Loneliness	0.391	0.334	0.319	0.448	0.01
Anxious-Ambivalent Attachment on Social Anxiety with Mediating Role of Loneliness	0.367	0.316	0.304	0.422	0.01

Table 6 shows that the indirect effects of secure, avoidant, and anxious-ambivalent attachment styles on social anxiety with the mediating role of loneliness are 0.420, 0.391, and 0.367, respectively, with common variance (determination coefficient) values of 0.355, 0.334, and 0.316, respectively, which are significant at the 0.01 level.

4. Discussion and Conclusion

The results showed that the obtained statistics from the three indices—comparative, absolute, and parsimonious—indicate that the corrected model has acceptable fits, and the model is appropriate regarding errors and variances obtained. This result aligns with previous findings (11, 14, 17-25, 31, 32).

In explaining the findings, it can be said that adolescents who show weaknesses in social skills lack the necessary social knowledge and awareness for appropriate and normative behavior in social skills. This deficiency is related to three main shortcomings in these individuals. First, some of these children may have difficulty forming goals for interactions with peers and adults (17).

The second deficiency is related to appropriate and correct behavioral strategies for achieving desirable social goals. This type of deficiency is often the result of a lack of training and practice in social skills that facilitate the achievement of social goals. The third deficiency pertains to the knowledge and skills that give depth and meaning to proper and appropriate behaviors. Unlike the first group, who have difficulty forming and recognizing suitable social goals, or the second group, who lack appropriate and correct behavioral strategies for achieving desirable social goals, this group is often capable of adapting and aligning behavioral strategies (social skills) with social situations they encounter (14).

Additionally, it can be said that various maladaptive attachment styles can affect social anxiety. This relational pattern is generalized later in life and may increase the likelihood of social incompetence and loneliness, potentially causing the individual to repeat past traumas either as a perpetrator or victim. Therefore, given deficiencies in emotion and healthy coping styles, it is expected that the outcome of these pathological components due to various attachment traumas in childhood leads to social anxiety (32). Therefore, the mediating role of loneliness in the relationship between attachment styles and social anxiety in adolescents is justified.

In explaining the relationship between attachment styles and social anxiety with the mediating role of cognitive emotion regulation, it can be said that individuals with secure attachment are more optimistic about life and make fewer catastrophic evaluations of threats and dangers. They also have more confidence in their ability to cope with threats and challenges and tend to use more constructive and effective emotion regulation strategies. Furthermore, secure individuals can accept their emotions by managing threatening events or positively reassessing them, freely and accurately expressing their emotions to others, communicating with others, and fully experiencing their emotions without distortion.

Intervening variables such as the influence of subcultures and socio-economic conditions, which could have impacted the results of the present study, were not examined. The sample for this study consisted of first-grade high school students studying in the 2023-2024 academic year in Babol, and generalizing the results to other individuals and locations should be done cautiously. Factors such as family economic status, cultural conditions, etc., which may have influenced the results, were not controlled in this study. To enhance the study's results, it is suggested to use other data

collection methods such as interviews and observations. Future research should consider intervening variables such as subcultural influences and socio-economic conditions. Future studies should sample from other social environments. It is suggested that future research use localized questionnaires for the studied population. It is recommended to use the findings of this study in counseling centers, educational workshops on adolescent social anxiety for prevention, treatment, and enriching parent-child relationships, and to prepare booklets in simple language for parents. Family therapists should use these research findings to provide strategies to reduce social anxiety in their individual and group counseling and educational workshops. Counselors, psychologists, and communication media can raise awareness among families and increase individuals' information levels to prevent anxiety disorders and internet gaming addiction in adolescents.

Authors' Contributions

R.N. conceptualized the study, designed the research methodology, and supervised the overall project implementation. A.K., the corresponding author, conducted the data analysis using structural equation modeling, interpreted the results, and led the drafting and revising of the manuscript. A.K. (Ali Khanekhesi) assisted with the recruitment of participants, supported the administration of the questionnaires, and contributed to the literature review. All authors participated in discussing the findings, critically reviewed the manuscript for important intellectual content, and approved the final version for publication.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study placed a high emphasis on ethical considerations. Informed consent obtained from all participants, ensuring they are fully aware of the nature of the study and their role in it. Confidentiality strictly maintained, with data anonymized to protect individual privacy. The study adhered to the ethical guidelines for research with human subjects as outlined in the Declaration of Helsinki.

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