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Investigating the Relationships between Internet Addiction and Suicidal Ideation in Adolescent Girls

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Abstract

Objective: Suicidal ideation (SI) signifies a psychiatric crisis, and individuals with SI are at a significantly higher risk of suicide attempts compared to those without. According to previous research, three factors that affect SI in adolescent girls are externalization problems, alexithymia, and perceived social support (PSS). As a result, the present research aimed to examine whether internet addiction (IA) is associated with SI through the mediating roles of PSS, externalizing problems, and alexithymia among adolescent girls in Tehran, Iran.

Method: The current correlational study employed a structural equation modeling approach. Model fit indices such as the Chi-square to degrees of freedom ratio (CMIN/DF), normed fit index (NFI), root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), and goodness-of-fit index (CFI) were reported to assess the model's adequacy.
A total of 441 adolescent girls were selected from high school and between the ages of 11 and 19 using a convenience sampling method. Participants completed the Multidimensional Scale of Perceived Social Support (MSPSS), the Beck Scale for Suicidal Ideation (BSSI), the Cell-Phone Over-Use Scale (COS), the Youth Self-Report (YSR), and the Toronto Alexithymia Scale-20 (TAS-20) in a written manner. Data analysis was done using SPSS 25 and AMOS 22.

Results: Results revealed a significant positive correlation between IA and SI ($P < 0.001$). The study's most significant findings indicate that PSS, externalizing problems, and alexithymia significantly mediate the relationship between SI and IA. The coefficient of determination for the SI variable was 0.33, which means that predictor variables can explain 33% of the variance in SI (IA, PSS, alexithymia, and externalizing problems).

Conclusion: IA showed direct and indirect effects on SI. Using these findings, we can elucidate the mechanism of how IA affects individual SI, providing critical information for the development and implementation of targeted strategies and interventions to reduce SI among Iranian adolescent girls. Psychological interventions that address the role of externalizing behaviors, alexithymia, and PSS in adolescents with IA may help reduce SI.

Key words: *Adolescent; Alexithymia; Behavioral Problems; Internet Addiction; Perceived Social Support; Suicidal Ideation*

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Suicide is a major public health concern, especially among adolescents, as it is the second leading cause of death worldwide for individuals aged 15 to 29 years. Suicidal ideation (SI), commonly known as suicidal thoughts or ideas, encompasses a wide range of thoughts, wishes, and fixations on death and suicide (1). A recent survey conducted in 2021 revealed that nearly 30% of adolescent girls' experience SI (2). Additionally, research has shown that 40% of adolescent girls who have suicidal thoughts attempt suicide (3). The factors contributing to SI among adolescents may align with or differ from those observed in other age groups. A meta-analysis conducted in Iran highlighted family conflicts, financial hardships, and academic challenges as the predominant risk factors for suicide attempts (4). SI serves as a direct precursor to suicide attempts and is vital for predicting and preventing suicidal behavior through early intervention. Consequently, it is important to investigate the risk factors linked to suicidal thoughts and to implement suitable strategies to mitigate and prevent suicidal behavior in adolescents (5).

Internet addiction (IA) is a significant factor associated with SI. IA is characterized by overuse, urgency, avoidance, tolerance, dependence, difficulty in controlling use, and craving (6). A meta-analysis of 25 studies found that suicidal thoughts were significantly more prevalent among Internet addicts compared to non-addicted individuals (7). Some studies have demonstrated that Internet use is higher among young people aged 16 to 24 years, suggesting that university students and high school students are at the highest risk of addiction. Generation Z, as the first digital generation, may experience something worse than mental health crisis (8). IA is an actual public health concern, and in 2014, the World Health Organization (WHO) reported that IA is often accompanied by psychosocial problems, such as social withdrawal, depressed mood, anxiety disorders, suicidal behavior and ideation, feelings of loneliness, poor academic performance, and other health issues like sedentary lifestyles, vision problems, sleep disturbances, and musculoskeletal disorders (1).

The relationship between Internet use, depression, and SI is crucial to understand during adolescence. In fact, adolescence often marks the first onset of major depressive episodes and suicidal thoughts (9). For example, one study reported that adolescents who spent five or more hours per day using the Internet and social media were more prone to declare lower levels of happiness and well-being compared to people who spent less than one hour per day on these platforms (10). However, the relationship between Internet use and adolescent mental health is complex. Another study suggests that adolescents use social media to alleviate stress, enhance social connection, access mental health information, and foster peer support (11). These findings indicate that not only is it important to pay attention to the frequency of Internet use among adolescents but also to examine how adolescents utilize the Internet. Furthermore, it is crucial to identify the factors influencing Internet use and the conditions under which these factors are associated with the development of psychopathology, culminating in SI and suicidal behavior (12).

A study conducted in 23 European countries found that individuals residing in communities centered on mutual aid reported lower suicide rates. Within these communities, individuals view themselves as part of a group and, therefore, feel they are valuable to others. Others depend on them and trust them to assist in resolving difficult situations that may arise (13). These findings are consistent with existing literature that shows a reduced risk of suicide among adolescents who receive social support from their families and friends. Social support is defined as the perceived physical and/or psychological resources available to an individual within their environment, such as those provided by family, friends, or other significant individuals (14). It can be concluded that an adolescent who is well-integrated into a supportive family structure and a network of friends based on mutual aid and trust will experience a sense of belonging and a strong sense of security (1). In other words, interpersonal factors, such as social support, play a mediating role between cell-phone addiction and SI. Social support is portrayed as supportive relationships that can help individuals cope with stress and maintain well-being. The buffer hypothesis regarding social support suggests that social support can provide psychological and instrumental coping resources to mitigate the potential harm and adverse consequences of negative stimulators, and consequently promote well-being. Social support carries signal of acceptance and social connection that may culminate in a reconstructed positive self-perception, ultimately preventing depression and SI (15). Social support has moderating effects on both the relationship between IA and depressive symptoms and the correlation between IA and self-harm, including suicide (16). It may serve as a protective factor against IA. According to the cognitive-behavioral model, a lack of perceived social support (PSS) results in excessive reliance on the Internet in an attempt to find equivalent help in the virtual world, which is associated with problematic Internet use (17). Another factor that influences SI is externalizing problems, which encompass disorders characterized by prominent features of impulsive, disruptive, and antisocial behavior (18). Personality traits are a significant intrinsic factor influencing addictive behavior, with impulsivity potentially playing a crucial role in both the development and maintenance of such behaviors (19). Internet Addiction (IA) is associated with impaired impulse control (20), and individuals experiencing IA tend to be more impulsive than those without it. Furthermore, a neuroscience study conducted by Park *et al*. involving 20 men revealed that 11 individuals identified as Internet over-users exhibited

altered resting-state glucose metabolism in the orbitofrontal cortex and other brain areas that are primarily involved in impulse control (21). These findings support the hypothesis that individuals with high IA may exhibit greater impulsivity compared to those with lower levels of IA (22).

While new technologies can act as social facilitators and enhance adolescents' creativity, they can also, in vulnerable situations, exacerbate existing issues such as internalizing and externalizing disorders. Researchers point out the similarities between Internet Addiction (IA) and addictive behaviors as well as impulse control disorders. Studies have shown a significant association between IA and various psychopathological features, including anxiety, depression, attention deficit/hyperactivity disorder (ADHD), emerging personality disorders, and substance use disorders. Additionally, IA is influenced by personality traits associated with Cluster B traits (such as emotional instability and impulsivity) and Cluster C traits (including aspects of anxiety, control, and dependence) (23).

Externalizing problems refer to the outward expression of distress and are exemplified by disorders such as conduct disorder, ADHD, and substance use disorders. Externalizing behavior is predictive of being a blamer, while internalizing behavior is characteristic of being a victim. One of the most worrying consequences identified, particularly among individuals with high externalizing behavior, is suicide (24).

Another factor influencing SI is alexithymia, which is defined as the difficulty in identifying, labeling, or describing one's own emotions or feelings, with a particular problem in finding words to describe them, which is more prevalent in boys than in girls (25). It is worth mentioning that, unlike the cyclical nature of depression, stable personality traits may be more important in predicting the long-term risk of suicide attempt. Specifically, alexithymia, a personality trait defined as a deficit in identifying and describing feelings, may be a significant risk factor for suicide. High rates of alexithymia have been reported among psychiatric outpatients in general. Problems with internal emotions in individuals with alexithymia often emerge as a reduced capacity for engaging in fantasy and other imaginative activities, as well as a tendency toward an externally oriented cognitive style dependent on a specific stimulus (26). Another aspect affected by alexithymia is IA. Adolescents who exhibit significant alexithymia during their adolescence often encounter difficulties in socializing and thus feel discomfort in social situations, which may make them more prone to social anxiety; socially anxious individuals may prefer online communication over face-to-face interactions (27).

In contemporary society, the growing prevalence of IA has become a focal point of research due to its association with various adverse consequences, including SI. Nonetheless, the complex mechanisms of this relationship are still not well understood. Moreover, current research predominantly explores IA and its associations within general populations, frequently neglecting the specific vulnerabilities and experiences of adolescent girls. However, IA, along with social pressures and the stigma surrounding mental health, has been identified as contributing factors to the rise in SI among this demographic. The findings of this study address a critical research gap by assessing the effect of IA on SI specifically in adolescent girls. Our results provide evidence-based support for preventing SI in adolescents through supportive interventions, identifying externalizing problems in academic settings, and emotion regulation strategies to reduce alexithymia. While previous studies have examined the direct relationship between IA and SI, there is limited research investigating mediating factors, such as PSS, externalizing problems, and alexithymia. Understanding these mediating mechanisms is essential for developing targeted interventions aimed at mitigating the adverse effects of IA and preventing SI among adolescent girls. This study aimed to assess the intricate interaction between IA and SI among adolescent girls, focusing on the mediating roles of PSS, externalizing problems, and alexithymia. This study proposes that higher levels of IA lead to an increase in externalizing behaviors, which in turn amplify SI. Furthermore, it is hypothesized that elevated IA intensifies alexithymia, thereby increasing SI, and diminishes PSS, which also contributes to heightened SI (see Figure 1).

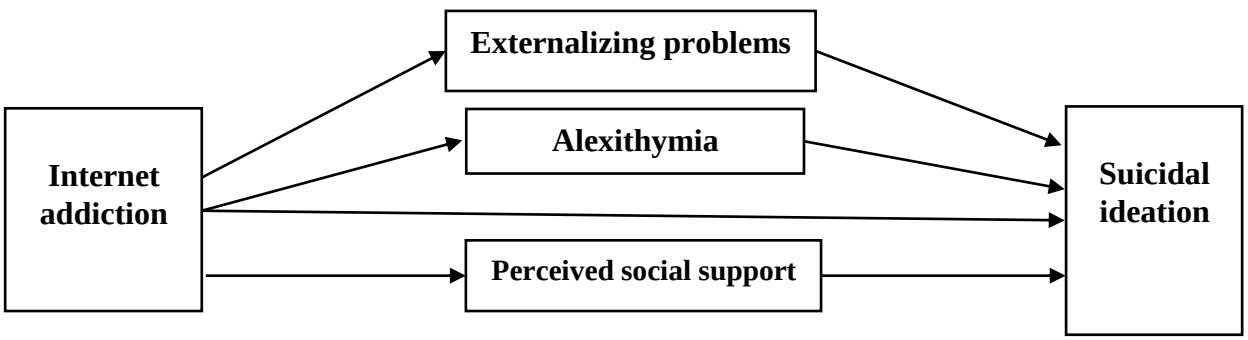

Figure 1. The Conceptual Model of Internet Addiction and Suicidal Ideation through the Mediating Roles of Perceived Social Support, Externalizing Problems, and Alexithymia

Materials and Methods

Methods

This study used a cross-sectional design. The statistical population consisted of all adolescent girls studying in Tehran, Iran, in 2024 (n = 441). Participants were recruited by a convenience sampling method from diverse socioeconomic backgrounds and geographical areas within Tehran, ensuring adequate representation of the demographic. Data collection was carried out through a paper-based questionnaire**.** Inclusion criteria included being between the ages of 11 and 19, being able to read and write, and providing informed consent. In addition, exclusion criteria were a refusal to complete the questionnaire and submission of incomplete questionnaires. Participants provided informed consent after being informed about the research objectives, instructions for completing the questionnaires, the confidentiality of their information, and the non-essential requirement to provide personal information, such as their first and last names. Necessary ethical considerations were addressed to obtain ethical approval at the outset. Subsequently, to collect data, questionnaires for the Youth Self-Report (YSR)**,** Cell-Phone Over-Use Scale (COS)**,** Beck Scale for Suicidal Ideation (BSSI), Multidimensional Scale of Perceived Social Support (MSPSS), and Toronto Alexithymia Scale (TAS-20) were distributed in paper format to female adolescent students in Tehran, Iran.

Measurements

SSI: The BSSI, designed by Beck *et al*. (1988), is a 19-item self-report measure designed to identify and assess the severity of attitudes, behaviors, and plans for suicide in the past week. It has demonstrated high validity and reliability, with Cronbach's alpha coefficients between 0.87 and 0.97 (28). The BSSI was adapted and validated for the Iranian population by Isfahani *et al*. (2015), with satisfactory Cronbach's alpha coefficients for both the screening section and the whole scale (29).

COS: The COS, designed by Jenaro *et al*. (2007), aims to examine the pathological use of the Internet and cell-phones. This 23-item scale has demonstrated adequate reliability and validity (30). The COS was adapted and validated for the Iranian population by Golmohammadian *et al*. (2011), with the difference that the Persian version of the questionnaire contains 21 items. The Persian version of the scale also exhibited adequate reliability and validity (31).

MSPSS: The 12-item MSPSS, designed by Zimet *et al*. (1988), has good reliability and validity (32). Besharat *et al*. (2007) conducted a psychometric analysis of this scale in Iran, obtaining Cronbach's alpha coefficients for the whole scale and the subscales of family, community, and friend support were 0.91, 0.87, and 0.83, respectively. These results confirm the internal consistency of the MSPSS (33).

YSR: The YSR, developed by Achenbach (1991), is a self-report measure for individuals aged 11 to 18. This 122-item scale was used in this study, specifically focusing on the externalizing subscales. The test-retest reliability of the overall problems scale was 0.87, and for the competencies scale, it was 0.69, with a time interval of three to four weeks (34). The YSR was adapted and validated for the Iranian population by Kakabaraei *et al*. (2007), with a Cronbach's alpha of 0.92 for adolescent girls, indicating acceptable reliability and validity.

TAS-20: The TAS-20, designed by Taylor *et al*. (1995) and revised by Bagby *et al*. (1994), is a 20-item scale. It uses a five-point Likert scale and has three subscales, including externally-oriented thinking, difficulty describing feelings, and difficulty identifying feelings. It has shown good reliability and validity (35). In Iran, the scale has been validated by Besharat *et al*. (2007) for 587 students, confirming its reliability and validity (36).

Data Analysis

The collected data were analyzed in the present study using structural equation modeling (SEM) with AMOS-22 and SPSS-25 software. Model fit indices such as the goodness-of-fit index (GFI), root mean square error of approximation (RMSEA), Chi-square to degrees of freedom ratio (CMIN/DF), Tucker-Lewis index (TLI), and normed fit index (NFI) were reported to assess the model's adequacy.

Ethical Consideration

Ethical approval for this study was obtained from the Research Ethics Committees of the Vice-Chancellor in Research Affairs at Shahid Beheshti University of Medical Sciences (Grant No: 43010383, Ethical approval number: IR.SBMU.RETECH.REC.1403.242). All procedures followed the ethical guidelines established in the Declaration of Helsinki and its subsequent revisions, or comparable ethical standards.

Results

A total of 441 questionnaires were completed. Table 1 presents the participants' demographic characteristics. According to Table 1, 7.9% of the participants were aged 14-15, 83.9% were aged 16-17, and 8.2% were aged 18-19. Regarding their grade level, 43.1% were in the 10th grade, 49.2% in the 11th grade, and 7.7% in the 12th grade. Furthermore, 91.4% of parents lived together, 5.4% were divorced, 1.8% had lost their fathers, 0.7% had lost their mothers, and 0.5% had lost both parents.

AMOS 22 was applied for data analysis and hypothesis testing. Descriptive statistics of the variables (IA, SI, PSS, externalizing problems, and alexithymia) are presented in Table 2. The results of Table 2 show that the means and standard deviations were 61.72 and 20.51 for IA, 7.83 and 8.39 for SI, 57.01 and 16.57 for PSS, 81.79 and 31.05 for externalizing problems, as well as 56.28 and 11.44 for alexithymia. To evaluate the normality of the data, skewness and kurtosis values were computed for all research variables. As presented in Table 2, the skewness and kurtosis values for all variables (IA, SI, PSS, externalizing problems, and

alexithymia) ranged from -2 to +2. Consequently, the data's normality was confirmed.

Table 1. Descriptive Statistics of the Participants (n = 441)

Age	**Frequency**	**%**
14-15 years	35	7.9
16-17 years	370	83.9
18-19 years	36	8.2
Total	441	100
Education Level	**Frequency**	**%**
Tenth grade	190	43.1
Eleventh grade	217	49.2
Twelfth grade	34	7.7
Total	441	100
Parental Status	**Frequency**	**%**
Living together	403	91.4
Divorced	24	5.4
Father's death	8	1.8
Mother's death	3	0.7
Mother's remarriage	1	0.2
Death of both parents	2	0.5
Total	441	100

Table 2. Results Related to the Descriptive Statistics of SI Based on IA through the Mediating Roles of PSS, Externalizing Problems, and Alexithymia

Variable	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**	**Skewness**	**Kurtosis**
Internet addiction	21	114	61.72	20.51	0.18	-0.59
Suicidal ideation	0	34	7.83	8.39	1.16	0.61
Perceived social support	12	84	57.01	16.57	-0.49	-0.34
Externalizing problems	10	187	81.79	31.05	0.36	0.09
Alexithymia	20	92	56.28	11.44	-0.03	-0.28

Note: SI = Suicidal ideation, PSS = Perceived social support, IA = Internet addiction

Cronbach's alpha coefficient was calculated to assess the reliability of the research variables. Results indicate that Cronbach's alphas for IA, SI, PSS, alexithymia, and externalizing problems were 0.91, 0.94, 0.89, 0.53, and 0.94, respectively.

The Conceptual Model of Research

To analyze the data, the conceptual model was initially created using AMOS 22 (Figure 2). The original model was adjusted to obtain acceptable fit indices, and the revised model is shown in Figure 3.

The results indicate that the RMSEA was 0.06 (with RMSEA < 0.08), the GFI was 0.99, the TLI was 0.96, the Bentler-Bonnet NFI was 0.99, and the CMIN/DF was 3.004 (with CMIN/DF > 5). Therefore, the fit indices fall within the acceptable range, indicating that the modified model fits well and that the research hypotheses can be tested. Following this, Table 3 displays the regression weights of the modified model based on the variables.

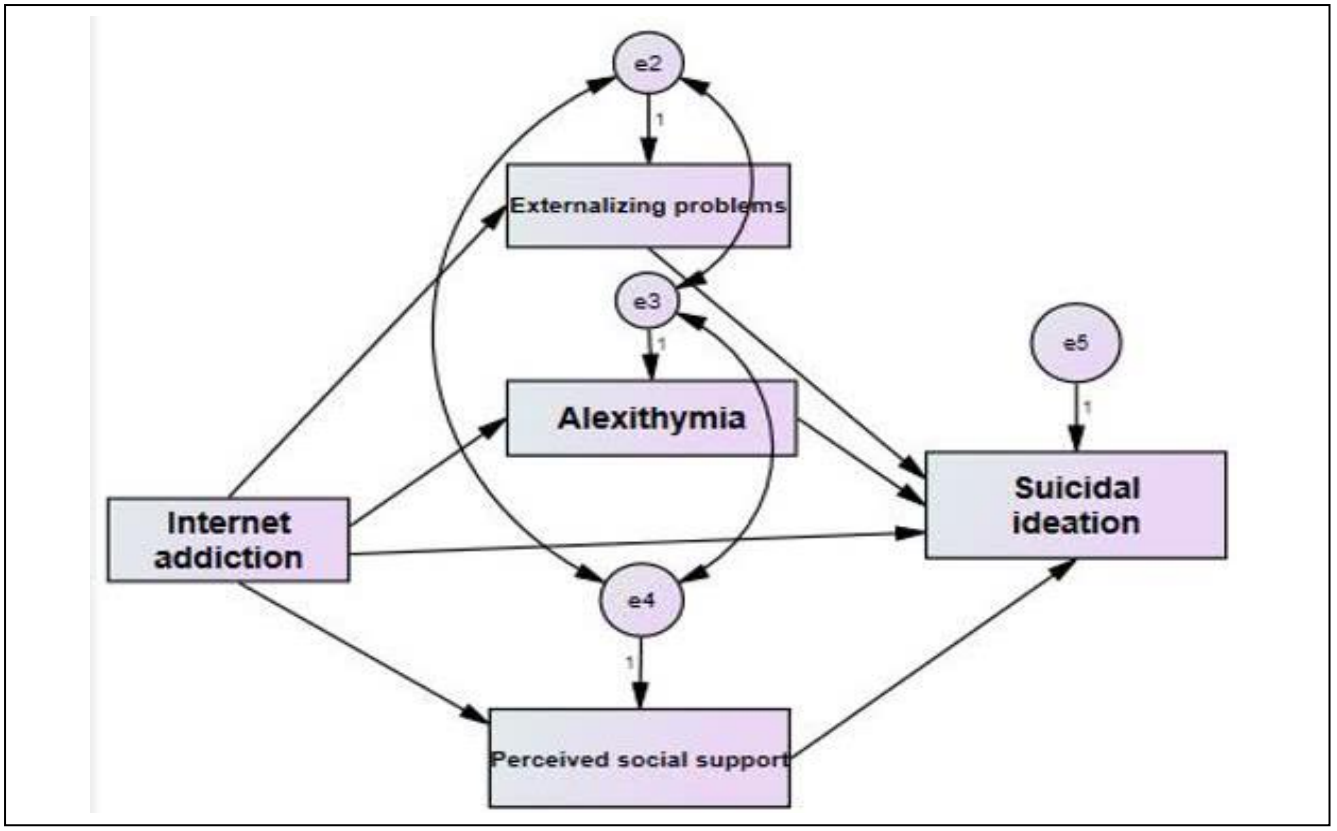

Figure 2. The Conceptual Model of Internet Addiction and Suicidal Ideation through the Mediating Roles of Perceived Social Support, Externalizing Problems, and Alexithymia

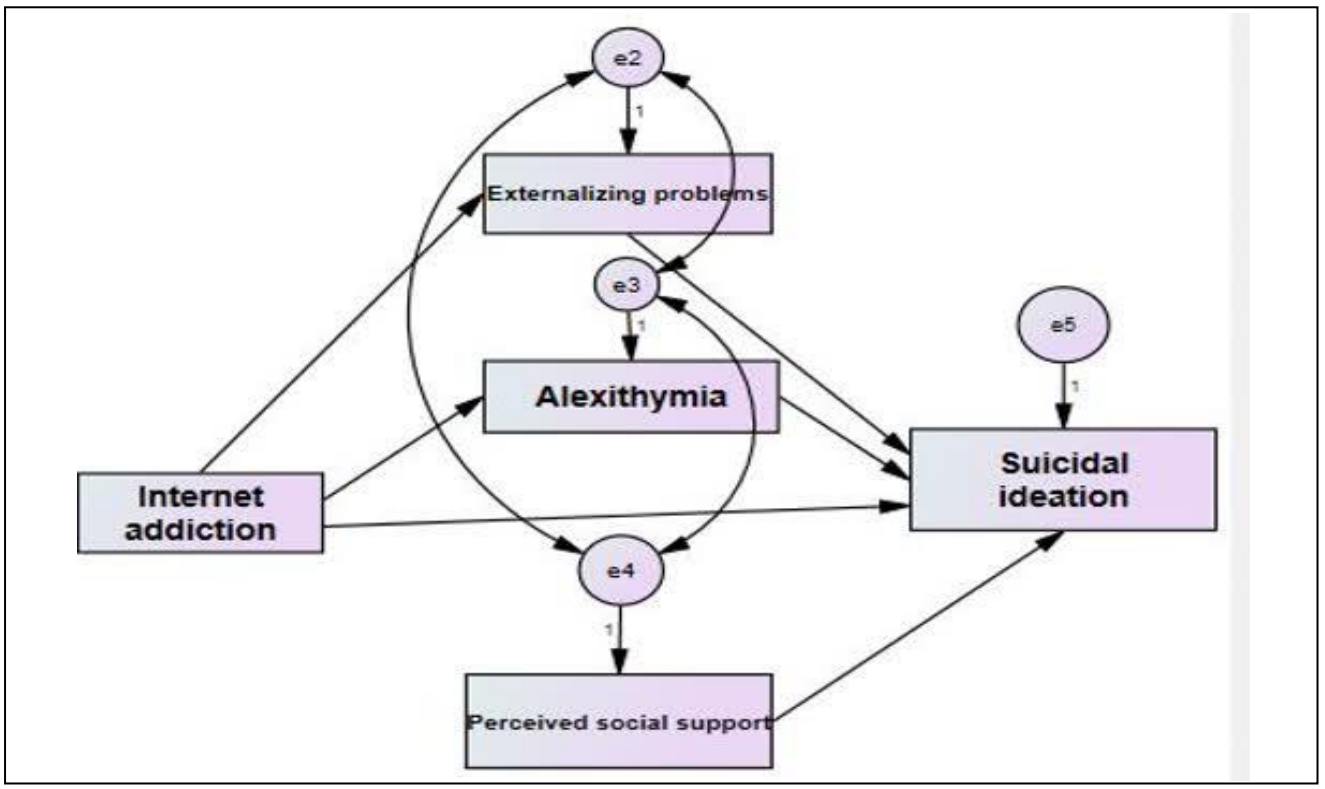

Figure 3. The Modified Model of Internet Addiction and Suicidal Ideation through the Mediating Roles of Perceived Social Support, Externalizing Problems, and Alexithymia

Table 3. Regression Weights of the Prediction Model of SI Based on IA through the Mediating Roles of PSS, Externalizing Problems, and Alexithymia

Path	Direct Model			Indirect Model			Full Model		
	Estimate	C.R.	P	Estimate	C.R.	P	Estimate	C.R.	P
Internet addiction ➔➔ Suicidal ideation	0.063	3.962	0.000				0.063	3.167	0.002
Social support ➔➔ Suicidal ideation	-0.082	-3.971	0.000	-0.073	-3.534	0.000	-0.082	-3.944	0.000
Externalizing problems ➔➔ Suicidal ideation	0.092	7.472	0.000	0.11	8.845	0.000	0.092	6.776	0.000
Alexithymia ➔➔ Suicidal ideation	0.091	2.666	0.000	0.122	3.549	0.000	0.091	2.559	0.010
Internet addiction ➔➔ Externalizing problems				0.811	13.943	0.000	0.811	13.943	0.000
Internet addiction ➔➔ Alexithymia				0.249	11.216	0.000	0.249	11.216	0.000

Note: SI = Suicidal ideation, PSS = Perceived social support, IA = Internet addiction

Table 3 indicates that:

1. The significance level for the direct effect of IA on SI was below 0.01 ($P < 0.01$), thereby confirming the first hypothesis that "IA is associated with SI among adolescent girls in Tehran."
2. The significance level for the direct effect of PSS on SI was below 0.001 ($P < 0.001$), thus validating the second hypothesis that "PSS is linked to SI among adolescent girls in Tehran."
3. The significance level for the direct effect of externalizing problems on SI was also below 0.001 ($P < 0.001$), confirming the third hypothesis that "externalizing problems are related to SI among adolescent girls in Tehran."
4. The significance level for the direct effect of alexithymia on SI was below 0.05 ($P < 0.05$), thereby confirming the fourth hypothesis that "alexithymia is associated with SI among adolescent girls in Tehran."
5. The significance level for the direct effect of IA on externalizing problems was less than 0.001 ($P < 0.001$), confirming the fifth hypothesis that "IA is linked to externalizing problems among adolescent girls in Tehran."
6. The significance level for the direct effect of IA on alexithymia was below 0.001 ($P < 0.001$), thus validating the sixth hypothesis that "IA is related to alexithymia among adolescent girls in Tehran."
7. The significance level for the direct effect of IA on alexithymia was less than 0.001 ($P < 0.001$), confirming the seventh hypothesis that "IA is associated with alexithymia among adolescent girls in Tehran."
8. The significance level for the effect of IA on externalizing problems in the full model was less than 0.001 ($P < 0.001$). Similarly, the significance level of the effect of externalizing problems on SI in the full model is less than 0.001 ($P < 0.001$). Thus, the variable of externalizing problems plays a partial mediating role between IA and SI. In order to determine the intensity of the effect of the externalizing problems variable (mediating effect), the VAF (Variance Accounted For) statistic was used. The value of this statistic for the externalizing problems variable was calculated as 0.23 (VAF = 0.23), which indicates that approximately 23 percent of the total effect of IA on the SI variable can be indirectly explained by the externalizing problems variable.
9. The significance level for the effect of IA on alexithymia in the full model was less than 0.001 ($P < 0.001$). Similarly, the significance level of the effect of alexithymia on SI in the full model is less than 0.001 ($P < 0.001$). Thus, the variable of alexithymia plays a partial mediating role between IA and SI.

The coefficient of determination for the SI variable was 0.33, which means that predictor variables can explain 33% of the variance in SI (IA, PSS, alexithymia, and externalizing problems). It can also be stated that the research model is regarded as a moderate model for predicting SI through the predictor variables (IA, PSS, alexithymia, and externalizing problems). In order to determine the intensity of the effect of the alexithymia variable (mediating effect), the VAF statistic was employed. The value of this statistic for the alexithymia variable was calculated as 0.55 (VAF = 0.55), which indicates that approximately 55 percent of the total effect of Internet addiction on the suicidal ideation variable can be explained indirectly by the externalizing problems variable. The confidence intervals for the effects of the variables are presented in Table 4.

Table 4. Confidence Intervals for the Effects of IA, PSS, Externalizing Problems, and Alexithymia

Variable	95% Confidence Interval	
	Lower	Upper
Alexithymia	0.02	0.16
Internet addiction	0.01	0.11
Perceived social support	-0.12	-0.04
Externalizing problems	0.06	0.12

Note: SI = Suicidal ideation, PSS = Perceived social support, IA = Internet addiction

Discussion

We explored the relationship between SI and IA in adolescent girls, considering the mediating roles of PSS, externalizing problems, and alexithymia. The findings revealed that IA was significantly linked to SI, and this relationship was mediated by levels of PSS, externalizing problems, and alexithymia.

The results of the structural equation modeling demonstrated a direct relationship between IA and SI among adolescent girls in Tehran. This finding supports the studies conducted by Peng C. *et al*. (37), Rosemary Sedgwick *et al*. (38), and Yuntian Xie *et al*. (39). This assumption can be explained by the fact that direct relationship between IA and SI highlight the potential risks stemming from Internet overuse. IA can culminate in a range of negative consequences, such as social isolation, academic problems, emotional distress, and disrupted sleep patterns, all of which may enhance the risk of SI. Studies by Peng (2018) and Cheng (2018), which are inconsistent with our findings, showed that IA does not predict SI. One of the reasons for the difference between this study and the present one is that the study population was not the same (7, 40), because the present study focused on female adolescents. Observing IA from the framework of cognitive behavioral theory shows that adolescents may use IA as a coping strategy to avoid life problems (41). IA strengthens fundamental negative thoughts, including loneliness, which is closely related to SI (42) because IA causes social isolation, and according to interpersonal suicide theory, one of the components of SI is feelings of thwarted belongingness (43), and in the present study, low social support indicates greater loneliness. As a result, SI is more common in female adolescents with IA.

The results of the SEM showed that the variable of externalizing problems had a partial mediating role between SI and IA. This data aligns with the studies conducted by Shapira NA (20) and Kelly EV (24). This assumption can be explained by the fact that externalizing problems, such as aggression and delinquency, are also involved in the relationship between IA and SI. Adolescents with higher levels of externalizing problems were susceptible to both IA and SI. This finding suggests the potential of IA as a maladaptive coping mechanism for managing externalizing behaviors. Consequently, addressing these behavioral issues through targeted interventions can help reduce reliance on Internet use as a coping strategy and mitigate the risk of SI.

The results of the SEM also showed that the variable of alexithymia had a partial mediating role between IA and SI. This finding is in line with the studies conducted by Buyukbayraktar CG *et al*. (27) and Yang Liu (44). Adolescents with high levels of alexithymia may resort to the Internet as a means of escaping or refraining from their emotional adversities. However, this resort to the Internet can aggravate emotional adversities and culminate in a heightened risk of SI.

Finally, the SEM results indicated that the variable of PSS had a partial mediating role between SI and IA, which is consistent with the studies by ma Y *et al*. (16) and Xiaofan Yang *et al*. (45). This result can be explained by the fact that PSS manifested as a vital protective factor in this study. Adolescents with higher levels of PSS were less likely to exhibit SI, even when they had considerable IA.

The clinical implications of this research are remarkable as the noticeable role of PSS suggests that interventions aimed at strengthening social connections may be influential in reducing SI among Internet-addicted adolescents. Furthermore, dealing with externalizing problems and improving emotion regulation skills are substantial components of comprehensive intervention strategies. Psychological interventions that address the role of externalizing behaviors, alexithymia, and PSS in adolescents with IA may help reduce SI. An increase in social support may reduce adolescents' feelings of loneliness and isolation, likely leading to a decrease in SI. Mental health professionals can use the evidence from the present study to develop programs based on healthy Internet use and provides possible strategies to prevent the dangerous effects of IA on adolescents.

Limitation

Limitations of the current research include its cross-sectional design, which precludes the determination of causality, and the sample's restriction to adolescent girls, which may culminate in restricting the generalizability of the results to other populations. Additionally, the use of self-report questionnaires may cause response biases, like recall bias or social desirability bias. Participants may have underreported or overreported behaviors or feelings, which could affect the reliability of the data. The sample size in this study comprised 441 adolescent

girls, a relatively small sample size that may affect the generalizability and statistical power of the results. The limited sample size could limit the ability to detect smaller effect sizes. Despite its limitations, the advantage of the present study over other similar studies is that it examines the mediating roles of externalizing problems, alexithymia, and PSS in the relationship between IA and SI. Given that fewer studies have examined mediators in the adolescent female population, the evidence from the present findings provides new information in the field of SI.

It is suggested that longitudinal studies be conducted in future to establish causal relationships and discover dynamics in diverse population groups. Furthermore, it is important to use a qualitative method to take into account the lived experience of adolescents. Investigating the impact of specific types of social support and interventions focusing on alexithymia and externalizing problems could provide more profound insights. Finally, future studies can enhance the validity of the findings of this study by examining other factors influencing the relationship between SI and IA, such as socioeconomic status, existing mental health conditions, and family environment. Controlling for these variables can provide a more thorough understanding of the relationship between SI and IA.

Conclusion

The levels of PSS, externalizing problems, and alexithymia play a mediating effect on the relationship between SI and IA among Iranian adolescent girls. These findings help our understanding of the intricate interaction between IA and SI and underscore the need for multidimensional interventions. Eliminating IA in adolescents requires a comprehensive approach that comprises reinforcing social support, managing externalizing behaviors, and improving emotional awareness. By focusing on these domains, it is possible to better support adolescent girls and mitigate their probability of experiencing SI.

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Conflict of Interest

None.

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