

Developing a Structural Model of Anxiety and Internet Addiction Through the Mediating Role of Alexithymia Among University Students

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ABSTRACT

This study aimed to develop and test a structural model of the relationship between anxiety and Internet addiction through the mediating role of alexithymia among university students in Sirjan. This applied, quantitative, cross-sectional correlational study was conducted using structural equation modeling. The statistical population consisted of students enrolled at universities in Sirjan during the 2025–2026 academic year. Using multistage cluster random sampling, 209 students were included in the final analysis. Data were collected using the six-item PROMIS Anxiety Short Form, the Toronto Alexithymia Scale-20, and the six-item Problematic Internet Use Questionnaire Short Form. Data analysis was performed using SPSS and AMOS. Pearson correlation, regression analysis, and mediation analysis with 5,000 bootstrap resamples were used to examine the direct and indirect relationships among the variables. Anxiety was positively and significantly correlated with alexithymia ($r = .52$, $p < .01$) and Internet addiction ($r = .41$, $p < .01$), while alexithymia was positively correlated with Internet addiction ($r = .48$, $p < .01$). Anxiety significantly predicted Internet addiction ($\beta = .41$, $p < .001$) and explained 16.8% of its variance. Anxiety also significantly predicted alexithymia ($\beta = .52$, $p < .001$), accounting for 27.0% of its variance. When anxiety and alexithymia were entered simultaneously, alexithymia significantly predicted Internet addiction ($\beta = .38$, $p < .001$), while the direct effect of anxiety remained significant but decreased to $\beta = .18$ ($p = .011$). The indirect effect of anxiety on Internet addiction through alexithymia was significant (effect = .23, SE = .05, 95% CI [.14, .33]), confirming partial mediation. Alexithymia partially mediates the relationship between anxiety and Internet addiction, indicating that anxiety contributes to problematic Internet use both directly and indirectly through greater difficulty in identifying and processing emotions.

Keywords: Anxiety; Alexithymia; Internet Addiction; Problematic Internet Use; University Students; Mediation; Structural Model

1. Introduction

The Internet has become an integral component of contemporary university life, profoundly transforming learning, communication, entertainment, social interaction, and access to information. University students increasingly rely on Internet-based technologies for academic activities, interpersonal communication, digital services, and recreation, and this dependence has intensified with the expansion of smartphones, social networking platforms, online gaming, short-form video applications, and artificial intelligence-based systems. Although Internet use offers substantial educational and social benefits, excessive or poorly regulated use may develop into a maladaptive behavioral pattern characterized by preoccupation, impaired control, neglect of responsibilities, persistence despite adverse consequences, and interference with daily functioning. Such patterns are commonly conceptualized as problematic Internet use or Internet addiction and have attracted considerable attention because of their associations with psychological distress, sleep problems, impaired academic functioning, and diminished well-being (Abdel-Khalek, 2026; Soriano-Molina & Rubio-Aparicio, 2025; Sun Y & Liu, 2025; Wijesinghe & Kuruppuarachchi, 2026).

The importance of problematic Internet use is particularly evident in younger populations and university students, who are among the most intensive users of digital technologies. Evidence from different educational and cultural settings indicates that maladaptive Internet engagement cannot be understood merely in terms of time spent online; rather, it involves the interaction of emotional, cognitive, behavioral, and contextual factors. Research on school-age populations has shown that Internet addiction constitutes a meaningful behavioral and mental-health concern even before individuals enter higher education, suggesting that vulnerability may already be established during adolescence and may continue or intensify during university years (Wijesinghe & Kuruppuarachchi, 2026). Meta-analytic evidence further indicates that Internet addiction is consistently associated with higher levels of psychiatric symptoms and sleep disturbances, emphasizing that problematic digital behavior is embedded within a broader pattern of psychological dysregulation rather than representing an isolated behavioral habit (Sun Y & Liu, 2025). Likewise, a meta-analytic review of adolescents found a systematic relationship between Internet addiction and poorer mental-health outcomes, underscoring the need to identify the psychological mechanisms through which

problematic use develops and persists (Soriano-Molina & Rubio-Aparicio, 2025).

Recent neurobehavioral research has further strengthened the view that problematic digital use involves alterations in processes related to reward sensitivity, self-regulation, stress, and decision making. Neuroimaging studies of problematic smartphone use have suggested that stress and self-control may operate as important pathways linking functional brain-network characteristics to maladaptive technology use (Tie & Zhang, 2025). Research involving college students with short-video addiction has also demonstrated that excessive engagement with highly stimulating digital content may be associated with altered risk decision-making processes and prefrontal cortical functioning (Zhang & Yang, 2025). Similarly, research on Internet gaming disorder has identified differences in prefrontal responses to game-related rewards and losses, highlighting the involvement of neural systems underlying reinforcement, reward evaluation, and behavioral control (Zhang & Li, 2025). A broader scoping review of the neurobiology of Internet addiction has additionally emphasized developmental and gender-specific mechanisms, suggesting that vulnerability to problematic Internet use may reflect complex interactions among neurodevelopmental processes, individual characteristics, and environmental exposure (Jin J & Ding, 2026). These findings reinforce the need for psychological models that explain how internal emotional states may contribute to dysregulated Internet behavior.

Among the psychological factors that may be particularly relevant to problematic Internet use, anxiety occupies a central position. University students encounter numerous potential sources of anxiety, including academic workload, examinations, uncertainty regarding employment, financial pressure, changes in social relationships, transition to greater independence, and concerns about future professional performance. Contemporary evidence demonstrates that anxiety symptoms are prevalent across university populations and may be shaped by academic, interpersonal, and environmental conditions. A large multicenter study of European university students identified multiple factors associated with anxiety symptoms and highlighted barriers that can prevent students from seeking psychological support (Pinho & Jacinto, 2026). Academic burnout and school engagement have also been implicated in anxiety among university students, indicating that the academic environment itself can contribute meaningfully to psychological strain (Chen, 2026). More broadly, the

capacity of higher-education environments to foster human, social, knowledge, and intellectual resources has been emphasized as an important determinant of student outcomes, suggesting that psychological adjustment must be understood within the wider university context (Awashreh & Almi, 2026).

Elevated anxiety appears to be especially important in demanding academic disciplines. A scoping review of systematic reviews and meta-analyses concerning medical students documented a substantial burden of anxiety symptoms in this population, emphasizing the cumulative effects of academic demands, clinical responsibilities, and professional expectations (Agyapong-Opoku & Greenshaw, 2026). An updated systematic review and meta-analysis similarly reported considerable levels of anxiety and other forms of psychological distress among pharmacy students (Pradubkham & Phimarn, 2026). Anxiety has also been observed among students exposed to broader societal crises, demonstrating that university students' psychological functioning is sensitive not only to academic pressures but also to instability in the social environment (Mersal & Masaeed, 2026). At the same time, systematic-review evidence suggests that structured physical activity may reduce anxiety symptoms in university students, reinforcing the modifiable nature of this psychological condition and the importance of identifying mechanisms that connect anxiety with maladaptive behavioral outcomes (Praisan & Berchicci, 2026).

Rapid technological change may itself introduce new forms of anxiety-related vulnerability. The emergence of generative artificial intelligence has created new educational opportunities but also new patterns of dependent technological use. A cross-sectional study among medical students reported associations between dependent use of generative AI systems and anxiety symptoms, illustrating how psychological distress may become intertwined with reliance on new digital technologies (Chavez Sosa & Huancahuire-Vega, 2026). Similarly, research among college students has shown that anxiety may mediate relationships between patterns of Internet use and other health-related outcomes such as sleep duration (Gong & Wang, 2026). Such findings suggest that anxiety may not simply coexist with excessive Internet use but may participate in psychological processes through which digital engagement becomes maladaptive. Students experiencing persistent worry, tension, fear, or physiological arousal may increasingly turn to online environments for distraction, avoidance, reassurance, social interaction, or temporary

emotional relief. When such use becomes a habitual coping response, short-term reduction of discomfort may reinforce repeated Internet engagement and gradually contribute to loss of control.

However, anxiety alone may not fully explain why some students develop problematic Internet use whereas others exposed to comparable levels of stress do not. Differences in emotional awareness and emotional processing may be particularly important in determining how anxiety is experienced, understood, and regulated. Alexithymia is a multidimensional psychological construct characterized primarily by difficulty identifying one's own feelings, difficulty describing emotional experiences to others, and an externally oriented cognitive style that emphasizes concrete events rather than internal affective states. Individuals with higher alexithymia may experience considerable physiological and psychological arousal while having limited ability to label, interpret, and communicate the emotional meaning of these experiences. Consequently, emotional distress may be experienced as diffuse tension or discomfort and may be managed through behavioral avoidance rather than reflective emotional processing.

Contemporary research continues to establish alexithymia as a meaningful individual-difference characteristic influencing cognition, emotion, and adaptation. Daily-life research indicates that individual differences in alexithymia modulate the interaction between cognitive and emotional processes during ongoing experiences, supporting the view that alexithymia affects how emotional information is integrated into everyday thought and behavior (Lei & Ho, 2026). Research on identity development has also suggested that the psychological implications of alexithymia depend partly on broader personality characteristics, further demonstrating that difficulties in emotional awareness are embedded within complex patterns of psychological functioning (Vinhais & Roberto, 2026). In clinical research, a meta-analysis has documented elevated alexithymia among individuals with posttraumatic stress disorder, highlighting its close connection with persistent emotional dysregulation and difficulties processing distressing internal states (Couette & Ferreri, 2026). A recent scoping review in neurodevelopmental populations similarly identified alexithymia as an important transdiagnostic construct relevant to emotional functioning across diverse groups (Chalghaf N & Dergaa, 2026).

The characteristics of alexithymia make it particularly relevant to behavioral addictions. When individuals have

difficulty identifying and verbally processing distress, they may be more likely to rely on externally oriented strategies that provide rapid changes in attention or affect. Digital environments are especially well suited to this function because they offer immediate stimulation, distraction, social contact, entertainment, and escape from unpleasant internal experiences. Accordingly, Internet use may serve as a form of experiential avoidance for individuals who lack more adaptive ways of understanding and regulating anxiety. Over time, repeated reliance on digital engagement to modify internal states may reinforce compulsive patterns and increase the likelihood of problematic Internet use.

Empirical evidence increasingly supports an association between alexithymia and Internet-related behavioral problems. Utkarsh and Kanwar directly examined the relationship between alexithymia and Internet addiction and showed that this association may operate through psychological and interpersonal mechanisms, demonstrating that alexithymia is meaningfully connected to maladaptive Internet engagement rather than being merely a correlate of general distress (Utkarsh & Kanwar, 2025). Research among adolescents with psychological difficulties has similarly found that alexithymia can function as a mediating mechanism in pathways leading to Internet addiction, further supporting its role in the translation of emotional vulnerability into problematic online behavior (Wang & Liu, 2025). These findings suggest that students who struggle to recognize and communicate their emotional experiences may be especially likely to use the Internet as an external means of managing internal distress.

A mediation perspective therefore provides a useful framework for understanding the relationship between anxiety and Internet addiction. Anxiety may increase the intensity and frequency of unpleasant emotional arousal, whereas alexithymia may limit the individual's ability to recognize, differentiate, and appropriately regulate this arousal. Under these circumstances, Internet use can become an easily accessible behavioral strategy for reducing awareness of distress or shifting attention away from uncomfortable internal experiences. In this model, anxiety is expected to exert both a direct effect on problematic Internet use and an indirect effect through increased alexithymic difficulties. This conceptualization is consistent with emerging evidence that emotional distress can mediate or interact with behavioral and neurocognitive vulnerabilities in different forms of digital addiction. For example, emotional distress has been implicated in pathways between bullying victimization and short-video addiction, with

evidence indicating that psychological and neural mechanisms jointly contribute to maladaptive digital behavior (Yao & Hu, 2025).

The broader student-psychology literature also emphasizes that adjustment in educational settings is shaped by individual psychological resources, interpersonal functioning, and perceived competence. Studies conducted across different student populations have demonstrated substantial variability in psychological characteristics associated with academic adaptation and well-being (Adiang & Kinga, 2026; Li & Yan, 2026; Nguyen & McGregor, 2026; Oribhabor, 2026). Although these studies address constructs outside the specific structural model tested in the present research, collectively they illustrate that university students' psychological functioning cannot be reduced to academic performance alone and that individual differences in emotional and psychological adaptation deserve explicit investigation. Similarly, research documenting the global burden of psychological symptoms among university students demonstrates that mental-health difficulties constitute an international higher-education concern rather than a context-specific phenomenon (Jacob & Maguvhe, 2026). This broader evidence provides additional justification for examining mechanisms through which emotional difficulties may contribute to maladaptive patterns of technology use in student populations.

The relationship between Internet addiction and well-being further increases the practical significance of identifying such mechanisms. Internet addiction has been found to show negative associations with subjective well-being, indicating that problematic Internet use may compromise individuals' overall evaluations of their lives and psychological functioning (Abdel-Khalek, 2026). Because university students increasingly depend on digital platforms for legitimate academic and social purposes, simply reducing Internet access is neither realistic nor desirable. More useful preventive approaches require identifying psychological characteristics that differentiate adaptive from maladaptive use. If anxiety contributes to problematic Internet engagement partly through alexithymia, then interventions focused exclusively on reducing Internet exposure may have limited effectiveness unless students are also helped to identify, label, communicate, and regulate distressing emotional experiences.

This issue is particularly relevant in the Iranian university context. Students in different universities and academic disciplines may experience substantial academic, social, and

future-oriented pressures while simultaneously living in a digital environment in which Internet access is embedded in education, communication, entertainment, and everyday problem solving. Despite growing international research on anxiety, alexithymia, and problematic Internet use, there remains a need for context-specific structural models capable of estimating both direct and indirect relationships among these variables in Iranian university populations. Much of the available research has examined pairwise associations, specific forms of digital behavior, adolescent populations, or clinical groups. Fewer studies have tested an integrated model in which alexithymia is explicitly examined as a mediator between anxiety and Internet addiction among university students. Establishing such a model can contribute theoretically by clarifying the psychological pathway linking emotional distress to maladaptive Internet behavior and practically by identifying potential targets for campus-based prevention and counseling programs.

Accordingly, the present study aimed to develop and test a structural model of the relationship between anxiety and Internet addiction through the mediating role of alexithymia among students of universities in Sirjan.

2. Methods and Materials

2.1. Study Design and Participants

The present study was an applied, quantitative, cross-sectional correlational study conducted using structural equation modeling (SEM). From an applied perspective, the study was designed to generate empirical evidence that could contribute to the development of preventive and psychological interventions aimed at reducing problematic Internet use among university students. The cross-sectional design involved collecting data from participants during a defined period and examining the concurrent relationships among anxiety, alexithymia, and problematic Internet use. Structural equation modeling was selected because it permits the simultaneous examination of measurement and structural relationships among observed and latent variables and enables estimation of both direct and indirect effects within an integrated theoretical model. In the proposed model, anxiety was specified as the predictor variable, alexithymia as the mediating variable, and problematic Internet use as the final endogenous outcome. Accordingly, the model examined both the direct association between anxiety and problematic Internet use and the indirect association transmitted through alexithymia.

The statistical population consisted of students enrolled at universities located in Sirjan, Iran, including Sirjan University of Medical Sciences, Islamic Azad University, a public university, and Payame Noor University during the 2025–2026 academic year. According to the administrative information available to the researchers, the student population was estimated at approximately 27,000. Participants could be undergraduate, master's, or doctoral students. Given the requirements of SEM and recommendations that a sufficiently large sample should be used to obtain stable parameter estimates, a minimum analyzable sample of 200 participants was considered appropriate. To compensate for possible attrition, incomplete questionnaires, and unusable response patterns, an additional 50 participants were included in the sampling plan. Therefore, the target sample size was set at 250 students.

A multistage cluster random sampling procedure was used. In the first stage, two universities were randomly selected from the universities operating in Sirjan. In the next stage, several academic disciplines and classes within the selected universities were considered as sampling clusters, and eligible students were randomly recruited from the selected classes. Data were collected through direct administration of the questionnaires in university classrooms. Before questionnaire completion, the researcher provided participants with a brief explanation of the study objectives and procedures and emphasized that participation was entirely voluntary, that refusal to participate would have no academic consequences, and that all responses would remain confidential. Questionnaires were completed anonymously without recording participants' names or other directly identifying information.

Eligibility criteria included enrollment as a student at one of the universities in Sirjan during the 2025–2026 academic year, enrollment at the undergraduate, master's, or doctoral level, willingness to participate voluntarily after receiving information about the study, adequate Persian reading and writing ability to understand the questionnaire items, and completion of at least 90% of the items on each study instrument. Students were excluded if more than 10% of the items on any questionnaire were unanswered, if their responses demonstrated clearly invalid response patterns such as indiscriminate or uniform responding across nearly all items, or if they voluntarily withdrew before completion of the data collection process. Individuals who self-reported a severe psychiatric or neurocognitive condition that could substantially compromise their ability to understand or

accurately respond to the questionnaires were also excluded. Similarly, participants reporting circumstances that seriously impaired reliable questionnaire completion were not included in the final analytical sample.

The study was conducted in accordance with ethical principles governing human-subject research in the behavioral sciences. Participation was voluntary, and informed consent was obtained after participants had been informed about the purpose of the research, approximate questionnaire-completion requirements, confidentiality procedures, and their right to withdraw without penalty. The questionnaires were anonymous, research data were stored securely, and the findings were analyzed and reported only in aggregate form. Participants were informed that their decision to participate or decline participation would have no effect on their academic status, grades, or relationship with university personnel. The study was conducted after approval by the relevant institutional research ethics committee, with the ethics approval code to be inserted in the final manuscript.

2.2. Data Collection Tools

PROMIS Anxiety Short Form. Anxiety was assessed using the six-item short form from the Patient-Reported Outcomes Measurement Information System (PROMIS). PROMIS was developed under the auspices of the U.S. National Institutes of Health to provide standardized, psychometrically robust measures of physical, psychological, and social health outcomes. The six-item anxiety form assesses the frequency and intensity of anxiety-related experiences during the preceding seven days, including worry, fear, tension, nervousness, and anxious arousal. Each item is rated on a five-point Likert scale ranging from 1 (never) to 5 (always). Raw total scores therefore range from 6 to 30, with higher scores indicating greater severity of anxiety symptoms. When required, raw scores can be converted to standardized T-scores according to PROMIS scoring procedures, with a normative mean of 50 and a standard deviation of 10. The PROMIS anxiety item bank was developed using modern psychometric methods, including item response theory, and has demonstrated satisfactory construct validity and reliability in previous research. In the present study, the internal consistency of the anxiety scale was evaluated using Cronbach's alpha and composite reliability. The Cronbach's alpha coefficient obtained for the anxiety scale was .89, while the two-week

test-retest reliability coefficient was .83, indicating satisfactory internal consistency and temporal stability.

Problematic Internet Use Questionnaire Short Form (PIUQ-SF-6). Problematic Internet use was assessed using the six-item Problematic Internet Use Questionnaire Short Form (PIUQ-SF-6). The instrument is derived from the original 18-item Problematic Internet Use Questionnaire developed by Demetrovics, Szeredi, and Rózsa and was subsequently shortened by Demetrovics and colleagues to provide a brief measure suitable for research and screening contexts. The PIUQ-SF-6 contains six items distributed across three dimensions: obsession or preoccupation, neglect, and control disorder, with two items representing each dimension. Responses are scored on a five-point Likert scale ranging from 1 (never) to 5 (always or almost always), yielding a possible total score between 6 and 30. Higher scores represent a greater degree of problematic Internet use. Previous psychometric studies have supported the three-factor structure of the short form and have demonstrated acceptable construct validity and reliability. In the present study, the PIUQ-SF-6 was used as the operational measure of Internet addiction/problematic Internet use. Its Cronbach's alpha coefficient was .83, and its two-week test-retest reliability coefficient was .79, indicating acceptable internal consistency and temporal stability.

Toronto Alexithymia Scale-20 (TAS-20). Alexithymia was measured using the 20-item Toronto Alexithymia Scale (TAS-20), originally developed by Bagby and colleagues and subsequently refined and extensively validated by Taylor and colleagues. The TAS-20 is one of the most widely used self-report instruments for assessing difficulties in emotional awareness and emotional processing. It comprises three dimensions: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. The scale contains 20 items scored on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Items 4, 5, 10, 18, and 19 are reverse-scored. The total score ranges from 20 to 100, with higher scores indicating greater alexithymia. Conventionally, scores of 51 or below represent relatively low alexithymia, scores between 52 and 60 are regarded as borderline, and scores of 61 or higher indicate elevated alexithymia. Previous confirmatory factor analytic studies have generally supported the three-dimensional structure of the instrument in clinical and nonclinical populations, and Persian versions have also shown satisfactory psychometric properties. In the present sample, Cronbach's alpha for the total TAS-20 score was .88, and the two-week test-retest reliability coefficient

was .83, indicating high internal consistency and satisfactory temporal stability.

Before the main data collection, face validity of the questionnaires was examined using a group of 10 university students who were not included in the main study sample. These students evaluated the clarity, comprehensibility, simplicity, and ambiguity of the questionnaire items, and minor wording adjustments were made where necessary without altering the substantive content of the standardized measures. Content validity was additionally examined by eight experts in clinical psychology and research methodology. The experts evaluated the relevance, clarity, and simplicity of the study items, and content validity was considered acceptable when the content validity ratio and content validity index met the predefined criteria. Construct validity was subsequently evaluated through confirmatory factor analysis within the SEM framework. Reliability was examined through Cronbach's alpha, composite reliability, and, for temporal stability, a two-week test-retest procedure administered to 30 students.

2.3. Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) and Analysis of Moment Structures (AMOS). Prior to testing the structural model, the dataset was screened for missing values, invalid response patterns, outliers, distributional characteristics, and the assumptions required for SEM. Descriptive statistics, including the mean, standard deviation, minimum, maximum, skewness, and kurtosis, were calculated for the principal study variables. Pearson correlation coefficients were also calculated to provide an initial assessment of the bivariate relationships among anxiety, alexithymia, and problematic Internet use. The distributions of the observed variables were examined for approximate normality, while multicollinearity and linearity were assessed before estimation of the structural model. Internal consistency was evaluated using Cronbach's alpha and composite reliability, whereas construct validity of the measurement model was examined through confirmatory factor analysis.

Structural equation modeling was conducted in two successive stages. First, the measurement model was evaluated using confirmatory factor analysis to determine whether the observed indicators adequately represented the latent constructs of anxiety, alexithymia, and problematic Internet use. Standardized factor loadings and overall model-fit statistics were examined to assess the adequacy of the

measurement structure. After establishing an acceptable measurement model, the structural model was estimated to test the hypothesized relationships among the study variables. Specifically, the analysis examined the direct path from anxiety to problematic Internet use, the path from anxiety to alexithymia, the path from alexithymia to problematic Internet use, and the indirect effect of anxiety on problematic Internet use through alexithymia. Standardized and unstandardized regression coefficients, critical ratios, standard errors, p values, and coefficients of determination for endogenous variables were calculated and interpreted.

The overall goodness of fit of the measurement and structural models was assessed using multiple fit indices rather than relying exclusively on the chi-square statistic. These indices included the chi-square to degrees-of-freedom ratio (χ^2/df), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Normed Fit Index (NFI), Incremental Fit Index (IFI), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Root Mean Square Error of Approximation (RMSEA), and, where applicable, the Standardized Root Mean Square Residual (SRMR). As general criteria, χ^2/df values below 3, CFI and TLI values above .90, and RMSEA values below .08 were considered indicative of an acceptable model fit, with more stringent values interpreted as evidence of stronger fit.

The mediating role of alexithymia was examined using a nonparametric bootstrap procedure with 5,000 resamples. The indirect effect of anxiety on problematic Internet use through alexithymia was estimated together with its 95% bootstrap confidence interval. Mediation was considered statistically significant when the confidence interval for the indirect effect did not include zero. The direct, indirect, and total effects were reported separately to determine whether alexithymia partially or fully accounted for the association between anxiety and problematic Internet use. Statistical significance for the primary analyses was evaluated at the .05 level.

3. Findings and Results

A total of 209 university students were included in the final analysis. Of these participants, 67 (32.1%) were male and 142 (67.9%) were female. Regarding field of study, 42 students (20.1%) were studying dentistry, 38 (18.2%) pharmacy, 21 (10.0%) medicine, 18 (8.6%) nursing, 17 (8.1%) anesthesiology, 15 (7.2%) laboratory sciences, 14 (6.7%) occupational health engineering, 13 (6.2%)

environmental health engineering, 12 (5.7%) psychology, 8 (3.8%) health information technology, 6 (2.9%) biology and vector control, and 5 (2.4%) other disciplines. In terms of educational level, 28 participants (13.4%) were associate-degree students, 105 (50.2%) were undergraduate students, 31 (14.8%) were master's students, and 45 (21.5%) were

enrolled in professional doctoral programs. Regarding university affiliation, 98 students (46.9%) were studying at the University of Medical Sciences, 42 (20.1%) at the public university, 38 (18.2%) at Islamic Azad University, 21 (10.0%) at Payame Noor University, and 10 (4.8%) at the University of Applied Science and Technology.

Table 1

Descriptive Statistics and Pearson Correlations Among the Study Variables

Variable	M	SD	Min	Max	Skewness	Kurtosis	1	2	3
1. Anxiety	15.84	4.27	6	28	0.35	-0.42	1		
2. Alexithymia	58.32	11.56	32	89	0.28	-0.31	.52**	1	
3. Internet addiction	14.25	4.83	6	29	0.52	-0.18	.41**	.48**	1

As shown in Table 1, the mean anxiety score was 15.84 (SD = 4.27), the mean alexithymia score was 58.32 (SD = 11.56), and the mean Internet addiction score was 14.25 (SD = 4.83). The skewness values ranged from 0.28 to 0.52 and the kurtosis values ranged from -0.42 to -0.18, indicating no substantial departure from univariate normality. Pearson correlation analysis demonstrated that anxiety was positively and significantly correlated with alexithymia ($r = .52$, $p < .01$) and Internet addiction ($r = .41$, $p < .01$). Alexithymia was also positively and significantly correlated with Internet addiction ($r = .48$, $p < .01$). Thus, higher anxiety was associated with greater alexithymia and more severe Internet addiction, while greater alexithymia was also associated with higher levels of Internet addiction.

The assumptions required for regression and mediation analyses were examined before testing the proposed model.

The Kolmogorov-Smirnov test was nonsignificant for anxiety ($K-S = .058$, $p = .200$), alexithymia ($K-S = .062$, $p = .150$), and Internet addiction ($K-S = .071$, $p = .080$), supporting the assumption of approximate normality. This conclusion was further supported by the skewness and kurtosis coefficients reported in Table 1, all of which were within the acceptable range of ± 2 . Multicollinearity was not problematic, as both anxiety and alexithymia had tolerance values of .73 and variance inflation factor values of 1.37, considerably above the minimum tolerance criterion of .10 and below conventional VIF thresholds. The Durbin-Watson statistic was 1.92, which was within the acceptable range of approximately 1.5 to 2.5 and indicated that the residuals were sufficiently independent. Collectively, these findings indicated that the principal statistical assumptions for the regression-based mediation analysis were satisfied.

Table 2

Regression Results for the Direct Paths in the Mediation Model

Outcome	Predictor	Path	B	SE	β	t	p	R ²
Internet addiction	Anxiety	Total effect (c)	0.41	0.06	.41	6.83	<.001	.168
Alexithymia	Anxiety	Path a	1.43	0.13	.52	11.00	<.001	.270
Internet addiction	Anxiety	Direct effect (c')	0.18	0.07	.18	2.57	.011	.285
Internet addiction	Alexithymia	Path b	0.16	0.03	.38	5.33	<.001	.285

As presented in Table 2, anxiety significantly and positively predicted Internet addiction before alexithymia was entered into the model ($\beta = .41$, $t = 6.83$, $p < .001$), and anxiety alone accounted for 16.8% of the variance in Internet addiction. Anxiety also significantly predicted alexithymia ($\beta = .52$, $t = 11.00$, $p < .001$), explaining 27.0% of its

variance. When anxiety and alexithymia were entered simultaneously as predictors of Internet addiction, alexithymia remained a significant positive predictor ($\beta = .38$, $t = 5.33$, $p < .001$), while the standardized direct effect of anxiety decreased from .41 to .18 but remained statistically significant ($\beta = .18$, $t = 2.57$, $p = .011$). Together,

anxiety and alexithymia explained 28.5% of the variance in Internet addiction. The reduction in the anxiety coefficient after the inclusion of alexithymia, accompanied by the

persistence of a significant direct effect, was consistent with a partial mediation pattern.

Table 3

Bootstrap Analysis of the Indirect Effect of Anxiety on Internet Addiction Through Alexithymia

Indirect pathway	Indirect effect	Bootstrap SE	95% CI Lower	95% CI Upper	Result
Anxiety → Alexithymia → Internet addiction	0.23	0.05	0.14	0.33	Significant

The bootstrap analysis presented in Table 3 confirmed the mediating role of alexithymia. The indirect effect of anxiety on Internet addiction through alexithymia was 0.23 (SE = 0.05), with a 95% bootstrap confidence interval ranging from 0.14 to 0.33. Because the confidence interval did not include zero, the indirect effect was statistically significant. Therefore, the study hypothesis that anxiety exerts a significant indirect effect on Internet addiction through alexithymia was supported. Considering that the direct effect of anxiety on Internet addiction remained significant after alexithymia was incorporated into the model, alexithymia demonstrated a partial mediating effect. Accordingly, higher anxiety was associated with greater Internet addiction both directly and indirectly through increased alexithymia.

4. Discussion

The present study examined the structural relationship between anxiety and Internet addiction through the mediating role of alexithymia among university students in Sirjan. The findings indicated that anxiety was positively and significantly associated with both alexithymia and Internet addiction, while alexithymia was also positively and significantly associated with Internet addiction. In the regression analyses, anxiety significantly predicted Internet addiction and accounted for 16.8% of its variance before the mediator was entered into the model. Anxiety also significantly predicted alexithymia and explained 27.0% of its variance. When anxiety and alexithymia were entered simultaneously into the model, both variables remained significant predictors of Internet addiction, and together they explained 28.5% of its variance. Importantly, the standardized direct effect of anxiety on Internet addiction decreased from .41 to .18 after alexithymia was included in the model, while the bootstrap analysis showed a significant indirect effect of .23, with a 95% confidence interval ranging from .14 to .33. Because the direct effect remained statistically significant after accounting for the mediator, the

findings supported a partial mediating role for alexithymia in the relationship between anxiety and Internet addiction.

The significant positive relationship between anxiety and Internet addiction is consistent with a growing body of evidence indicating that problematic Internet use is closely related to psychological distress. Meta-analytic findings have shown that Internet addiction is associated with higher levels of psychiatric symptoms and other indicators of impaired psychological functioning (Sun Y & Liu, 2025). Similarly, a meta-analytic review focusing on adolescent populations demonstrated that Internet addiction is consistently associated with poorer mental-health outcomes, supporting the view that maladaptive Internet use frequently co-occurs with emotional difficulties rather than developing independently from them (Soriano-Molina & Rubio-Aparicio, 2025). The negative association between Internet addiction and subjective well-being reported in recent research further supports the interpretation that excessive and poorly controlled Internet use is embedded in a broader pattern of psychological maladjustment (Abdel-Khalek, 2026). The present findings extend this literature by demonstrating that anxiety is not merely correlated with Internet addiction but also has a statistically significant predictive role within a structural model.

One possible explanation for this result is that anxious individuals may use the Internet as a readily available strategy for escaping or attenuating aversive emotional states. Anxiety is characterized by excessive worry, tension, threat anticipation, physiological arousal, and difficulty disengaging from distressing thoughts. Online environments may provide rapid distraction, immediate stimulation, reassurance seeking, entertainment, social contact, or opportunities to avoid offline demands. When Internet use temporarily reduces anxious arousal, the resulting emotional relief may act as a negative reinforcement mechanism that increases the probability of repeated use. Over time, this pattern can become habitual and contribute to loss of control. This interpretation is compatible with research

demonstrating that anxiety can occupy an important mediating or explanatory role in relationships between Internet use and other health-related outcomes among college students (Gong & Wang, 2026). It is also consistent with findings among medical students showing that dependent use of emerging digital technologies such as generative artificial intelligence can be associated with anxiety symptoms, suggesting that emotional distress and technological dependence may become mutually reinforcing in academic settings (Chavez Sosa & Huancahuire-Vega, 2026).

The association between anxiety and problematic digital behavior can also be understood in light of emerging neurobehavioral evidence. Research on problematic smartphone use indicates that stress and self-control may mediate associations between brain-network characteristics and maladaptive digital engagement (Tie & Zhang, 2025). Likewise, studies of short-video addiction among college students have linked problematic engagement with changes in risk decision-making processes and prefrontal cortical activation (Zhang & Yang, 2025). Research on Internet gaming disorder has similarly identified altered prefrontal responses to rewards and losses, which may reflect dysregulation in reinforcement sensitivity and behavioral control (Zhang & Li, 2025). A broader neurobiological review has emphasized the importance of developmental and gender-related mechanisms in Internet addiction and has highlighted the complex interaction between neural vulnerability, behavioral regulation, and environmental exposure (Jin J & Ding, 2026). From this perspective, anxiety may intensify motivational pressure to seek rapid relief through digital activity, whereas reduced self-regulation may facilitate continuation of use despite negative consequences.

The present study also found that anxiety significantly predicted alexithymia. This result suggests that students who reported higher levels of anxiety also tended to experience greater difficulty identifying, describing, and cognitively processing emotional states. Such an association is theoretically plausible because persistent anxiety can create a complex pattern of somatic arousal and diffuse negative affect that may be difficult to differentiate and verbalize. Individuals may experience tension, restlessness, or physiological activation without being fully able to distinguish fear, worry, frustration, or other emotional states. Research on alexithymia increasingly demonstrates that this construct is closely linked to the way cognitive and emotional information is processed in everyday life.

Individual differences in alexithymia have been shown to modulate cognition-emotion interactions in ongoing daily experiences, indicating that alexithymia influences how individuals attend to, interpret, and integrate emotional information (Lei & Ho, 2026). In addition, recent research has linked alexithymia with broader processes of identity development, further indicating that difficulties in emotional awareness can affect important dimensions of psychological adaptation (Vinhais & Roberto, 2026).

The positive association between anxiety and alexithymia is also compatible with evidence from clinical and high-distress populations. A meta-analysis of patients with posttraumatic stress disorder found elevated levels of alexithymia, supporting the view that difficulty identifying and communicating emotions is strongly connected with persistent emotional distress (Couette & Ferreri, 2026). A recent scoping review of alexithymia in neurodevelopmental populations likewise emphasized its relevance as a transdiagnostic characteristic of emotional processing rather than a phenomenon confined to a single disorder or diagnostic category (Chalhaf N & Dergaa, 2026). Although the present participants were university students rather than clinical populations, the same underlying mechanism may be relevant: when emotional arousal becomes intense or recurrent, individuals who have limited emotional differentiation skills may experience their internal states in a poorly organized and less verbally accessible manner. Thus, higher anxiety may be associated with greater difficulty making sense of one's own emotional experience.

The finding that alexithymia significantly predicted Internet addiction is another central result of the study. Students with higher alexithymia scores were more likely to report greater problematic Internet use, even after anxiety was statistically controlled. This finding is directly consistent with previous work demonstrating a relationship between alexithymia and Internet addiction. Utkarsh and Kanwar reported that alexithymia was significantly related to Internet addiction and that this relationship could operate through additional psychological and interpersonal mechanisms (Utkarsh & Kanwar, 2025). Similarly, research among adolescents with psychological difficulties found that alexithymia can function as a mediating mechanism in pathways leading to Internet addiction (Wang & Liu, 2025). The present findings therefore support the interpretation that alexithymia is not only a correlate of general psychological distress but also a specific emotional-processing vulnerability that may contribute to maladaptive Internet engagement.

A likely explanation is that individuals with alexithymic tendencies may have fewer internal resources for identifying and regulating unpleasant emotional states through reflective or interpersonal means. Difficulty identifying feelings can make distress feel vague and overwhelming, while difficulty describing feelings can reduce the likelihood that individuals will seek support or communicate their needs effectively. An externally oriented thinking style may further encourage reliance on concrete activities rather than introspection. Digital environments provide a highly accessible external focus and can therefore become attractive to individuals who struggle with internal emotional processing. Repetitive browsing, gaming, social networking, video consumption, or other online behaviors may help shift attention away from uncomfortable internal experiences. However, when these behaviors are repeatedly used for emotion regulation, they may become increasingly rigid and compulsive. The significant positive relationship observed in the present study supports this mechanism.

The most important finding was that alexithymia partially mediated the relationship between anxiety and Internet addiction. This means that anxiety was associated with Internet addiction through two pathways. One pathway was direct: greater anxiety predicted greater problematic Internet use even after alexithymia was included in the model. The second pathway was indirect: higher anxiety was associated with greater alexithymia, which in turn was associated with greater Internet addiction. The significant bootstrap estimate for the indirect effect supports this interpretation and indicates that emotional-processing difficulties account for a meaningful portion of the association between anxiety and problematic Internet use. The partial rather than complete mediation is also theoretically informative because it suggests that alexithymia explains part, but not all, of the mechanism connecting anxiety to Internet addiction.

This mediation pattern is broadly consistent with previous findings showing that alexithymia can function as an explanatory psychological pathway in Internet-related behavioral problems. Wang and colleagues found that alexithymia played a mediating role in the relationship between earlier psychological adversity and Internet addiction, suggesting that impairments in emotional awareness can transmit the effects of distress-related vulnerabilities into maladaptive online behavior (Wang & Liu, 2025). Likewise, Utkarsh and Kanwar demonstrated that the relationship between alexithymia and Internet addiction can be shaped by psychological and interpersonal processes, reinforcing the view that emotional-processing

deficits occupy a central place in behavioral addiction models (Utkarsh & Kanwar, 2025). The current study extends these findings by positioning alexithymia specifically between anxiety and Internet addiction in a university student sample.

A similar mechanism can be inferred from research on emotional distress and other forms of digital addiction. For example, emotional distress has been shown to play an important role in pathways leading from adverse interpersonal experiences to short-video addiction (Yao & Hu, 2025). This suggests that emotional states may influence problematic digital behavior not simply because individuals are exposed to technology but because technology may become a preferred strategy for coping with difficult internal experiences. In students with elevated anxiety, alexithymia may magnify this vulnerability by reducing the individual's ability to identify what is being felt and why. Instead of recognizing an emotional state, evaluating its source, and selecting an adaptive coping strategy, the student may move directly toward a behavior that rapidly alters attention or arousal. Internet use is particularly effective for this purpose because it is immediate, private, highly reinforcing, and continuously available.

The findings are also meaningful within the broader context of university mental health. Recent studies and reviews indicate that anxiety symptoms are common in university populations, including medical and pharmacy students, and may be influenced by academic demands, institutional pressures, and broader social stressors (Agyapong-Opoku & Greenshaw, 2026; Pinho & Jacinto, 2026; Pradubkham & Phimarn, 2026). Anxiety among students has also been associated with academic burnout and school engagement, highlighting the importance of the educational environment in shaping emotional functioning (Chen, 2026). Furthermore, research conducted during periods of societal crisis has demonstrated that student mental health can be particularly sensitive to wider social conditions (Mersal & Masaeed, 2026). These findings help contextualize the current results by suggesting that students may encounter substantial levels of anxiety from multiple sources, thereby increasing the likelihood that they will rely on digital activities as coping strategies.

At the same time, the partial mediation observed in the present study indicates that alexithymia cannot be considered the only mechanism linking anxiety with Internet addiction. Anxiety retained a significant direct effect after the mediator was included, suggesting that additional processes are likely involved. These may include impaired

self-control, avoidance coping, reward sensitivity, fear of missing out, reassurance seeking, sleep disruption, academic stress, or habit formation. Neurobehavioral studies of problematic smartphone and Internet-related behaviors similarly suggest that stress regulation, inhibitory control, reward processing, and decision making may contribute to the development of maladaptive digital use (Tie & Zhang, 2025; Zhang & Li, 2025; Zhang & Yang, 2025). Therefore, the current model should be viewed as identifying one important emotional pathway rather than providing a complete explanation of Internet addiction.

Another important implication concerns the distinction between high-frequency Internet use and psychologically problematic use. Contemporary university students rely heavily on Internet-based platforms for legitimate academic, professional, and interpersonal activities. Therefore, time online alone cannot adequately identify problematic behavior. The stronger conceptual issue is whether Internet use becomes inflexible, emotionally driven, difficult to control, and disruptive to everyday functioning. Research showing associations between Internet addiction and lower subjective well-being reinforces the importance of assessing the psychological function and consequences of use rather than simply its duration (Abdel-Khalek, 2026). The present findings support this perspective by demonstrating that Internet addiction is linked to both anxiety and deficits in emotional awareness, indicating that emotional context may be more informative than exposure alone.

The current findings also suggest that emotional awareness should receive greater attention in university mental-health research. The broader higher-education literature increasingly emphasizes the role of psychological resources and personal capacities in student adjustment and functioning (Awashreh & Almi, 2026). Although the present model focused specifically on anxiety, alexithymia, and Internet addiction, research across student populations has demonstrated substantial variability in psychological characteristics relevant to academic and personal functioning (Adiang & Kinga, 2026; Li & Yan, 2026; Nguyen & McGregor, 2026; Oribhabor, 2026). At the same time, global evidence indicates that psychological difficulties among university students constitute a substantial international concern (Jacob & Maguvhe, 2026). These observations reinforce the importance of addressing both emotional symptoms and the processes by which students understand and regulate those symptoms.

Finally, the findings have implications for conceptualizing prevention. If anxiety contributes to Internet

addiction partly because some students have difficulty recognizing and processing their emotional experiences, interventions focused exclusively on restricting Internet access may be insufficient. Reducing access does not address the emotional function served by the behavior. The significant mediation effect suggests that the relationship between anxiety and problematic Internet use may be weakened when students develop greater emotional clarity and more adaptive ways of communicating and regulating distress. The fact that structured interventions such as exercise have shown beneficial effects on anxiety among university students also suggests that anxiety itself is modifiable and can be targeted through preventive programs (Praisan & Berchicci, 2026). Taken together, the findings support an integrated perspective in which Internet addiction is understood not simply as excessive technology use, but as a behavior partly embedded in difficulties with anxiety management and emotional processing.

Several limitations should be considered when interpreting the findings. First, the cross-sectional design does not permit definitive causal conclusions regarding the direction of relationships among anxiety, alexithymia, and Internet addiction; although the structural model was theoretically specified, reciprocal relationships are also possible. Second, all study variables were assessed through self-report questionnaires, which may be influenced by recall error, social desirability, response styles, and participants' willingness or ability to accurately report internal experiences. Third, the sample was drawn from university students in Sirjan, and the distribution of participants across gender, fields of study, and universities was not perfectly balanced; therefore, caution is required when generalizing the findings to students in other geographical regions, nonstudent populations, or populations with different educational and cultural characteristics. Fourth, although the sample size was adequate for the reported analyses, larger samples could provide more stable parameter estimates and permit more detailed subgroup analyses. Finally, the model explained a meaningful but limited proportion of the variance in Internet addiction, indicating that other psychological, interpersonal, behavioral, and contextual factors that were not included in the present study may also contribute to problematic Internet use.

Future studies should employ longitudinal designs to clarify the temporal ordering of anxiety, alexithymia, and Internet addiction and to determine whether changes in anxiety precede changes in alexithymia-related difficulties

and problematic Internet use. Multiwave designs would be particularly useful for distinguishing mediation from reciprocal influence. Replication with larger and more geographically diverse samples is also recommended, including students from different universities, academic disciplines, and cultural settings. Future research could compare structural pathways across gender, educational level, or type of Internet activity to determine whether the model operates similarly across subgroups. Studies should also incorporate complementary assessment methods, such as behavioral indicators of digital use, ecological momentary assessment, clinical interviews, or device-based usage records, to reduce reliance on self-report data. In addition, expanded models could investigate whether emotion regulation, self-control, avoidance coping, loneliness, academic stress, sleep quality, or specific patterns of online activity help explain the remaining direct association between anxiety and Internet addiction. Experimental and intervention studies are also needed to determine whether improving emotional awareness and reducing anxiety lead to measurable reductions in problematic Internet use.

The findings suggest that university counseling centers and student mental-health services should consider screening for anxiety, alexithymia, and problematic Internet use together rather than treating excessive Internet use solely as a behavioral-management issue. Students who report persistent anxiety and difficulty identifying or describing emotions may benefit from early psychological assessment because they may be especially likely to use digital environments as a compensatory coping strategy. Preventive programs could incorporate training in emotional identification, emotional labeling, communication of feelings, distress tolerance, and adaptive coping alongside psychoeducation about healthy Internet use. Counseling interventions should also help students recognize the emotional triggers that precede compulsive Internet engagement and develop alternative responses to anxiety that do not depend on immediate digital distraction. Universities may further benefit from integrating brief screening and skills-based workshops into student support programs, particularly during periods of high academic pressure. Such approaches may be more effective than restrictive strategies alone because they target the emotional processes that can sustain problematic Internet use.

5. Conclusion

Overall, the present findings suggest that reducing health-related threat perceptions while strengthening emotional and interpersonal resources may offer a more comprehensive pathway for supporting quality of life among older adults with chronic disease.

The present study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design does not permit definitive causal conclusions regarding the direction of relationships among health anxiety, emotion regulation, perceived social support, and quality of life. Although the structural model was theoretically specified and statistically supported, reciprocal relationships are possible; for example, poorer quality of life may increase health anxiety, and prolonged health anxiety may alter social perceptions over time. Second, all principal variables were assessed using self-report instruments, which may introduce common-method variance, recall bias, social desirability, and response-style effects. Third, participants were recruited from healthcare and community-based settings in Tehran, and therefore the findings may not generalize to older adults living in rural areas, other Iranian provinces, long-term residential facilities, or populations with substantially different cultural and socioeconomic characteristics. Fourth, the sample included older adults with heterogeneous chronic diseases, and the effects may differ according to illness type, severity, number of conditions, functional impairment, pain, treatment burden, and prognosis. Finally, although major demographic and clinical covariates were considered, potentially relevant factors such as depression, sleep quality, resilience, cognitive functioning, financial stress, medication burden, and objective social-network size were not incorporated into the model.

Future research should employ longitudinal and prospective designs to clarify the temporal ordering of health anxiety, emotion regulation, perceived social support, and quality of life and to determine whether changes in the proposed mediators predict subsequent improvement or deterioration in quality of life. Experimental and intervention studies are also needed to test whether directly improving emotion-regulation skills or strengthening perceived social support produces measurable reductions in the negative consequences of health anxiety. Future models could compare specific chronic disease groups and examine whether the structural relationships differ according to disease severity, multimorbidity, sex, age subgroup,

socioeconomic status, living arrangement, or level of functional independence. It would also be valuable to distinguish among specific emotion-regulation strategies rather than relying only on a general adaptive-regulation construct and to examine different sources of social support, including family, friends, significant others, peers with similar illnesses, and healthcare professionals. Incorporating objective indicators of physical functioning, healthcare utilization, social-network characteristics, and longitudinal clinical outcomes could further strengthen methodological rigor. Future studies may also test more complex sequential or moderated mediation models involving resilience, depression, self-efficacy, illness perception, loneliness, fear of death, or psychological capital.

From a practical perspective, the findings suggest that assessment and care of older adults with chronic illness should extend beyond physical symptoms and disease management to include systematic screening for excessive health anxiety, emotional-regulation difficulties, and inadequate perceived social support. Healthcare professionals working with older adults should be trained to identify patterns of catastrophic health interpretation, persistent reassurance seeking, avoidance, and social withdrawal. Psychological interventions may incorporate cognitive reappraisal, anxiety-management techniques, distress-tolerance training, mindfulness-based strategies, and education about realistic interpretation of chronic disease symptoms. Family members and caregivers may benefit from guidance on how to provide supportive reassurance without reinforcing excessive illness-focused behavior. Group-based programs, peer-support networks, community activities, and structured opportunities for social participation may further strengthen perceived support and reduce isolation. Integrating geriatric medical care with psychological and social services could therefore provide a more comprehensive model of chronic disease management and may help older adults maintain autonomy, emotional stability, and a higher quality of life despite ongoing medical limitations.

Authors' Contributions

Authors equally contributed to this article.

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

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Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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