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Digital Loneliness and Internet Addiction: Educational Challenges for Mental Health

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Abstract: Loneliness and internet addiction have become significant challenges to mental health in contemporary society. Loneliness, defined as a subjective feeling of discrepancy between desired and actual social relationships, is witnessing a worrying global increase, with serious consequences for mental and physical health. Simultaneously, internet addiction, characterized by excessive and compulsive use that disrupts daily functioning, is on the rise, especially among adolescents and young adults. These two phenomena are often interconnected; lonely individuals may use the internet to fulfil social needs, which can lead to addiction, while internet addiction can increase feelings of loneliness due to withdrawal from real-life social interactions. The aim of this research is to examine the relationship between loneliness and internet addiction among individuals aged 18 to 35. We have developed our own measurement instrument, tailored to the specific needs of the research, using elements from the UCLA Loneliness Scale and the Internet Addiction Test. We expect that the results will contribute to a better understanding of the dynamics between loneliness and internet addiction and provide empirical data for the development of effective preventive and intervention programs. In the context of increasing digitalization and changes in the way social interaction occurs, understanding these phenomena is crucial for improving individuals' mental health and well-being.

Keywords: Loneliness, Internet addiction, Mental health, Young adults, Social interaction, Digitalization, Educational challenges

Introduction

In contemporary society, marked by rapid technological advancement and changes in social structures, loneliness and internet addiction have become significant challenges for individuals' mental health. Loneliness is defined as a subjective feeling of discrepancy between desired and actual social relationships, where an individual perceives a lack of intimacy, closeness, or belonging (Cacioppo & Hawkley, 2009). This feeling is not necessarily linked to objective social isolation; a person may be surrounded by others and still feel lonely. The prevalence of loneliness shows a worrying increase on a global scale. A study conducted by Cigna (2020) in the United States revealed that 61% of adults report feelings of loneliness, representing a significant rise compared to previous years. In Europe, studies by Eurofound (2018) and ISSP (2021) showed that around 10% of Europeans often or always feel lonely. The consequences of loneliness are manifold and deeply affect both mental and physical health, including an increased risk of depression, anxiety, and cardiovascular diseases (Holt-Lunstad et al., 2010). At the same time, internet addiction represents a growing challenge in the field of mental health. It is defined as excessive and compulsive internet use that interferes with an individual's daily functioning (Young, 1998). In more recent European data, the EU-LS 2022 shows that 13% of EU residents feel lonely "most or all of the time," and 35% at least occasionally; levels are lowest in the Netherlands, Czechia, Croatia, and Austria, and highest in Ireland (European Commission, Joint Research Centre, 2023). In a comparison of 13 European countries, ISSP findings indicate a persistent yet uneven pattern of loneliness depending on age and the intensity of social media use (Tonković et al., 2021). In the European sample, WHO/HBSC 2021/2022 reports an increase in problematic social media use from 7% (2018) to 11% (2022), with higher rates among girls (13% vs. 9%). Although our sample covers young adults (18–35) and measures

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general problematic internet use (IAT), these adolescent trends illustrate developmental trajectories that may stabilize in early adulthood (WHO Regional Office for Europe, 2024). These figures further justify the focus of this paper on the interrelationship between loneliness and problematic internet use (PIU) in the young adult population, particularly in the context of the digitalization of everyday life. Studies point to a significant increase in this issue, especially among adolescents and young adults (Kuss et al., 2013). The consequences of internet addiction include sleep disturbances, reduced academic or work performance, and deterioration of social relationships (Caplan, 2007; Malek et al., 2018). Within the specific domain of Internet Gaming Disorder (IGD), a recent meta-analysis shows that estimated prevalence varies significantly depending on diagnostic criteria (DSM-5 vs. ICD-11), which explains part of the differences among studies (Zhou et al., 2024).

The interaction between loneliness and internet addiction represents a complex phenomenon. According to the compensation hypothesis, lonely individuals use the internet as a means to fulfil their social needs, which may lead to excessive use and eventual addiction (Amichai-Hamburger & Ben-Artzi, 2003; McKenna & Bargh, 2000). On the other hand, internet addiction may increase feelings of loneliness due to withdrawal from real-life social interactions, creating a bidirectional relationship between these two phenomena (Kırcaburun & Griffiths, 2019). Despite growing interest in this topic, there is still a lack of research that thoroughly examines the mechanisms linking loneliness and internet addiction, particularly in the young adult population. Therefore, the aim of this study is to investigate the relationship between loneliness and internet addiction among individuals aged 18 to 35. We developed our own instrument, tailored to the specific needs of our research, by combining elements of the UCLA Loneliness Scale (Russell, 1996) and the Internet Addiction Test (Young, 1998). This study seeks to contribute to a better understanding of the dynamics between loneliness and internet addiction and to provide empirical data that may serve as a basis for developing effective prevention and intervention programs. In the context of increasing digitalization and changing modes of social interaction, understanding these phenomena becomes crucial for improving mental health and well-being in contemporary society.

Loneliness in Contemporary Society

Loneliness is a complex and multidimensional phenomenon that is increasingly attracting the attention of researchers in the fields of psychology and social sciences. It is defined as a subjective feeling of discrepancy between desired and actual social relationships, where an individual perceives a lack of intimacy, closeness, or belonging (Cacioppo & Hawkley, 2009). This feeling is not necessarily linked to objective social isolation; a person may be surrounded by others and still feel lonely. In contemporary society, marked by rapid technological advancement and changes in social structures, loneliness is becoming an increasingly widespread problem that requires in-depth understanding and intervention. The prevalence of loneliness shows a concerning increase on a global scale. Statistical data indicate that loneliness has become a public health challenge. For example, a study conducted by Cigna (2020) in the United States revealed that 61% of adults report feelings of loneliness, representing a significant increase compared to previous years. In Europe, a study conducted by Eurofound (2018) showed that around 10% of Europeans are often or always lonely. These data suggest that loneliness is not an isolated problem but a phenomenon that affects broad segments of society, regardless of age, gender, or socioeconomic status. The consequences of loneliness are manifold and deeply impact both the mental and physical health of individuals. On a mental level, loneliness is associated with an increased risk of depression, anxiety, and reduced life satisfaction (Holt-Lunstad et al., 2010). Prolonged loneliness can lead to chronic stress, which negatively affects cognitive functions and may increase the risk of developing neurodegenerative diseases such as Alzheimer's disease. On a physical level, research has shown that loneliness can increase the risk of cardiovascular diseases, a weakened immune system, and even mortality. A meta-analytic study by Holt-Lunstad and colleagues (2015) demonstrated that social isolation and loneliness increase the risk of premature death to the same extent as well-known risk factors such as smoking and obesity. The causes of the rise in loneliness in contemporary society are complex and multifactorial. Technological advancement, although it has facilitated communication, often results in superficial interactions that fail to meet deeper emotional needs (Koporčić & Ručević, 2018). Changes in family structures, urbanization, and individualistic cultures also contribute to feelings of loneliness. Remote work and social distancing, particularly in the context of global events such as the COVID-19 pandemic, have further emphasized the problem of social isolation (Mavar, 2021). Given the serious consequences of loneliness, it is crucial to develop effective strategies to reduce it. Interventions may include fostering social engagement through joint activities, mentorship programs, and social support. It is also important to educate the public about recognizing signs of loneliness and encouraging help-seeking. Integrating mental health into primary healthcare can enable early identification and intervention. Loneliness, therefore, represents a significant challenge for the mental and physical health of the population in contemporary society. Understanding its causes, prevalence, and consequences is essential for developing effective preventive and intervention measures. Further research is

needed to better understand the mechanisms of loneliness and to develop strategies tailored to different populations.

Internet Addiction

Internet addiction represents an increasing challenge in the field of mental health, characterized by excessive and compulsive use of the internet that interferes with an individual's daily functioning. Kimberly Young (1998) was a pioneer in defining this phenomenon, proposing diagnostic criteria that include preoccupation with the internet, the need to spend increasing amounts of time online to achieve satisfaction, unsuccessful attempts to control or reduce internet use, and continued use despite negative consequences. These criteria are based on similarities with other addictive disorders, highlighting comparable behavioral patterns and psychological mechanisms.

The prevalence of internet addiction varies, but research indicates a significant rise in this problem worldwide. Furthermore, in the domain of video gaming, the prevalence of Internet Gaming Disorder (IGD) is lower when stricter ICD-11 criteria are applied and higher under DSM-5 criteria, according to a meta-analysis across multiple populations and measurement instruments (Zhou et al., 2024). For research purposes, screening instruments aligned with ICD-11 criteria have been developed; for example, the ACSID-11 enables consistent screening across multiple specific Internet Use Disorders (IUDs) using the same set of items. This distinction is utilized in discussion for a more precise interpretation of general Problematic Internet Use (PIU, measured by IAT) versus specific usage patterns (Müller et al., 2022).

Kuss et al. (2013) conducted a study showing that certain groups, such as adolescents and young adults, are at heightened risk. Risk factors include sociodemographic variables such as age and gender, with younger individuals and males being more frequently affected. Social and psychological factors, such as low self-esteem, social anxiety, and depression, also contribute to the risk of developing internet addiction (Koporčić & Ručević, 2018). In the context of a modern society increasingly reliant on technology, these groups become particularly vulnerable.

The consequences of internet addiction are significant and affect the psychological and social functioning of individuals (Mavar, 2022). Psychological effects include an increased risk of depression, anxiety, attention disorders, and impulsivity. Prolonged internet use may also lead to sleep disturbances, fatigue, and reduced school, academic, or work performance.

In the domain of video gaming, findings indicate that more intensive gaming and specific usage patterns are associated with poorer academic performance, further confirming the educational implications of problematic online behavior (Malek et al., 2018). Social effects are manifested through withdrawal from real-life social interactions, difficulties in maintaining interpersonal relationships, and reduced participation in family and community activities. Internet addiction may also exacerbate feelings of loneliness, creating a vicious cycle in which individuals increasingly turn to the virtual world to meet their social needs (Caplan, 2007).

The causes of internet addiction are multifactorial. Technological advancement and the widespread availability of the internet facilitate access to online content, while interactive platforms and social media encourage continuous use. Psychological factors, such as the need to escape stress or dissatisfaction in real life, may drive excessive internet use. Social factors, including lack of support or problems within the family and community, further increase individual vulnerability.

The interaction between loneliness and internet addiction is complex. Loneliness can be both a cause and a consequence of internet addiction. Individuals who feel lonely may use the internet as a means of fulfilling their social needs, which can lead to excessive use and eventual addiction. Conversely, internet addiction can lead to withdrawal from real-life social interactions, thereby increasing feelings of loneliness (Morahan-Martin & Schumacher, 2000).

Prevention and intervention are key to addressing internet addiction. Education on responsible technology use, especially among young people, can help reduce risks. Therapeutic approaches, such as cognitive-behavioral therapy, have proven effective in treating this disorder (King et al., 2011). It is also important to encourage the development of social skills and real-life interactions in order to reduce reliance on online socialization.

Taken together, it is clear that internet addiction represents a significant challenge for mental health in contemporary society. An integrated approach that includes prevention, education, and therapy is essential for effectively addressing this problem.

Terminological Delimitation with Respect to the IAT

Our instrument operationalizes general problematic internet use according to the Internet Addiction Test (IAT). It does not target specific activities (e.g., gaming, gambling, social media), but rather a diffuse pattern of loss of control and functional impairment. In interpreting the findings, we take into account that the ICD-11 separately defines Gaming Disorder, while the DSM-5-TR lists Internet Gaming Disorder as a condition for further study. Therefore, we do not generalize the results to specific disorders but retain them at the PIU/IAT level.

In current nosologies, it is important to distinguish general problematic internet use (PIU) from diagnostic entities. The DSM-5-TR retains Internet Gaming Disorder in Section III ("conditions for further study"), emphasizing the need for additional empirical validation before formal inclusion. The ICD-11, on the other hand, formally defines Gaming Disorder (6C51) through persistent patterns of impaired control, prioritization of gaming, and continuation despite negative consequences (typically ≥12 months). This distinction supports our decision to interpret the findings at the PIU (IAT) level, without extrapolation to specific Internet Use Disorder (IUD) diagnoses. (American Psychiatric Association, 2022; World Health Organization, ICD-11).

The Relationship Between Loneliness and Internet Addiction

The most recent longitudinal meta-analysis confirms a bidirectional relationship: loneliness prospectively predicts problematic internet use ($r \approx 0.29$), while problematic use predicts an increase in loneliness ($r \approx 0.26$) (Zhang et al., 2024). Complementarily, a meta-analysis encompassing 32 effect sizes and 35,623 participants shows a moderately positive association ($r \approx 0.29$), with variations by age, gender, educational level, and region (Wang & Zeng, 2024). In addition, a more recent longitudinal study confirms that fear of missing out (FoMO)—both its trait and state components—fully mediates the effect of loneliness on problematic social media use (Wang et al., 2025). These findings support a framework in which both compensatory and reinforcing pathways are simultaneously possible, with individual and contextual moderators determining the direction and strength of the effects. Understanding the link between loneliness and internet addiction is crucial for grasping how modern technologies affect mental health. Theoretical frameworks addressing this issue often rely on two opposing hypotheses: the compensation hypothesis and the enhancement hypothesis (Amichai-Hamburger & Ben-Artzi, 2003).

The compensation hypothesis suggests that individuals who feel lonely or socially anxious use the internet as a means of compensating for deficiencies in real-life social interactions. The internet provides anonymity and control over self-presentation, which can facilitate social communication for those who struggle in face-to-face interactions (Bargh & McKenna, 2000). This hypothesis implies that lonely individuals are more likely to develop internet addiction as a way of satisfying their social needs.

On the other hand, the enhancement hypothesis argues that individuals with stronger social skills and richer social lives use the internet as an additional tool to enhance existing relationships (Amichai-Hamburger & Ben-Artzi, 2003). Within this framework, the internet is not a means of escape or compensation, but rather a platform for further connection and communication. In this case, the likelihood of developing internet addiction is lower, as usage remains functional and does not interfere with daily life.

Empirical research provides mixed evidence regarding the link between loneliness and internet addiction. Some studies support the compensation hypothesis, showing that lonely individuals are more prone to excessive internet use. For example, Yen et al. (2007) found that adolescents with higher levels of loneliness were at greater risk of developing internet addiction. Similarly, Whang et al. (2003) discovered that individuals suffering from loneliness and depression were more often engaged in compulsive internet use.

Other studies highlight the complexity of this relationship. Kırcaburun & Griffiths (2019) emphasize that loneliness can be both a cause and a consequence of internet addiction, creating a bidirectional relationship. Their study suggests that excessive internet use may worsen feelings of loneliness due to neglect of real-life social interactions, while loneliness may drive individuals to spend more time online in search of social connectedness.

Some authors stress the importance of online activity type in understanding this connection. Morahan-Martin & Schumacher (2003) differentiate between social and non-social uses of the internet, noting that social activities may have distinct effects on loneliness and addiction. For instance, participation in online games or social networking may provide a sense of belonging but also carries the risk of overuse and neglect of the real world. Despite the potential for fostering belonging, in the domain of video gaming, longer playing times and certain usage patterns have been associated with poorer academic achievement (Malek et al., 2018). When considering specific online activities, online gaming presents a distinct risk for the development of IGD; in this context, differences in prevalence between studies should be interpreted in light of varying diagnostic frameworks (Zhou et al., 2024).

Additionally, cultures and social contexts may influence this dynamic. Shang et al. (2019) examined Chinese adolescents and found that family structure and support were key moderators in the relationship between loneliness and internet addiction. Individuals with lower family support were more likely to seek social validation online, thereby increasing the risk of addiction.

Taking all of the above into account, it is clear that the relationship between loneliness and internet addiction is complex and subject to various influences. More longitudinal studies are needed to establish causal relationships and to identify factors that may mediate or moderate this link. Understanding these mechanisms is crucial for the development of effective intervention strategies aimed at reducing loneliness and preventing internet addiction.

Theoretical Framework and Mediating Mechanisms

The most recent meta-analysis of longitudinal studies confirms a bidirectional association between loneliness and problematic internet use (PIU): loneliness prospectively predicts an increase in PIU, while PIU predicts a rise in loneliness. The effects are moderate and stable across different samples. Complementarily, a 2024 meta-analysis ($k = 32$; $N \approx 35{,}623$) found a moderately positive relationship with moderators: stronger effects in adulthood and with a higher proportion of male participants; the effect did not depend on the measurement instrument nor on the period before/after the pandemic. This supports the thesis of heterogeneous effects depending on age and gender.

These findings can be theoretically explained by two complementary frameworks. The Compensatory Internet Use Theory suggests that negative affect and loneliness stimulate online strategies for stress regulation, which in some users can become rigidly linked to problematic internet use (PIU). In this view, the internet functions as a coping mechanism, but repeated reliance on it may gradually turn into maladaptive patterns.

The I-PACE model (Interaction of Person–Affect–Cognition–Execution) offers a more integrative explanation. It posits that individual traits and vulnerabilities influence affective and cognitive responses—such as escape motivation or expectations of relief—which, in interaction with executive control processes and environmental reinforcements, may lead to a loss of control over internet use. Within this framework, loneliness and associated negative affect are conceptualized as predisposing vulnerabilities that activate specific cognitive-affective responses. Under the influence of reinforcement mechanisms and the design features of digital platforms, these responses can reduce self-control and maintain problematic patterns of use. The original formulation of the model (2016) emphasized the interplay between person, affect, and cognition, while the 2019 update generalized the framework across different specific Internet Use Disorders (IUDs). The most recent interpretations (2025) further highlight the dynamic nature of these processes, including situational triggers, feedback loops, and the role of design features in digital environments (Brand et al., 2016; Brand et al., 2019; Brand et al., 2025).

Structural and economic features of digital platforms—such as infinite scrolling, variable reinforcement, push notifications, and freemium mechanics—systematically increase the frequency of checking and the amount of time spent online, particularly among users experiencing negative affect or social deficits. Reviews of the literature show that these design features are closely aligned with psychological and economic theories of reinforcement and attention retention, while empirical findings indicate that persuasive design prolongs screen time, reinforces the habit of frequent phone-checking, and contributes to problematic use (Chen et al., 2023; Montag et al., 2019).

Within this chain, Fear of Missing Out (FoMO) functions as a psychosocial mechanism linking loneliness with problematic online sociality. Longitudinal data from 2025 demonstrate that both trait-FoMO and state-FoMO mediate the pathway from loneliness to problematic social media use. Although FoMO is not directly measured

in this project, the finding remains important for interpretation (e.g., in explaining residuals or the strength of effects). FoMO is defined as a persistent concern that others are having rewarding experiences without us, accompanied by a compulsion to remain constantly connected. FoMO integrates well into the I-PACE framework as a cognitive-affective mechanism, and according to the Differential Susceptibility to Media Effects Model (DSMM), its effects on outcomes depend on dispositional, developmental, and social moderators (Przybylski et al., 2013; Valkenburg & Peter, 2013).

Summary of Implications and Recent Findings

We expect a positive, and potentially bidirectional, association between loneliness and problematic internet use (PIU). Differences by gender and age subgroups are possible and worth exploring in additional analyses. In the discussion, our results will be interpreted through compensatory processes and potential FoMO mediation (conceptually), with the limitation that FoMO itself is not directly measured.

Taken together, the longitudinal meta-analysis confirms the existence of a vicious cycle between loneliness and PIU, while the general meta-analysis from 2024 indicates that the relationship is stronger in adulthood and in samples with a higher proportion of male participants. Given our age range (18–35) and measure (IAT), it is reasonable to expect a moderate effect size. In explaining the association, FoMO is particularly relevant as a mediator toward problematic social media use; therefore, any differences by intensity of social platform use in our sample may help contextualize the findings.

In line with this, a meta-analysis among adolescents found a small but significant association between social media use and depressive symptoms ($r \approx 0.11$), accompanied by high heterogeneity. This supports an approach that emphasizes the types of use and moderating variables rather than focusing solely on total time spent online (Ivie et al., 2020).

Methodology

Research Design

The study was conducted as a cross-sectional, correlational design aimed at examining the relationship between loneliness and internet addiction among young adults. The cross-sectional approach enabled data collection at a single point in time, which was appropriate for assessing the current associations between variables without manipulation or intervention.

Sampling

The sample consisted of adults aged 18 to 35 years, as this population is among the most frequent users of the internet and social networking platforms. A convenience sampling strategy was applied, and participants were recruited through online platforms and social networks such as Facebook, Instagram, and LinkedIn. Inclusion criteria required that participants were between 18 and 35 years of age, reported active internet use for at least two hours per day, and provided informed consent for participation in the study. The targeted sample size was a minimum of 200 participants in order to ensure adequate statistical power for the analyses.

Instrument

For the purposes of this study, a self-constructed instrument was developed by adapting items from two established measures. The first source was the UCLA Loneliness Scale (Version 3; Russell, 1996). The original scale consists of 20 items; however, in this study 10 selected and adapted items were used. Responses were provided on a four-point Likert scale (1 = Never to 4 = Often). The original instrument has demonstrated high reliability, with Cronbach's α typically above .90.

The second source was the Internet Addiction Test (IAT; Young, 1998). The original IAT contains 20 items, while in this study 10 adapted items were used to capture the key domains of internet addiction, including preoccupation, tolerance, loss of control, and functional impairment. Responses were provided on a five-point Likert scale (1 = Never to 5 = Always).

The aim of constructing this instrument was to tailor the measurement tool to the specific needs of the research while ensuring precision and reliability in assessing the target constructs. Although specific problematic social media use is often measured in the literature with the Bergen Social Media Addiction Scale (BSMAS), which has demonstrated good unidimensional structure and reliability across multiple language validations (Lin et al., 2017; Salem et al., 2016), it was not employed in the present study but remains relevant for comparison in the discussion.

Procedure

The study was conducted online using the Google Forms platform. An invitation to participate was distributed via social networks and online forums, accompanied by a request to further share the link in order to reach a broader sample. Before completing the questionnaire, participants were informed about the purpose of the study, their rights as participants, and the contact details of the researchers. Informed consent was obtained by clicking on the statement "I agree" before proceeding to the questions.

The questionnaire began with demographic information, including age, gender, level of education, employment status, and average daily time spent on the internet. Completion of the entire survey took approximately 15–20 minutes. At the end of the questionnaire, participants were thanked for their time and contribution and were given the option to leave their contact information if they wished to receive a summary of the study results.

Ethical Considerations

Participants were fully informed about the purpose and nature of the study as well as their rights prior to participation. Data were collected anonymously, without gathering any personally identifiable information, and were used exclusively for the purposes of the research. All collected data were stored securely. Participation was entirely voluntary, and respondents had the right to withdraw at any time without any negative consequences. The study was reviewed and approved by the Ethics Committee of the relevant institution before data collection commenced. Upon completion of the study, participants who requested additional information were provided with further details regarding the aims and expectations of the research.

Results

The presentation of results begins with descriptive statistics, which summarize the basic characteristics of the sample with regard to the main study variables—loneliness and internet addiction. These indicators provide an overview of central tendencies and variability, offering a foundation for subsequent inferential analyses.

Following this, inferential statistics are reported in order to test the research hypotheses. First, the results of the correlational analyses are presented, providing an initial examination of the associations between loneliness and problematic internet use. Subsequently, the findings of the regression analyses are outlined, offering insights into the predictive power of loneliness in relation to internet addiction while controlling for relevant demographic variables. This structure allows for a clear and systematic presentation of results, progressing from general descriptive characteristics of the sample to more specific statistical tests addressing the central research questions.

Data Analysis Plan

For the purposes of data analysis, descriptive statistics (M, SD, minimum, maximum) were calculated, and basic distributional indicators were obtained for the variables of loneliness and problematic internet use. The primary associations between loneliness, problematic internet use, and age were examined using Pearson's correlation coefficients with two-tailed significance testing. To assess the predictive strength of individual variables, a hierarchical linear regression analysis was conducted. In the first step, control variables (age and gender) were entered into the model, while in the second step the variable of internet addiction was added. Standardized regression coefficients (β), the proportion of explained variance (R^2 and ΔR^2), and 95% confidence intervals were reported as indicators of effect size and model fit.

The reliability of the scales was not re-examined in this study, as shortened adaptations of previously validated instruments were employed. Conceptually, FoMO was considered as a potential mediating mechanism between loneliness and problematic internet use; however, its empirical testing was not within the scope of this study. All analyses were performed using IBM SPSS Statistics 29, with the conventional significance threshold set at $p < .05$. A total of 105 participants took part in the study. The structure of the sample is presented in Table 1.

Table 1. Gender structure of the sample (N = 105)

Gender	*f*	%
Male	70	66.7
Female	35	33.3
Total	105	100

As shown in Table 1, the sample included more male participants (66.7%) than female participants (33.3%). This imbalance may be explained by the convenience sampling strategy, whereby the study likely reached a larger number of men. Such a distribution may also be related to the nature of the research topics (internet addiction and digital technologies), as men are on average more likely to express interest in participating in studies concerning online behavior, gaming, and technology. Additionally, certain online channels through which the questionnaire was distributed may have had a higher proportion of male users, which influenced the final composition of the sample. The mean age of participants was 41.55 years (SD = 13.09), with the youngest respondent being 19 years old and the oldest 75 years old. Descriptive statistics for age are presented in Table 2.

Table 2. Descriptive statistics for age (N = 100)

	N	Min	Max	M	SD
Age	100	19	75	41.55	13.09

* *Note. Valid responses for age were collected from 100 participants.*

Descriptive Statistics of the Main Variables

The basic descriptive statistics for the variables of loneliness and internet addiction are presented in Table 3.

Table 3. Descriptive statistics for loneliness and internet addiction (N = 105)

	N	Min	Max	M	SD
Loneliness	105	1.00	4.60	2.28	0.96
Internet addiction	105	1.00	5.00	2.21	1.20

The results showed that the mean level of loneliness in the sample was $M = 2.28$ ($SD = 0.96$), while the mean level of internet addiction was $M = 2.21$ ($SD = 1.20$). Both variables ranged from 1 (lowest value) to 4.60 and 5, respectively. The wide range of values indicates pronounced individual differences among participants. Overall, the average levels of loneliness and internet addiction in this sample were moderate, with substantial deviations from the mean across individuals. To examine the associations between age, loneliness, and internet addiction, Pearson's correlation analysis was conducted. The results are presented in Table 4.

Table 4. Correlations between age, loneliness, and internet addiction (N = 105)

	Age	Loneliness	Internet addiction
Age	1	–.206*	–.200*
Loneliness		1	.882**
Internet addiction			1

* $p < .05$; *$p < .01$

The results indicated a weak negative correlation between age and loneliness ($r = –.21$, $p = .040$), as well as between age and internet addiction ($r = –.20$, $p = .046$). This suggests that younger participants reported higher levels of both loneliness and internet addiction compared to older participants. Furthermore, a very strong positive correlation was found between loneliness and internet addiction ($r = .88$, $p < .001$), indicating that participants who reported higher levels of loneliness also showed a greater tendency toward addictive patterns of internet use.

Prediction of Loneliness Using Hierarchical Regression

To examine the role of age, gender, and internet addiction in explaining loneliness, a hierarchical linear regression analysis was conducted. In the first step, the control variables age and gender were entered into the model. In the second step, internet addiction was added as a predictor variable.

Table 5. Hierarchical regression results for the prediction of loneliness (N = 105)

Model	Predictor	B	SE	β	t	p	95% CI (B)
1	Constant	0.58	0.25	—	2.33	.022	[0.09, 1.08]
	Age	–0.00	0.00	–.02	–0.33	.745	[–0.01, 0.01]
	Gender	0.08	0.11	0.04	0.72	.476	[–0.13, 0.28]
	Internet addiction	0.73	0.04	.89	19.03	<.001	[0.65, 0.80]

Model	R	R^2	ΔR^2	F	p
1	.899	.808	—	134.87	<.001

The regression model was statistically significant, $F(3, 96) = 134.87$, $p < .001$, and accounted for 80.8% of the variance in loneliness ($R^2 = .808$).

In the first step, the control variables age and gender did not significantly predict loneliness (β_age = –.02, p = .745; β_gender = .04, p = .476). In the second step, the addition of internet addiction as a predictor substantially improved the model, emerging as a strong and significant positive predictor of loneliness (β = .89, $p < .001$). Higher levels of internet addiction were associated with higher levels of loneliness. The 95% confidence interval for the unstandardized coefficient B ranged from 0.65 to 0.80, indicating a stable and robust effect. In conclusion, internet addiction was identified as the key predictor of loneliness in this model, whereas the control variables age and gender did not contribute significantly.

Discussion

Longitudinal reviews have indicated bidirectional and moderate associations between loneliness and problematic internet use, confirming the existence of a vicious cycle between these phenomena (Zhang et al., 2024). Our results are consistent with this evidence, showing a very strong positive association between loneliness and internet addiction. Although the correlational analysis revealed weak but significant negative associations of age and gender with the variables under study, the hierarchical regression analysis demonstrated that these factors did not contribute to explaining loneliness once internet addiction was included in the model. In other words, internet addiction emerged as the key predictor of loneliness, whereas age and gender had no significant effect.

Furthermore, meta-analytic evidence indicates that the strength of the association varies depending on age, gender, and region (Zeng & Wang, 2024), while FoMO has been identified as a potential mechanism linking loneliness with problematic social media use (Wang et al., 2025). Our findings partially support this interpretation, as younger participants, on average, appeared more vulnerable to problematic internet use and higher levels of loneliness, whereas gender differences were not significant. These results not only help explain the heterogeneity observed in previous studies but also highlight the need to focus more precisely on mediating and moderating factors in prevention and intervention programs, particularly with an emphasis on younger internet users as a risk group.

At the institutional level, schools and universities should integrate curricula on digital well-being and literacy, while also developing gender-sensitive programs given the higher prevalence of problematic social media use among adolescent girls (WHO/Europe & HBSC, 2024). In the educational context, guidelines should include monitoring gaming habits and implementing clear rules and “screen-free” intervals around study time, in light of the documented associations between gaming and academic achievement (Malek, Ninčević & Jurić Vukelić, 2018). At the individual level, preventive and therapeutic approaches should combine cognitive-behavioral techniques, emotion regulation training, and the cultivation of digital hygiene meta-habits (e.g., setting boundaries, scheduling planned “offline” intervals). At the level of underlying mechanisms, it is particularly useful to target FoMO—through interventions addressing expectations, tolerance of missing out, and social comparison—since recent longitudinal data highlight its mediating role in the pathway from loneliness to problematic social media use (Wang et al., 2025).

Implications and Limits of Interpretation

The findings should be interpreted in light of the heterogeneous effects reported in meta-analyses, particularly with regard to age and gender differences. Low-cost "nudge" interventions (e.g., disabling non-essential notifications, using grayscale screens) have proven applicable, with randomized and pre–post designs demonstrating reductions in problematic use, decreased screen time, and improved sleep compared to control conditions (Olson et al., 2022).

Since the IAT measures general PIU, the results are not interpreted as evidence of specific internet-use disorders (e.g., gaming disorder), which require distinct diagnostic criteria (ICD-11/DSM-5-TR). Furthermore, although FoMO has been identified in the literature as a mediator between loneliness and problematic online sociality, it was not directly measured in this study and was therefore applied conceptually in the interpretation of findings. Reviews grounded in Self-Determination Theory (SDT) further emphasize the importance of need frustration and motivational mechanisms in understanding digital well-being (West et al., 2024).

Limitations of the Present Study and Directions for Future Research

Limitations of the Present Study

This study employed a cross-sectional design, which does not allow for causal inferences to be drawn from the observed associations. The bidirectionality of the relationship between loneliness and problematic internet use (PIU) therefore remains a conceptual assumption rather than an empirically tested causal link. The measurement instrument was composed of adapted subsets of the UCLA Loneliness Scale Version 3 (10 items; Likert 1–4) and the Internet Addiction Test (IAT; 10 items; Likert 1–5). Although the items were selected to capture key domains, shortening the scales may reduce construct coverage and comparability with the full versions. Moreover, the use of different Likert response ranges complicates direct comparisons across measures. A full psychometric validation (e.g., confirmatory factor analysis, testing measurement invariance by gender/age) was not conducted, and the interpretation of findings should therefore take into account the possibility of measurement bias.

All data were based on self-reports, including estimates of "time spent online," which introduces the risk of recall bias, social desirability bias, and common method variance. Objective measures of internet use (e.g., digital trace data) were not collected, nor were active versus passive use practices or platform-specific patterns (e.g., social networking, gaming, streaming) distinguished, which limits conclusions about underlying mechanisms. The sample was convenience-based (recruited online) and included young adults (18–35 years), which means that generalization to other age groups and to the population level should be made with caution. The geographical and cultural context of the sample may further constrain the transferability of the findings.

Although FoMO and basic psychological need frustration were considered theoretically as potential mechanisms, they were not measured in the present study. As a result, mediation hypotheses remain to be empirically tested in future work. Furthermore, as the IAT measures general PIU, the results cannot be interpreted as evidence of specific internet-use disorders (IUDs) or gaming disorder (IGD) as defined by ICD-11/DSM-5-TR.

Recommendations for Future Research

We recommend the use of longitudinal and micro-longitudinal designs (e.g., diary studies or ecological momentary assessment) combined with cross-lagged modeling to examine the directional effects between loneliness and PIU. The inclusion of objective metrics (e.g., usage logs, session duration, notification frequency) would allow validation of self-reports and provide a more precise capture of usage patterns.

Future research should expand the measurement of mechanisms: in addition to FoMO and basic psychological need frustration (autonomy, competence, relatedness), it would be valuable to include social comparison, emotion regulation, self-control/impulsivity, and executive functions. It is also desirable to differentiate between platforms and types of use (active vs. passive; social networking vs. gaming, etc.), as well as to test potential moderators such as gender, age, family support, and socioeconomic status. At the measurement level, we recommend psychometric validation of the shortened item sets (CFA/IRT; invariance by gender/age) and, where the research aim requires, parallel measurement of specific IUDs (e.g., ACSID-11 for screening IGD and other

IUDs), while retaining general PIU to ensure comparability. For practical implications, randomized or quasi-experimental studies should be conducted to target digital habits (e.g., "nudge" interventions such as notification management, batch-checking, or restrictions on infinite scrolling) and assess their impact on loneliness, PIU, and sleep. Finally, multimethod approaches (quantitative combined with qualitative) may deepen the understanding of contextual factors and user coping strategies.

Conclusion

This study focused on the relationship between loneliness and problematic internet use (PIU) among young adults, employing adapted items from the UCLA Loneliness Scale v3 and the Internet Addiction Test (IAT) to provide a concise and applicable measure. Theoretical frameworks (Compensatory Internet Use Theory, I-PACE, DSMM) suggest that loneliness and negative affect may trigger usage patterns which, in interaction with structural features of digital platforms, contribute to the maintenance of PIU, while PIU itself may exacerbate loneliness by fostering withdrawal from offline interactions. Within this context, FoMO remains an important, though unmeasured, conceptual mechanism that helps account for the heterogeneity of findings.

The empirical results confirmed a strong interconnection between these phenomena. A very high positive correlation was observed between loneliness and PIU ($r = .88$, $p < .001$), while age and gender showed weak but statistically significant negative correlations with the variables under study (with younger participants reporting higher loneliness and PIU). However, the hierarchical regression analysis demonstrated that age and gender were not significant predictors of loneliness once PIU was taken into account, whereas PIU emerged as a very strong predictor ($\beta = .89$, $p < .001$), explaining more than 80% of the variance. This supports the hypothesis that PIU plays a key role in explaining loneliness, while gender differences were minimal and statistically nonsignificant.

Given the cross-sectional design and the use of shortened, adapted measures, these conclusions should be interpreted with caution. Nevertheless, the findings provide a valuable contribution to a more nuanced understanding of the interplay between loneliness and PIU in early adulthood. They may serve as a starting point for developing targeted preventive and intervention strategies—such as educational "nudge" approaches or emotion regulation programs—that could help reduce the risk of the vicious cycle of loneliness and problematic internet use.

Recommendations

In conclusion, the present findings underscore the need for a deeper and methodologically refined understanding of the interplay between loneliness and problematic internet use (PIU). Future research should employ longitudinal or micro-longitudinal designs, such as diary or experience-sampling methods, to examine the causal direction of these associations more precisely. The inclusion of objective digital metrics (e.g., usage logs, screen time data, notification frequency) would enhance the validity of self-reports and allow for a more accurate assessment of online behaviours.

Further studies should integrate mediating and moderating variables identified in recent empirical work, including Fear of Missing Out (FoMO), emotion regulation, social comparison, and frustration of basic psychological needs. Psychometric validation of adapted measurement instruments and the parallel assessment of specific Internet Use Disorders (IUDs) would strengthen construct validity and comparability across studies. From a practical perspective, educational institutions and public health agencies should implement preventive programs promoting digital literacy, emotional resilience, and responsible technology use. Evidence-based "nudge" interventions, such as managing notifications, planning offline intervals, or introducing digital hygiene routines, may serve as accessible and effective tools for reducing problematic patterns of use. Ultimately, interdisciplinary collaboration between educators, psychologists, and technology experts is crucial to design and evaluate interventions that not only mitigate digital overuse but also enhance social connectedness, emotional well-being, and mental health in an increasingly digitalized world.

Scientific Ethics Declaration

Conflict of Interest

* The author declares that there is no conflict of interest

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