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An Explanatory Sequential Mixed Method Study on the Role of Loneliness and Self Esteem in the Development of Internet Addiction Among Young Adults

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Abstract

Background: The present study assessed the contribution of loneliness and self-esteem in the development of internet addiction in young adults. Methods: An explanatory sequential mixed-method design was utilized. In Phase I, quantitative data from 150 young adults were gathered with standardized measures: Internet Addiction Test (Young, 1998), Rosenberg Self-Esteem Scale (Rosenberg, 1965), and UCLA Loneliness Scale (Russell, 1996). Descriptive statistics, correlation, regression, and t-tests were conducted. In Phase II, semi-structured interviews were held with high addiction scorers, and thematic analysis was conducted with Braun and Clarke thematic analysis process. Results: Quantitative results suggested loneliness was strongly and positively related to internet addiction, whereas self-esteem was negatively related. Regression analysis found loneliness and self-esteem to be a strong predictor of internet addiction. Gender differences did not prove statistically significant. Qualitative results yielded three themes: excessive daily use, self-esteem validation and comparison, functional impact and addiction cycle. The participants had been using the internet as a coping strategy for loneliness and low self-esteem and this may lead to decreased offline interactions and unsuccessful attempts at control. Conclusion: The results show the interwoven function of loneliness and self-esteem in internet addiction. Intervention based on increased self-esteem and lonely thoughts may be able to prevent internet addiction among young adults.

Keywords: internet addiction, loneliness, self-esteem, young adults, mixed-method

Mixed methods research offers the unique ability to integrate quantitative and qualitative approaches, providing a more comprehensive understanding of complex phenomena than either method alone can achieve (Creswell & Plano Clark, 2017). There are three basic designs in mixed methods research: the convergent design, the explanatory sequential design, and the exploratory sequential design (Creswell & Plano Clark, 2017). In the exploratory sequential design, the qualitative phase precedes the quantitative phase (Curry & Nunez-Smith, 2015). It is useful when researchers aim to integrate qualitative and quantitative data, combining theoretical deduction with empirical analysis to thoroughly explore and develop new models (Brown et al., 2020).

Study background

The proliferation of young adults' social and psychological experiences has been significantly altered by the widespread use of digital technologies, which has sparked worries about excessive Internet use that could turn into addictive or problematic behaviours (Wongpakaran et al., 2021). Impaired control over Internet use, escapism from psychosocial stressors, and disruption of daily functioning are the hallmarks of this phenomenon, which is frequently referred to as Internet addiction. Loneliness has become a reliable risk factor among psychological predictors: people who feel socially isolated may turn to online interaction to make up for unmet relational needs, which feeds a vicious cycle of dependency (Wongpakaran et al., 2021). Simultaneously, self-esteem has a protective function; research indicates that even after controlling for comorbid psychopathology, higher self-esteem lowers the probability of excessive Internet behaviours (Wegmann et al., 2019). For example, a study conducted in Turkey revealed that loneliness was the main predictor of Internet addiction among university students, with self-esteem, life satisfaction, and loneliness all contributing to 38% of the variance (Şahin & Erturk, 2013). Despite these results, little mixed-method research has been done on young adults in India to examine how loneliness and self-esteem work together to cause Internet addiction. In order to close this gap, the current explanatory sequential mixed-method study investigates the role that self-esteem and loneliness play in the emergence of Internet addiction in young adults in Tamil Nadu.

Research gap

Although prior research has established associations between internet use, loneliness, and self-esteem among young adults in India (Singh et al., 2022), the majority of studies have primarily employed quantitative methodologies. Such approaches, while statistically robust, often fail to capture the nuanced, lived experiences and internalized meanings underlying these associations. Furthermore, existing qualitative studies on internet addiction are limited in number and scope, with most being conducted in metropolitan areas, thereby restricting the generalizability of their findings (Singh et al., 2022). This reveals a significant gap in the literature: the lack of mixed-method investigations that integrate both measurable patterns and subjective narratives. Addressing this gap through a combined quantitative and qualitative approach allows for a more comprehensive understanding of how loneliness and self-esteem contribute to internet addiction among young adults.

Need Of the Study

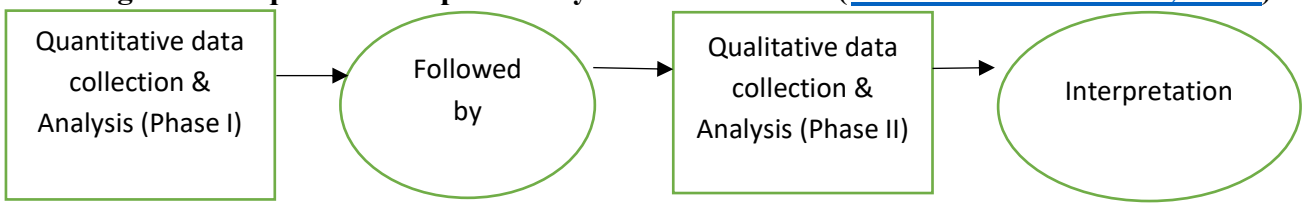
Young adults are at risk for loneliness and shifts in self-esteem and therefore may use the internet as a strategy to cope with these feelings. A study can be conducted by taking young adults into account (Singh et al., 2022). While some quantitative research in India found statistical association among loneliness, self-esteem and internet use, few had delved into the lived and internalized experiences of such, particularly from the qualitative perspective.

Qualitative Study relies on the participant's self-reflection and self-report, which is subjective and the location of the study is limited to some metropolitan cities in India (Singh et al., 2022). This research will address that shortfall by taking a mixed method approach to the evaluation quantifiable measures plus the more subjective richness of narrative gleaned from interviews.

Materials and Methods

The study employs an Explanatory Sequential Mixed Method Design. This design involves two distinct phases: Quantitative phase and Qualitative phase

Figure 1 Sequential Explanatory Mixed Method (Creswell & Creswell, 2017)



According to Creswell and Creswell (2017), this study used a Sequential Explanatory Mixed Method Design to examine the relationship between young adults' Internet addiction and feelings of loneliness and self-worth. A thorough grasp of the phenomenon being studied is produced by the design's integration of quantitative and qualitative data collection in two successive phases, which enables the initial quantitative findings to guide the subsequent qualitative investigation.

Method of qualitative stage

A descriptive-correlational design was employed in the quantitative phase to evaluate the connections among Internet addiction, loneliness, and self-esteem. Convenience sampling was used to select 150 young adults (18–25 years old) living in Tamil Nadu (59 men and 91 women). Participants had to be regular Internet users who could understand English in order to be eligible; those with neurodevelopmental or psychiatric disorders were not allowed. Standardised tools such as the UCLA Loneliness Scale (Russell, 1996), the Internet Addiction Test (Young, 1998), and the Rosenberg Self-Esteem Scale (Rosenberg, 1965) were used to gather data. Cronbach's $\alpha > 0.85$ indicated that all of the instruments had strong psychometric qualities. Descriptive statistics, tests of normality (Kolmogorov–Smirnov), correlation (Pearson or Spearman, depending on distribution), multiple regression to find predictors, and an independent-samples t test to look at gender differences were all used in the analysis of the data using SPSS v25.

Method of qualitative stage

Five participants who exhibited high levels of Internet addiction along with high levels of loneliness or low self-esteem were purposefully chosen from the quantitative sample for the qualitative phase. Participants lived experiences and coping mechanisms were investigated through semi-structured interviews. Following the six-step framework of Braun and Clarke (2006), which included open, axial, and selective coding in NVivo, the data were verbatim transcribed and subjected to thematic analysis.

Quantitative and qualitative Integration

Meta-inference and joint display analysis were used to combine the findings from both phases, allowing for more thorough contextual interpretation and result validation. The study's validity, reliability, and interpretive depth were guaranteed by this methodological triangulation (Fetters, Curry, & Creswell, 2013).

Results

Quantitative analysis

Correlation analysis

Significant relationships between the study variables were found by the correlation analysis . Internet addiction and loneliness were found to be significantly positively correlated (r =.310, p <.001), suggesting that higher levels of Internet addiction were linked to higher levels of loneliness. This result is consistent with earlier research showing that people who are socially isolated frequently turn to the Internet to satisfy unfulfilled emotional and interpersonal needs (Caplan, 2003). In order to find virtual companionship and social validation, lonely young adults may turn to online platforms in place of in-person connections. However, by decreasing real offline interactions, such compensatory behaviour may paradoxically make loneliness worse (Nowland, Necka, & Cacioppo, 2018).

Self-esteem and Internet addiction were found to be significantly correlated negatively (r = –.241, p =.003). This implies that compulsive or excessive Internet use was more common among people who had lower self-esteem. These results align with the compensatory Internet use model (Kardefelt-Winther, 2014), which suggests that people with low self-esteem may use the Internet to control their negative emotions and feel competent or accepted by others. Online interactions can reinforce the cycle of addiction by fostering dependence and avoiding real-world challenges, even though they can be rewarding in the short term (Andreassen, 2015).

Furthermore, there was a negative correlation between loneliness and self-esteem (r = -.238, p =.003), indicating that loneliness and low self-esteem are related. Reduced self-concept is linked to social isolation and trouble forming social connections, according to psychological research that has extensively documented this relationship (Cacioppo & Patrick, 2008; Orth & Robins, 2014). Overall, these findings support the study's hypotheses that there is a significant correlation between loneliness and self-esteem and that Internet addiction is positively related to loneliness and negatively related to self-esteem.

Regression analysis

A multiple regression analysis was performed to evaluate the predictive impact of loneliness and self-esteem on Internet addiction. Together, loneliness and self-esteem explained about 12.6% of the variance in Internet addiction scores (R =.355, R2 =.126), according to the statistically significant overall model (F(2, 147) = 10.571, p <.001). Internet addiction is multifactorial, and this moderate level of explained variance indicates that while social and psychological factors play a significant role in its development, other behavioural and environmental factors may also be involved (Kuss & Griffiths, 2017).

The results showed that loneliness was a significant positive predictor of Internet addiction (B = 0.599, β =.268, t = 3.375, p =.001), suggesting that higher levels of loneliness are associated with more addictive behaviour. This result is consistent with the cognitive-behavioural model of problematic Internet use (Caplan, 2010), which views loneliness as a major contributing factor to people's preference for online social interaction over in-person interactions. Such a dependence on digital settings to control emotions can gradually hinder offline functioning and strengthen unhealthy coping mechanisms.

A significant negative predictor of Internet addiction was found to be self-esteem (B = -0.884, β = -.177, t = -2.229, p =.027). This implies that compulsive Internet behaviours are more common in people with lower self-esteem, which is in line with findings from earlier research (Yang & Tung, 2007). Low self-esteem can be a vulnerability factor, making people more likely to turn to online platforms for validation and affirmation, where feedback mechanisms like likes, comments, and followers can momentarily

increase one's sense of value (Valkenburg et al., 2022). However, when online attention wanes, this fleeting sense of validation exacerbates feelings of inadequacy and reinforces dependency.

Together, the quantitative findings support the hypothesis that Internet addiction is significantly predicted by loneliness and self-esteem, giving the qualitative phase a solid empirical basis. These psychological constructs' predictive ability emphasises the necessity of treatments that focus on social connectedness, self-concept, and emotional regulation in order to reduce young adults' behavioural issues related to the Internet.

Qualitative analysis

Five participants who scored highly on loneliness and Internet addiction or who showed low self-esteem were the focus of the qualitative investigation that followed the quantitative phase. Excessive Daily Use, Self-Esteem Validation and Comparison, and Functional Impact and Addiction Cycle are the three main themes that emerged from the use of thematic analysis (Braun & Clarke, 2006) to find recurring patterns in participant narratives.

Explanation of themes and categories

Theme 1: Excessive Daily Use

Participants talked about using their smartphones and the Internet for extended periods of time, integrating them into almost every part of their daily lives. Usage started as soon as one woke up and continued during daily tasks like eating and sleeping. There were few breaks, suggesting an uncontrolled pattern of participation. Participants' online behaviour was dominated by social media sites like YouTube and Instagram. "There is no break like that," said one participant. I will typically use my phone if I bring it with me in the morning.

The loss of control and salience elements that are essential to addiction models are reflected in this theme (Griffiths, 2005). Overuse reinforces habitual use through sporadic reinforcement, especially when it comes to interactive and algorithm-driven content. According to similar findings by Kuss and Griffiths (2017), social media reward systems like likes, notifications, and novelty encourage compulsive checking behaviours, which is similar to how behavioural addictions like gambling work. This behavioural pattern is further amplified by the cultural context of Tamil Nadu, where youth social media visibility and digital connectivity are becoming more and more normalised.

Theme 2: Self-Esteem Validation and Comparison

Internet use was commonly associated with social validation and self-worth by participants. When accompanied by positive feedback, posting updates, stories, and photos produced instant emotional gratification. One participant said, "Someone will like us or comment on that when we post it. Comments like "You are good" make me happy.

This conduct exemplifies contingent self-esteem, in which one's assessment of oneself is dependent upon approval from others (Deci & Ryan, 2000). Participants unconsciously assessed their value in relation to peers or online influencers, demonstrating social comparison processes. In keeping with Festinger's (1954) social comparison theory, references like "I feel like we will be good in the future like her family" reveal subtle upward comparisons. Such reliance on online feedback can worsen anxiety and depressive symptoms, especially when self-validation is primarily virtual, according to earlier research (Valkenburg et al., 2022).

Furthermore, these results are consistent with the uses and gratifications theory, which holds that people actively use media to meet psychological needs like esteem and belonging (Katz, Blumler, & Gurevitch,

1974). But relying too much on digital validation paradoxically reduces genuine self-worth, strengthening the link between addictive Internet behaviours and low self-esteem.

Theme 3: Functional Impact and Addiction Cycle

Participants' awareness of their dependence and the ensuing psychosocial repercussions was captured by this theme. Many spokes of neglecting offline relationships and interests and of futile attempts to cut back on usage. Addiction cycles are characterised by behavioural tolerance and relapse, which are exemplified by statements like "I tried to reduce phone usage but I failed" and "I don't do anything else because I don't know how to use the Internet."

Additionally, participants described declining offline engagement and disapproval from family: "My family frequently complains about my phone usage. I wouldn't talk to anyone at home, but I would talk to my friends. These stories illustrate how loneliness and Internet addiction are reciprocal loneliness encourages online interaction, which diminishes offline social ties and furthers isolation (Tokunaga & Rains, 2016).

These results support the compensatory Internet use hypothesis, which postulates that people use the Internet to cope with negative emotions but ultimately suffer from increased loneliness and decreased wellbeing (Caplan, 2010). Although admitting to addiction ("I was addicted to it.") also shows some insight, the incapacity to control one's behaviour points to ingrained behavioural conditioning.

Themes	Code	Definition	Illustrative Quote
	Consistent Use	Sustained, high-duration internet/phone use.	I use my phone the whole day after I wake up....
Excessive daily use	Continuous No Breaks	Usage occurs without structured breaks; multitasking with phone during other activities.	There is no break like that....
	Preferred Apps	Mention of specific apps or content used like Instagram, YouTube, games.	I use Instagram and YouTube....
	Loneliness As Trigger	Expressions of feeling alone and using internet to alleviate loneliness.	If it's not there, I feel alone....
	Phone As Companion	Phone described as a companion or means to feel connected.	Mostly, I feel connected to others if I have a phone....
	Reduced Offline Circle	Reports that real-life social circle has shrunk; reduced face-to-face contact.	I would talk to my friends, but I would not talk to anyone at home....
	Self-esteem Validation	Use of social feedback to boost self-worth.	When we post that, someone will like us or comment on it....
Self-esteem validation and comparison	Comparison Influence	Comparing self with influencers or peers on social media.	When I see others posting them online, I compare myself with them...

	Failed Reduction	Attempts to cut down use which are unsuccessful.	I tried to reduce phone usage but I failed…
	Loss of Hobbies	Abandonment of offline hobbies/activities due to phone use.	I don't do anything else…
Functional impact and addiction cycle	Family Comments	Family members' feedback or scolding regarding internet use.	My family often complaint about my phone usage…
	Recognition Addiction	Participant describes themselves as addicted or recognizes addiction pattern.	I was addicted to it....
	Post College Increase	Increase in internet use after college/work transition.	Use increased after joining college…

Results of quantitative and qualitative findings

When quantitative and qualitative data are combined, a convergent narrative emerges: excessive Internet use exacerbates emotional detachment and low self-worth, while loneliness and low self-esteem serve as psychological preconditions for problematic Internet use. The reciprocal causation model put forth by Davis (2001), according to which emotional distress feeds maladaptive online behaviours, which in turn cause additional psychosocial impairment, is highlighted by the cyclical relationship between these constructs.

Digital immersion may have a disproportionately negative impact on the emotional well-being of young adults in India, where collectivist values place a strong emphasis on social belonging. Through the quantitative demonstration of statistical associations and the qualitative clarification of lived experiences that underlie those correlations, the mixed-method approach enhances understanding.

The study concludes by emphasising the need for interventions that focus on self-regulation, digital literacy, and emotional resilience in order to promote balanced online engagement and fortify offline relationships. Young adults' Internet addiction may be lessened by psychological counselling programs that emphasise loneliness reduction and self-esteem building.

Quantitative Results	Qualitative Themes	Integrated Interpretation
Significant positive correlation between Internet Addiction and Loneliness ($r = .310, p < .001$)	Theme 1: Excessive Daily Use – Sustained, high-duration phone use– No structured breaks– Internet used for emotional comfort and connection	Loneliness acts as an emotional trigger leading to excessive online engagement. Participants' descriptions of continuous use ("I use my phone the whole day…") support the quantitative finding that lonely individuals turn to the Internet for social and emotional fulfilment. This confirms the compensatory Internet use model (Caplan, 2010).
Significant negative correlation between Internet Addiction	Theme 2: Self-Esteem Validation and Comparison – Use of likes/comments for self-	Low self-esteem drives individuals to seek validation through social media feedback. The need for online approval reinforces Internet

Quantitative Results	Qualitative Themes	Integrated Interpretation
and Self-Esteem (*r = –.241, p = .003*)	worth – Upward comparison with peers/influencers	dependency, aligning with quantitative results showing low self-esteem predicts higher addiction. Qualitative accounts ("When we post, someone will like us…") reflect contingent self-esteem (Deci & Ryan, 2000).
Loneliness significantly predicts Internet Addiction (*B = 0.599, β = .268, p = .001*)	Theme 3: Functional Impact and Addiction Cycle – Loss of hobbies – Reduced offline relationships – Recognition of addiction	The regression finding that loneliness predicts Internet addiction is illuminated by participants' acknowledgment of withdrawal from offline life. As loneliness deepens, online engagement becomes habitual, reinforcing addiction and impairing real-world functioning ("I talk to my friends online but not at home").
Self-Esteem negatively predicts Internet Addiction (*B = –0.884, β = –.177, p = .027*)	Theme 2: Self-Esteem Validation and Comparison – Emotional dependence on social media validation – Comparison and dissatisfaction	Participants' dependence on social validation clarifies the negative predictive role of self-esteem. Qualitative findings expand quantitative results by explaining *how* low self-esteem manifests in digital behaviour—through comparison and dependence on online approval.
Internet Addiction associated with both Loneliness and Self-Esteem ($R^2 = .126$)	Cross-Theme Pattern: Reciprocal Reinforcement – Emotional reliance on phone use – Acknowledgment of addiction – Family concern and failed reduction	Integration reveals a cyclical relationship: loneliness and low self-esteem increase Internet use, which further reduces self-esteem and intensifies loneliness. Both phases converge to show reciprocal causality consistent with Davis's (2001) cognitive-behavioural model of pathological Internet use.

Discussion

Major findings

Quantitative findings

A total of 150 young adults completed three standardized instruments: the Internet Addiction Test (IAT), the Rosenberg Self-Esteem Scale, and the UCLA Loneliness Scale. Descriptive statistics indicated moderate levels of internet addiction and loneliness and relatively high self-esteem. Normality checks showed that the data were suitable for parametric analysis. Correlation analyses revealed a significant positive relationship between internet addiction and loneliness and a significant negative relationship between internet addiction and self-esteem. Multiple regression demonstrated that loneliness was a positive predictor and self-esteem a negative predictor of internet addiction, together explaining a meaningful proportion of variance. No significant gender differences emerged.

Qualitative findings

Semi-structured interviews with five purposefully selected participants who scored high on the IAT provided deeper insight into the lived experience of problematic internet use. Thematic analysis generated three central themes: (a) Excessive daily use, highlighting the phone as a constant companion and the

primary response to feelings of isolation; (b) Self-esteem validation and comparison, describing the search for approval and identity through social-media interactions; and (c) Functional impact and the addiction cycle, showing loss of offline activities, repeated failed attempts to reduce usage, and recognition of dependence.

Integrated Findings

Together, these phases show that loneliness increases vulnerability to excessive internet use, while lower self-esteem encourages reliance on online validation. The qualitative narratives reinforce and explain the statistical links by illustrating how feelings of isolation and the need for affirmation create a self-perpetuating cycle of dependence.

Conclusion

The study concludes that loneliness and self-esteem are key psychological determinants of internet addiction among young adults, and that these influences operate similarly across genders. Young people who experience greater loneliness and diminished self-esteem are more likely to use the internet compulsively, often substituting virtual connections for face-to-face relationships. Interventions to prevent or treat internet addiction should therefore focus not only on limiting screen time but also on reducing loneliness and strengthening self-esteem through counselling, peer-support programs, and psychoeducation.

Implications

These findings highlight the need for clinicians to routinely screen for loneliness and self-esteem when working with clients who present with problematic internet use. Universities and community organizations can develop digital-wellness initiatives and social-skills programs to address the emotional drivers of excessive online engagement. Policymakers can support public-health campaigns that move beyond behavioral warnings to the underlying psychological factors.

Limitations and Recommendations

The study's cross-sectional design and reliance on self-report measures limit causal inference and may introduce response bias. The qualitative phase, while rich, involved a small, region-specific sample, restricting generalizability. Future research should employ longitudinal designs, include more diverse populations, and evaluate targeted interventions—such as structured social-connection programs or self-esteem enhancement—for their ability to reduce internet addiction.

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