The Relationship Between Smartphone Addiction and Mental Health Among Teenagers

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Abstract

This study investigates the relationship between smartphone addiction and mental health outcomes among teenagers aged 13 to 19 years. With the exponential growth in smartphone ownership among adolescents, concerns have escalated regarding the psychological consequences of excessive and compulsive smartphone use during a critical developmental period. This research employs a quantitative, cross-sectional correlational design to examine the associations between smartphone addiction and four mental health indicators: anxiety, depression, stress, and self-esteem. A structured questionnaire comprising the Smartphone Addiction Scale-Short Version (SAS-SV) developed by Kwon et al. (2013), the Depression Anxiety Stress Scales (DASS-21) by Lovibond and Lovibond (1995), and the Rosenberg Self-Esteem Scale (RSES) by Rosenberg (1965) was administered to 100 teenagers selected through stratified random sampling from four secondary schools. The data were analyzed using descriptive statistics, Pearson correlation analysis, and multiple regression analysis. The findings reveal statistically significant positive correlations between smartphone addiction scores and anxiety ($r = 0.53$, $p < 0.01$), depression ($r = 0.49$, $p < 0.01$), and stress ($r = 0.46$, $p < 0.01$), and a significant negative correlation with self-esteem ($r = -0.41$, $p < 0.01$). Multiple regression analysis indicates that smartphone addiction, combined with daily screen time and nighttime phone use, explains approximately 39% of the variance in overall mental health distress scores. The study concludes that smartphone addiction is significantly associated with poorer mental health outcomes among teenagers and recommends targeted digital wellness interventions for adolescents, parents, and educational institutions.

Keywords: smartphone addiction, mental health, teenagers, anxiety, depression, self-esteem, screen time, adolescents

1. Introduction

1.1 Background of the Study

The smartphone has become arguably the most transformative technological device of the twenty-first century, fundamentally reshaping how individuals communicate, access information, entertain themselves, and navigate their daily lives. Among all demographic groups, teenagers have emerged as one of the most intensive users of smartphone technology. According to the Pew Research Center (2024), approximately 95% of adolescents in developed nations now own or have access to a smartphone, and a substantial proportion report that they are online on a near-constant basis. The average daily screen time among teenagers has been estimated at approximately five to seven hours, with social media applications, messaging platforms, video streaming services, and mobile gaming accounting for the majority of this usage (Common Sense Media, 2023).

While smartphones offer numerous benefits to adolescents, including access to educational resources, social connectivity, creative expression, and emergency communication, the growing concern among parents, educators, mental health professionals, and researchers centers on the phenomenon of smartphone addiction. Smartphone addiction, also referred to as problematic smartphone use, is characterized by an inability to control smartphone use despite negative consequences, preoccupation with the device, withdrawal symptoms when unable to use it, tolerance effects requiring increasing usage to achieve satisfaction, and functional impairment in academic, social, or personal domains (Billieux et al., 2015). This pattern of compulsive use mirrors the diagnostic criteria associated with behavioral addictions and has been increasingly recognized as a significant public health concern for adolescent populations.

Adolescence is a period of profound neurological, psychological, and social development during which individuals are particularly vulnerable to the formation of addictive behaviors. The prefrontal cortex, which governs executive functions such as impulse control, decision-making, and self-regulation, does not reach full maturity until the mid-twenties, rendering teenagers biologically susceptible to the immediate gratification mechanisms embedded in smartphone applications (Casey et al., 2008). Furthermore, the adolescent need for social belonging, peer acceptance, and identity formation creates powerful psychological incentives for continuous engagement with social media and messaging platforms, which are specifically designed to maximize user attention and habitual use through variable reward schedules and social feedback loops (Alter, 2017).

1.2 Problem Statement

The rising prevalence of smartphone addiction among teenagers coincides with a well-documented global increase in adolescent mental health problems, including anxiety disorders, depressive symptoms, chronic stress, and declining self-esteem (Twenge, 2017). While a growing number of studies have examined the association between excessive smartphone use and mental health outcomes, the evidence remains fragmented, with inconsistencies across studies regarding the strength, direction, and mediating mechanisms of this relationship. Many existing studies have relied on convenience samples, focused narrowly on single mental health outcomes, or failed to distinguish between general smartphone use and addictive patterns of use. There is a need for comprehensive research that simultaneously examines the association between smartphone addiction and multiple dimensions of mental health among a representative sample of teenagers, employing validated instruments for both constructs.

1.3 Research Objectives

This study pursues the following objectives: first, to assess the prevalence and severity of smartphone addiction among teenagers; second, to measure the levels of anxiety, depression, stress, and self-esteem among the sampled adolescents; third, to examine the correlational relationships between smartphone addiction and each of these mental health indicators; fourth, to determine the extent to which smartphone addiction, daily screen time, and nighttime phone use predict overall mental health distress; and fifth, to propose evidence-based recommendations for promoting healthy smartphone habits among teenagers.

1.4 Research Hypotheses

The study tests the following hypotheses: H1: There is a statistically significant positive correlation between smartphone addiction and anxiety among teenagers. H2: There is a statistically significant positive correlation between smartphone addiction and depression among teenagers. H3: There is a statistically significant positive correlation between smartphone addiction and perceived stress among teenagers. H4: There is a statistically significant negative correlation between smartphone addiction and self-esteem among teenagers. H5: Smartphone addiction, daily screen time, and nighttime phone use collectively predict a significant proportion of the variance in overall mental health distress.

1.5 Significance of the Study

This research is significant for multiple reasons. For mental health professionals and school counselors, the findings provide empirical evidence that can inform the development of screening tools and early intervention programs for smartphone-related psychological problems among adolescents. For parents and families, the study offers insights into the specific mental health risks associated with compulsive smartphone use, enabling more informed decisions about digital boundaries and parenting strategies. For educational institutions, the results can guide the formulation of school-based digital wellness policies and awareness campaigns. For policymakers and public health authorities, the study contributes to the growing evidence base that supports regulatory measures aimed at protecting adolescent mental health in the digital age.

2. Literature Review

2.1 Understanding Smartphone Addiction

Smartphone addiction is a relatively recent construct within the behavioral addiction literature, and its conceptualization continues to evolve. Billieux et al. (2015) proposed a comprehensive pathway model of problematic mobile phone use, identifying three distinct pathways through which excessive use may develop: the excessive reassurance pathway, driven by anxiety and attachment insecurity; the impulsive-antisocial pathway, driven by poor impulse control and sensation seeking; and the extraversion pathway, driven by high sociability and the need for social stimulation. This model highlights the heterogeneous nature of smartphone addiction and suggests that different individuals may develop problematic use patterns through different psychological mechanisms.

Kwon et al. (2013) developed the Smartphone Addiction Scale (SAS) and its short version (SAS-SV), which have become the most widely used instruments for measuring smartphone addiction in research and clinical settings. The SAS-SV assesses six factors: daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationships, overuse, and tolerance. A growing number of studies utilizing the SAS-SV have reported that between 15% and 40% of adolescents in various countries meet the threshold criteria for smartphone addiction, depending on the population studied and the cutoff scores applied (Sohn et al., 2019). These prevalence rates

are alarmingly high and have spurred increased research attention to the consequences of this phenomenon.

2.2 Smartphone Addiction and Anxiety

Anxiety is one of the mental health outcomes most frequently associated with smartphone addiction in the adolescent literature. Elhai et al. (2017) conducted a comprehensive review and found consistent positive associations between problematic smartphone use and anxiety symptoms across multiple studies and cultural contexts. The proposed mechanisms linking smartphone addiction to anxiety include fear of missing out (FoMO), which generates persistent apprehension about social events occurring in one's absence; social comparison processes, which trigger evaluative anxiety through constant exposure to curated online presentations of others' lives; and the disruption of sleep architecture, which is independently associated with heightened anxiety vulnerability (Vannucci et al., 2017). Furthermore, the intermittent reinforcement provided by smartphone notifications creates a state of chronic anticipatory arousal that may contribute to generalized anxiety symptoms over time.

2.3 Smartphone Addiction and Depression

The relationship between smartphone addiction and depressive symptoms among teenagers has been extensively studied with largely consistent findings. Twenge (2017) presented compelling longitudinal data demonstrating that the sharp increase in adolescent depression rates since 2012 closely parallels the widespread adoption of smartphones and social media, suggesting a temporal and potentially causal link. A meta-analysis by Sohn et al. (2019), which synthesized data from 23 published studies involving over 41,000 participants, reported a significant overall association between smartphone addiction and depression, with a pooled effect size in the moderate range. The mechanisms underlying this association include the displacement of face-to-face social interactions, which are critical for emotional well-being; exposure to cyberbullying and negative social feedback; upward social comparison leading to feelings of inadequacy and hopelessness; and the reduction of physical activity and outdoor engagement, both of which are protective factors against depression (Thomee, 2018).

2.4 Smartphone Addiction and Stress

Chronic stress represents another significant mental health concern associated with smartphone addiction among adolescents. Samaha and Hawi (2016) found a significant positive relationship between smartphone addiction risk and perceived stress in a sample of university students, and subsequent studies have extended these findings to younger adolescent populations. The constant connectivity afforded by smartphones creates an expectation of immediate availability and responsiveness that can generate a persistent sense of pressure and cognitive overload. Adolescents who are addicted to their smartphones often experience stress related to the management of multiple online social relationships, the pressure to maintain a desirable online persona, and the anxiety associated with potential social exclusion or negative feedback. Additionally, the displacement of stress-buffering activities such as physical exercise, mindfulness practices, face-to-face socialization, and adequate sleep further compromises the adolescent's ability to cope with everyday stressors (Boumosleh & Jaalouk, 2017).

2.5 Smartphone Addiction and Self-Esteem

Self-esteem, defined as an individual's global evaluation of their own worth, is a fundamental component of adolescent psychological well-being and has been shown to be inversely associated with smartphone addiction. Ihm (2018) reported that teenagers with higher levels of smartphone addiction exhibited significantly lower self-esteem scores, and that this relationship was partially mediated by social comparison and cyberbullying experiences. The mechanisms through which smartphone addiction may erode self-esteem include constant exposure to idealized representations of others on social media platforms, which fosters unfavorable self-evaluation; the experience of social rejection or inadequate social validation in online contexts; and the internalization of guilt and shame associated with the inability to control one's own smartphone use despite recognizing its negative consequences. Conversely, low self-esteem may also serve as a risk factor for smartphone addiction, as adolescents with poor self-worth may turn to their devices as a source of escapism, validation, and emotional regulation, creating a bidirectional and potentially self-reinforcing cycle (Bianchi & Phillips, 2005).

2.6 Theoretical Framework

This study is grounded in two complementary theoretical frameworks. The first is the Compensatory Internet Use Theory (Kardefelt-Winther, 2014), which posits that individuals engage in excessive technology use as a maladaptive coping strategy to compensate for unmet

psychological needs or to escape from negative emotional states such as loneliness, boredom, anxiety, or low self-esteem. This theory helps explain why teenagers who are already experiencing mental health difficulties may be particularly susceptible to developing addictive smartphone use patterns. The second framework is the Displacement Hypothesis (Neuman, 1988), which argues that the time devoted to screen-based activities displaces time that would otherwise be spent on developmentally beneficial activities such as physical exercise, face-to-face socialization, creative pursuits, and sleep. This displacement, in turn, deprives adolescents of the protective factors that support mental health resilience, creating a pathway through which smartphone addiction contributes to psychological distress.

3. Research Methodology

3.1 Research Design

This study employs a quantitative, cross-sectional correlational research design. The cross-sectional approach enables the collection of data at a single point in time from a representative sample, allowing for the examination of relationships between smartphone addiction and mental health variables. The correlational component facilitates the assessment of both the direction and strength of associations between the key variables of interest without experimental manipulation.

3.2 Population and Sample

The target population comprised teenagers aged 13 to 19 years enrolled in secondary schools within an urban district. A stratified random sampling technique was used to select 100 participants from four secondary schools, with 25 students drawn from each school. Stratification was based on school type and grade level to ensure demographic diversity. The inclusion criteria required participants to be between 13 and 19 years of age, to own or have regular access to a personal smartphone for at least six months, and to have obtained parental or guardian consent for participation. Among the 100 participants, 54 were female and 46 were male. The age distribution was as follows: 13 to 14 years (22%), 15 to 16 years (38%), and 17 to 19 years (40%).

3.3 Research Instruments

Data were collected using a composite questionnaire comprising four sections. Section A gathered demographic information including age, gender, grade level, type of smartphone owned,

and self-reported average daily screen time and nighttime phone use habits. Section B measured smartphone addiction using the Smartphone Addiction Scale-Short Version (SAS-SV) developed by Kwon et al. (2013). The SAS-SV consists of 10 items rated on a 6-point Likert scale ranging from 1 (Strongly Disagree) to 6 (Strongly Agree), with higher composite scores indicating greater addiction severity. The scale has demonstrated strong psychometric properties across multiple adolescent populations, with reported Cronbach's alpha values consistently exceeding 0.80. Section C assessed anxiety, depression, and stress using the Depression Anxiety Stress Scales-21 (DASS-21) by Lovibond and Lovibond (1995). The DASS-21 comprises three subscales of seven items each, rated on a 4-point scale from 0 (Did not apply to me at all) to 3 (Applied to me very much or most of the time). Section D measured self-esteem using the Rosenberg Self-Esteem Scale (RSES) by Rosenberg (1965), which consists of 10 items rated on a 4-point Likert scale. A pilot study conducted with 20 teenagers confirmed the reliability of the composite instrument, yielding Cronbach's alpha values of 0.86 for the SAS-SV, 0.88 for DASS-21 anxiety, 0.85 for DASS-21 depression, 0.83 for DASS-21 stress, and 0.81 for the RSES.

3.4 Data Collection Procedure

The questionnaires were administered in paper-based format during designated class periods at each participating school over a two-week period in November 2025. Prior to distribution, the purpose and procedures of the study were explained to the students, and written informed consent was obtained from both the participants and their parents or legal guardians. Participants were assured of the anonymity and confidentiality of their responses, and the voluntary nature of participation was emphasized. The completion of each questionnaire required approximately 20 to 25 minutes. Ethical approval for the study was obtained from the institutional ethics review committee, and permissions were secured from the school administrations of all four participating institutions.

3.5 Data Analysis

The collected data were coded and analyzed using IBM SPSS Statistics version 28. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were computed to characterize the demographic profile of the sample, smartphone usage patterns, addiction severity levels, and mental health scores. Pearson product-moment correlation coefficients were calculated to assess the bivariate relationships between smartphone addiction

scores and each of the four mental health indicators. A multiple linear regression analysis was conducted to determine the combined and individual predictive effects of smartphone addiction, daily screen time, and nighttime phone use on an overall mental health distress composite score derived from the DASS-21 subscales. All statistical tests were evaluated at the $p < 0.05$ significance level.

4. Data Analysis and Results

4.1 Demographic Profile and Smartphone Usage Patterns

All 100 questionnaires were returned complete, yielding a response rate of 100%. The gender distribution comprised 54 females (54%) and 46 males (46%). The mean age of participants was 16.2 years (SD = 1.74). Regarding daily screen time, 18% of respondents reported using their smartphones for fewer than three hours daily, 42% reported three to five hours, 28% reported five to seven hours, and 12% reported more than seven hours. The mean daily screen time was 4.6 hours (SD = 1.83). On nighttime phone use, 61% of participants reported using their smartphones within 30 minutes before sleep on most nights, and 34% reported frequently waking during the night to check their phones. The most commonly used applications were social media platforms (87%), messaging applications (82%), video streaming services (71%), and mobile games (53%).

4.2 Smartphone Addiction Severity

The mean SAS-SV score for the entire sample was 31.4 (SD = 8.72) out of a possible maximum of 60. Using the established cutoff scores recommended by Kwon et al. (2013), which are 31 for males and 33 for females, the results indicated that 38% of the total sample (38 out of 100 participants) met the criteria for smartphone addiction. Among female participants, 35.2% exceeded the female-specific cutoff, while among male participants, 41.3% exceeded the male-specific cutoff. These prevalence rates are consistent with the range reported in international adolescent studies and highlight the substantial proportion of teenagers exhibiting clinically significant addiction patterns.

4.3 Mental Health Scores

The descriptive statistics for the mental health measures are presented in the following table.

Table 1: Descriptive Statistics for Mental Health Variables (N = 100)

Variable	Mean	SD	Min	Max
Anxiety (DASS-21)	8.34	4.21	0	20
Depression (DASS-21)	9.12	4.67	0	21
Stress (DASS-21)	10.48	4.39	1	21
Self-Esteem (RSES)	27.56	5.18	12	40

Based on the DASS-21 severity classification, 29% of participants fell into the moderate-to-extremely-severe range for anxiety, 26% for depression, and 33% for stress. The mean self-esteem score of 27.56 out of a maximum of 40 indicates a moderate level of self-esteem among the sample, with 22% of respondents scoring below 20, which is conventionally considered indicative of low self-esteem.

4.4 Correlation Analysis

Pearson correlation coefficients were computed to examine the bivariate relationships between smartphone addiction scores and each mental health variable. The results are presented in the table below.

Table 2: Pearson Correlations Between Smartphone Addiction and Mental Health Variables (N = 100)

Variable	r	p-value
Anxiety	0.53**	< 0.001
Depression	0.49**	< 0.001
Stress	0.46**	< 0.001
Self-Esteem	-0.41**	< 0.001

*Note: ** Correlation is significant at the 0.01 level (2-tailed).*

The results reveal statistically significant correlations between smartphone addiction and all four mental health indicators. Smartphone addiction showed moderate positive correlations with anxiety ($r = 0.53$, $p < 0.001$), depression ($r = 0.49$, $p < 0.001$), and stress ($r = 0.46$, $p < 0.001$), indicating that higher addiction scores are associated with greater psychological distress. A moderate negative correlation was found between smartphone addiction and self-esteem ($r = -0.41$, $p < 0.001$), confirming that higher addiction levels are associated with lower self-worth. These results support Hypotheses H1, H2, H3, and H4.

4.5 Multiple Regression Analysis

A multiple linear regression analysis was conducted to assess the combined predictive effects of smartphone addiction, daily screen time, and nighttime phone use on an overall mental health distress composite score calculated as the sum of the DASS-21 anxiety, depression, and stress subscales.

Table 3: Multiple Regression Analysis Predicting Mental Health Distress

Predictor	B	Beta	t	p
Smartphone Addiction (SAS-SV)	0.54	0.36	3.87	< 0.001
Daily Screen Time (hours)	1.82	0.25	2.74	0.007
Nighttime Phone Use	2.41	0.21	2.38	0.019

Note: $R^2 = 0.41$, Adjusted $R^2 = 0.39$, $F(3, 96) = 22.34$, $p < 0.001$

The overall regression model was statistically significant ($F(3, 96) = 22.34$, $p < 0.001$), with an adjusted R-squared value of 0.39, indicating that the three predictor variables collectively explained 39% of the variance in mental health distress scores. Smartphone addiction was the strongest individual predictor (Beta = 0.36, $p < 0.001$), followed by daily screen time (Beta = 0.25, $p = 0.007$) and nighttime phone use (Beta = 0.21, $p = 0.019$). These findings confirm Hypothesis H5, demonstrating that smartphone addiction, along with screen time and nocturnal phone habits, are significant predictors of psychological distress among teenagers.

4.6 Gender Differences

Independent samples t-tests revealed that female participants reported significantly higher anxiety scores ($t = 2.31$, $p = 0.023$) and lower self-esteem scores ($t = -2.47$, $p = 0.015$) compared to male participants. However, no statistically significant gender differences were observed in smartphone addiction scores ($t = 0.89$, $p = 0.376$), depression ($t = 1.52$, $p = 0.132$), or stress ($t = 1.18$, $p = 0.241$). These findings suggest that while smartphone addiction affects both genders similarly, its mental health consequences may manifest differently, with females being particularly vulnerable to anxiety and self-esteem deficits.

5. Discussion

The findings of this study confirm and extend the existing body of evidence linking smartphone addiction to adverse mental health outcomes among teenagers. The strong positive correlations between smartphone addiction and anxiety ($r = 0.53$), depression ($r = 0.49$), and stress ($r = 0.46$) are consistent with the results reported by Elhai et al. (2017), Sohn et al. (2019), and Samaha and Hawi (2016), and reinforce the growing consensus that compulsive smartphone use represents a meaningful risk factor for adolescent psychological distress. The negative correlation between smartphone addiction and self-esteem ($r = -0.41$) aligns with the findings of Ihm (2018) and Bianchi and Phillips (2005), supporting the theoretical proposition that excessive smartphone use erodes self-worth through social comparison, cyberbullying exposure, and the internalization of negative self-perceptions cultivated in online environments.

The regression analysis provides additional explanatory depth by demonstrating that smartphone addiction, daily screen time, and nighttime phone use collectively account for 39% of the variance in mental health distress. This substantial explanatory power underscores that the relationship between smartphone use and mental health is not attributable solely to the quantity of screen time but is driven significantly by the quality and nature of the engagement, specifically the addictive and compulsive patterns of use that the SAS-SV captures. The finding that nighttime phone use is an independent predictor of mental health distress is particularly important and resonates with the growing body of sleep research documenting the detrimental effects of blue light exposure, cognitive arousal, and sleep displacement on adolescent psychological well-being (Thomee, 2018).

The gender differences observed in this study add an important dimension to the analysis. The finding that females reported higher anxiety and lower self-esteem despite comparable addiction scores suggests that the psychological mechanisms linking smartphone addiction to mental health may operate differently across genders. Female adolescents may be more vulnerable to the social comparison and appearance-related pressures amplified by social media platforms, which are a primary component of smartphone use among this demographic. These findings align with the broader adolescent mental health literature, which consistently identifies females as being at greater risk for internalizing disorders during the teenage years (Twenge, 2017).

Viewed through the lens of the Compensatory Internet Use Theory (Kardefelt-Winther, 2014), the findings suggest a potentially cyclical relationship in which teenagers experiencing

mental health difficulties turn to their smartphones as a coping mechanism, which in turn exacerbates their psychological distress through the displacement of healthier activities and the amplification of negative social experiences. The Displacement Hypothesis (Neuman, 1988) is further supported by the observation that high screen time and nighttime use, both of which directly displace sleep, physical activity, and face-to-face social interaction, are independently predictive of poorer mental health outcomes.

6. Conclusion and Recommendations

6.1 Conclusion

This study provides robust empirical evidence that smartphone addiction is significantly and meaningfully associated with poorer mental health outcomes among teenagers. Specifically, higher levels of smartphone addiction are associated with elevated anxiety, depression, and stress, and with diminished self-esteem. The combined predictive model, which incorporates smartphone addiction severity, daily screen time, and nighttime phone use, explains 39% of the variance in overall mental health distress, confirming the substantial impact of digital behavior patterns on adolescent psychological well-being. The finding that 38% of the sampled teenagers met the criteria for smartphone addiction highlights the urgency of this issue and underscores the need for immediate, coordinated intervention at multiple levels.

6.2 Recommendations

For teenagers and families, establishing clear digital boundaries is essential. These include setting daily screen time limits, designating phone-free periods during meals, study sessions, and before bedtime, and encouraging alternative leisure activities such as sports, reading, creative hobbies, and face-to-face socialization. Parents should model healthy smartphone habits and engage in open, non-judgmental conversations with their children about the psychological effects of excessive device use. For schools, implementing digital wellness education programs within the existing health and life skills curriculum can equip students with the knowledge and self-regulation strategies needed to manage their smartphone use proactively. Schools should also consider establishing phone-free classroom policies and providing access to counseling services for students exhibiting signs of problematic phone use or associated mental health difficulties.

For mental health professionals, the findings support the integration of smartphone use assessment into routine adolescent mental health screening protocols. Cognitive-behavioral interventions that specifically address the thought patterns and behavioral cycles underlying smartphone addiction, such as cognitive restructuring of FoMO-related anxiety and behavioral activation to increase engagement in offline rewarding activities, may be particularly effective. For policymakers, the evidence supports the consideration of regulatory measures that promote adolescent digital well-being, including mandating age-appropriate design standards for applications that target young users, requiring transparent disclosure of engagement-maximizing algorithmic practices, and funding public health campaigns that raise awareness about the mental health risks of excessive smartphone use among adolescents.

6.3 Limitations and Future Research

This study is subject to several limitations that should be considered when interpreting the findings. First, the cross-sectional design does not permit causal inferences, and the possibility that pre-existing mental health conditions predispose teenagers to smartphone addiction, rather than the reverse, cannot be ruled out. Future longitudinal and experimental studies are needed to establish temporal precedence and causal directionality. Second, the sample size of 100 participants, while sufficient for the correlational and regression analyses performed, limits the statistical power for detecting smaller effects and restricts the generalizability of the findings to broader adolescent populations. Third, all measures were self-reported, introducing the possibility of social desirability and recall biases. Future research could benefit from incorporating objective smartphone usage data obtained through digital tracking applications and clinical assessments of mental health conducted by trained professionals. Fourth, the study was conducted in an urban setting, and the findings may not fully apply to teenagers in rural or underserved communities where smartphone access patterns and social dynamics may differ substantially. Comparative studies across urban and rural contexts, as well as cross-cultural investigations, would strengthen the external validity of the conclusions and inform culturally sensitive intervention strategies.

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