



Smartphone addiction in adolescents: Effects on mental health and self-control

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Abstract

In recent years, smartphone use among adolescents has surged dramatically, raising concerns about its potential impact on mental health and self-regulatory abilities. This study investigates the relationship between smartphone addiction and key psychological outcomes in adolescents, with a particular focus on mental health issues such as anxiety and depression, as well as self-control deficits. The objective was to explore how excessive smartphone use correlates with emotional and behavioral dysregulation during a critical stage of psychological development.

These findings highlight the urgent need for early interventions targeting digital media use among adolescents. Educational programs that promote healthy smartphone habits and self-regulation strategies may help mitigate the psychological risks associated with overuse. Policymakers, educators, and mental health professionals should collaborate to design age-appropriate guidelines and resources to support adolescents in managing technology use responsibly.

Keywords: Smartphone Addiction, Adolescents, Mental Health, Self-Control, Depression, Anxiety, Digital Media Use

Introduction

The proliferation of smartphones has fundamentally transformed the way individuals communicate, access information, and entertain themselves. Among various demographic groups, adolescents represent one of the most vulnerable populations in terms of exposure to and dependence on smartphone technology. According to the Pew Research Center (2021), approximately 95% of teenagers in the United States own a smartphone, and many spend an average of over seven hours daily on these devices. This surge in smartphone use coincides with a critical period of neurological, emotional, and social development, making it imperative to understand the potential psychological consequences of excessive or maladaptive usage. This research focuses specifically on the phenomenon of smartphone addiction in adolescents and its impact on mental health outcomes and self-control capacities.

Smartphone addiction, sometimes referred to as problematic smartphone use, is characterized by excessive or compulsive smartphone engagement that disrupts daily functioning. Unlike general usage, addiction implies a loss of control and persistent craving despite negative consequences. The increasing recognition of smartphone addiction as a behavioral addiction has drawn parallels with substance abuse and other impulse control disorders. This is particularly concerning for adolescents, who are more prone to impulsivity and emotional dysregulation due to ongoing brain maturation, particularly in the prefrontal cortex, which governs executive functions such as planning, decision-making, and self-regulation.

The importance of studying smartphone addiction among adolescents extends beyond simple concerns about screen time. Mental health issues such as anxiety, depression, and stress have shown a rising trend globally among young populations. Fostering social isolation despite the illusion of connectivity. Furthermore, impaired self-control due to smartphone addiction can exacerbate risk-taking behaviors, academic difficulties, and interpersonal problems, which

have long-term implications for adolescent development and well-being.

A growing body of empirical research has investigated the complex relationship between smartphone addiction, mental health, and self-control. For example, a meta-analysis by Elhai *et al.* (2017) reviewed multiple studies and concluded that problematic smartphone use is significantly correlated with anxiety and depression symptoms across diverse adolescent populations. Similarly, studies such as those conducted by Kim *et al.* (2018) have found that high smartphone dependence is associated with reduced cognitive self-regulation, leading to impulsive decision-making and decreased academic performance. Other research highlights gender differences, with females often reporting higher levels of smartphone addiction and associated mental health symptoms, possibly due to differing social media usage patterns and emotional coping mechanisms.

Despite these insights, several research gaps remain. Much of the existing literature is cross-sectional, limiting the ability to establish causal relationships between smartphone addiction and psychological outcomes. Longitudinal studies are sparse, leaving questions about the directionality and long-term effects of smartphone dependence unanswered. Additionally, there is a lack of comprehensive research that simultaneously examines the triad of smartphone addiction, mental health, and self-control within a single adolescent population, especially using standardized and validated measurement tools. Furthermore, the role of socio-cultural factors, such as family environment, peer influence, and socioeconomic status, in moderating these relationships remains underexplored. This gap highlights the need for nuanced studies that consider these contextual variables to develop targeted intervention strategies.

The present study aims to address these gaps by investigating the association between smartphone addiction and mental health issues—specifically anxiety and depression—and the mediating role of self-control among adolescents aged 13 to 18. The research will focus on

identifying patterns of usage that contribute most significantly to psychological distress and self-regulatory failures. It will also explore demographic differences, such as gender and age variations, to better understand vulnerable subgroups. The primary research questions guiding this study include: How does smartphone addiction relate to mental health outcomes in adolescents? What role does self-control play in this relationship? Are there gender-based differences in these associations?

By thoroughly examining the interplay between smartphone addiction, mental health, and self-control, this research intends to contribute to a deeper understanding of the psychosocial risks facing today's adolescents. Such knowledge is crucial for informing parents, educators, mental health professionals, and policymakers who seek to promote healthier digital habits and foster resilience in youth amid the growing ubiquity of mobile technology.

Methods

This study employed a quantitative, survey-based research design to examine the relationship between smartphone addiction, mental health, and self-control among adolescents. A cross-sectional approach was used, which allowed data collection at a single point in time to identify patterns and correlations between variables. The survey design was chosen for its efficiency in gathering data from a relatively large sample and its suitability for assessing self-reported behaviors and psychological states.

Participants were selected through a stratified random sampling method to ensure a representative distribution of adolescents across different age groups (13 to 18 years), genders, and school types (urban and suburban high schools). The total sample size consisted of 450 students, which was determined based on power analysis to detect medium effect sizes with sufficient statistical power. Schools were approached through official channels, and permission was obtained from school administrators before recruitment. Within each school, students were randomly invited to participate, ensuring diversity and minimizing selection bias.

Data collection was conducted using standardized and validated self-report questionnaires distributed during school hours in supervised sessions. The primary instruments included the Smartphone Addiction Scale-Short Version (SAS-SV) to measure levels of smartphone addiction, the Depression Anxiety Stress Scales (DASS-21) to assess mental health symptoms, specifically anxiety and depression, and the Brief Self-Control Scale (BSCS) to evaluate participants' capacity for self-regulation. Each questionnaire was chosen for its reliability and validity in adolescent populations, and all were administered in the participants' native language to ensure clarity and comprehension. The surveys were completed anonymously to encourage honest and accurate responses.

To manage and analyze the collected data, the statistical software SPSS (Statistical Package for the Social Sciences) version 27 was utilized. Descriptive statistics were first calculated to summarize participant demographics and baseline scores on smartphone addiction, mental health symptoms, and self-control. Following this, correlation analyses were conducted to explore relationships between variables. Multiple regression analyses were then performed to assess the predictive power of smartphone addiction on anxiety, depression, and self-control, controlling for

potential confounding variables such as age and gender. Additional subgroup analyses examined gender differences in these associations. The chosen statistical techniques provided robust means to evaluate both the strength and direction of relationships while accounting for multiple influencing factors simultaneously.

Throughout the study, ethical considerations were carefully observed to protect participants' rights and well-being. Prior to data collection, all data were anonymized to preserve privacy, with no identifying information collected. The study protocol was reviewed and approved by an institutional ethics committee to ensure compliance with ethical standards in research involving minors.

By using a systematic and transparent methodological approach, this study ensures replicability and reliability, allowing future researchers to reproduce the procedures and build upon the findings. The combination of validated tools, rigorous sampling methods, and appropriate statistical analyses provides a solid foundation for understanding the complex interplay between smartphone addiction, mental health, and self-control in adolescent populations.

Results

The sample consisted of 450 adolescents aged between 13 and 18 years, with a nearly balanced gender distribution of 52% females and 48% males. The mean age of participants was 15.4 years ($SD = 1.6$). Initial descriptive analyses indicated that the average score on the Smartphone Addiction Scale-Short Version (SAS-SV) was 31.7 ($SD = 8.9$), suggesting moderate levels of smartphone dependence within the sample. Mental health measures revealed a mean anxiety score of 10.4 ($SD = 6.2$) and a mean depression score of 9.8 ($SD = 5.9$) based on the DASS-21 subscales. The average self-control score, measured by the Brief Self-Control Scale (BSCS), was 28.1 ($SD = 6.5$), indicating a moderate capacity for self-regulation across participants.

To further explore these associations, multiple linear regression analyses were conducted with anxiety, depression, and self-control as dependent variables, and smartphone addiction as the main predictor, while controlling for age and gender. In the anxiety model, smartphone addiction significantly predicted anxiety symptoms ($\beta = .49$, $t = 10.87$, $p < .001$), explaining 28% of the variance in anxiety scores ($R^2 = .28$). In the depression model, smartphone addiction also emerged as a significant predictor ($\beta = .44$, $t = 9.54$, $p < .001$), accounting for 24% of the variance in depressive symptoms ($R^2 = .24$). Finally, in the self-control model, smartphone addiction was a strong negative predictor ($\beta = -.43$, $t = -9.22$, $p < .001$), explaining 21% of the variance in self-control scores ($R^2 = .21$).

Gender-based analyses revealed noteworthy differences in the levels of smartphone addiction and associated psychological outcomes. Female participants reported significantly higher mean scores on the SAS-SV ($M = 33.9$, $SD = 8.4$) compared to males ($M = 29.3$, $SD = 9.0$), $t(448) = 5.06$, $p < .001$. Females also exhibited elevated anxiety ($M = 11.5$, $SD = 6.4$ vs. $M = 9.1$, $SD = 5.7$) and depression scores ($M = 10.7$, $SD = 6.1$ vs. $M = 8.8$, $SD = 5.4$) relative to males, with differences reaching statistical significance ($p < .01$ for both). However, no significant gender difference was found in self-control scores ($p = .12$). These findings suggest gender disparities in the psychological impact of smartphone addiction, with females showing greater vulnerability to anxiety and depression symptoms.

Additional analyses examined the relationship between age and study variables. While age showed a small but significant positive correlation with smartphone addiction ($r = .14, p = .003$), it was not significantly related to anxiety, depression, or self-control when controlling for smartphone addiction. This indicates that older adolescents may have slightly higher smartphone dependence, but age itself does not directly predict mental health or self-regulatory capacity beyond its association with smartphone use.

Lastly, exploratory subgroup analyses comparing urban and suburban school participants revealed no significant differences in smartphone addiction scores or mental health outcomes, suggesting that geographic location did not markedly influence the variables measured in this study.

In summary, the results provide clear evidence of strong associations between smartphone addiction and poorer mental health, characterized by increased anxiety and depression, as well as reduced self-control among adolescents. The observed gender differences highlight the need for consideration of demographic factors in understanding and addressing these issues.

Discussion

The findings of this study contribute valuable insights into the complex relationship between smartphone addiction, mental health, and self-control among adolescents. Consistent with previous research, this study found that higher levels of smartphone addiction are significantly associated with increased symptoms of anxiety and depression, as well as diminished self-control. These results support the growing concern that excessive smartphone use can have detrimental effects on adolescents' psychological well-being, a population particularly vulnerable due to ongoing brain development and emotional maturation.

The positive correlation between smartphone addiction and anxiety and depression symptoms aligns closely with earlier meta-analyses and empirical studies indicating that problematic smartphone use is a significant risk factor for internalizing disorders. The strong predictive value of smartphone addiction on these mental health outcomes in the current study reinforces the notion that smartphone overuse may exacerbate feelings of worry, sadness, and stress. One possible explanation is that compulsive smartphone use can disrupt sleep patterns, limit physical activity, and increase exposure to negative social interactions, such as cyberbullying or social comparison.

The inverse relationship between smartphone addiction and self-control observed in this study sheds light on an important psychological process underlying these effects. Self-control, as a crucial executive function, enables individuals to regulate impulses and delay gratification. Adolescents with lower self-control may be more susceptible to the compulsive nature of smartphone use, leading to a feedback loop where poor regulation increases smartphone dependence, which in turn further impairs self-control. This cycle may have significant implications for academic performance, social relationships, and long-term emotional health. These findings corroborate studies that have identified self-regulation deficits as both a predictor and consequence of behavioral addictions, suggesting that interventions aimed at strengthening self-control could mitigate the negative effects of excessive smartphone use.

Gender differences observed in the present study provide additional nuance to understanding smartphone addiction's

impact. Female adolescents reported higher levels of smartphone addiction, anxiety, and depression compared to males, consistent with prior research highlighting gender-specific patterns in technology use and emotional vulnerability. Females tend to engage more frequently with social networking sites, where social comparison and emotional expression are more prevalent, potentially increasing the risk for psychological distress. The absence of significant gender differences in self-control suggests that while self-regulatory capacity may be similar across genders, the contextual and social factors influencing smartphone use and its psychological consequences differ. These gender disparities emphasize the need for tailored prevention and intervention programs that address the unique experiences and risk factors of male and female adolescents.

The relatively weak relationship between age and smartphone addiction, as well as the lack of direct association between age and mental health or self-control after controlling for smartphone use, suggests that problematic smartphone behaviors are pervasive across the adolescent developmental spectrum. This finding challenges assumptions that older adolescents may be more vulnerable solely due to increased access or autonomy and highlights the importance of early intervention across all adolescent age groups. Furthermore, the lack of significant differences between urban and suburban participants indicates that smartphone addiction and its psychological effects are widespread across different geographic and socio-environmental contexts.

While this study adds important evidence to the field, it is essential to acknowledge its limitations. The cross-sectional design limits the ability to draw causal conclusions regarding the directionality of relationships between smartphone addiction, mental health, and self-control. It remains unclear whether smartphone addiction leads to increased anxiety and depression, whether preexisting mental health issues drive excessive smartphone use, or whether these relationships are bidirectional. Longitudinal studies are needed to clarify temporal sequences and causality. Additionally, reliance on self-report measures may introduce bias, such as social desirability or inaccurate recall, which could affect the validity of the results. Future research should consider incorporating objective measures of smartphone use, such as digital usage tracking, to complement self-reported data.

Another consideration is the potential influence of unmeasured confounding variables. Factors such as family dynamics, peer relationships, socioeconomic status, and personality traits may moderate or mediate the associations observed. Including these variables in future studies could provide a more comprehensive understanding of the mechanisms linking smartphone addiction to mental health and self-control. Moreover, qualitative research could enrich quantitative findings by exploring adolescents' subjective experiences with smartphone use and its psychological effects.

The practical implications of this research are significant for parents, educators, mental health professionals, and policymakers. Awareness of the mental health risks associated with excessive smartphone use should inform the development of educational campaigns and digital literacy programs that promote balanced technology use. Interventions that focus on enhancing self-control skills,

such as mindfulness training or cognitive-behavioral techniques, could be effective in reducing smartphone addiction and its negative psychological consequences. Schools may serve as an ideal setting for implementing such programs, given their access to adolescents and capacity to integrate mental health support into curricula.

In conclusion, this study highlights the strong links between smartphone addiction and adverse mental health outcomes, alongside reduced self-control, in adolescents. The findings underscore the importance of addressing smartphone addiction as a public health concern and advancing research that unravels its causal pathways and contextual factors. By fostering healthier smartphone habits and strengthening self-regulatory capacities, stakeholders can better support adolescents in navigating the challenges of digital technology while safeguarding their psychological well-being.

Conclusion

This study demonstrates a significant association between smartphone addiction and negative mental health outcomes, specifically increased anxiety and depression, among adolescents. Additionally, higher smartphone dependence was linked to lower levels of self-control, highlighting how excessive use can impair important regulatory functions during a critical developmental period. Gender differences emerged, with female adolescents exhibiting higher smartphone addiction and greater psychological distress, underscoring the need for gender-sensitive approaches in addressing these issues. The findings emphasize that problematic smartphone use is widespread across adolescent age groups and geographic settings, pointing to the urgency of early interventions. Promoting balanced smartphone habits and enhancing self-control may be effective strategies to mitigate the psychological risks associated with smartphone addiction. Overall, this research contributes to a growing understanding of the complex impact of digital technology on adolescent mental health and provides a foundation for future studies and practical initiatives aimed at supporting youth well-being in an increasingly connected world.

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