

Review Article

Smartphone addiction: impact on health and well-being

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ABSTRACT

This study explores the increasing prevalence and negative impacts of excessive smartphone use. It emphasizes the detrimental effects on academic performance, mental health, and physical well-being, highlighting the need for intervention strategies. The review aims to summarize evidence demonstrating the significant influence of smartphone addiction on dietary behavior and lifestyle, as well as the complex interplay between mobile phone usage patterns and mental health outcomes. The document suggests that mindfulness practices, self-reflection, and seeking professional help can be effective strategies to combat smartphone addiction. Through a systematic literature search using databases like Google Scholar, NIH, and PubMed, the review gathers information on smartphone addiction's effects on health, academics, and adolescence. The conclusion calls for longitudinal studies to track the long-term impact of smartphone usage on academic performance and overall well-being. It recommends identifying at-risk groups for intervention and promoting responsible smartphone usage to prevent adverse effects. Overall, the document underscores the importance of understanding the factors contributing to smartphone addiction and implementing measures to foster genuine human interactions, balance technology use, and mitigate the hazards of smartphone addiction among adolescents.

Keywords: Smartphone Addiction, Health, Well-being

INTRODUCTION

"Sometimes, the most productive thing you can do is to step away from the screen and take care of your own well-being." -Arianna Huffington.

In today's fast-paced digital landscape, smartphone addiction has become a silent epidemic, stealthily eroding our health and well-being. As we immerse ourselves in endless scrolling and constant connectivity, we inadvertently sacrifice precious moments of real-world interaction and self-care. Over the past decade, mobile phone technology has undergone a dramatic transformation, evolving from basic communication tools to sophisticated mini-computers. This rapid advancement has coincided with a growing concern about mobile

phone addiction (MPA) and its potential impact on individual and population health. The term MPA has emerged, which refers to compulsive and problematic phone use.

Nomophobia is the official term for smartphone addiction—a growing problem in modern society among both the younger and older generations.¹

Research on mobile addiction is still relatively young compared with other addictive behaviors. More studies are needed to realize its long-term effects and develop effective interventions. There can be a stigma associated with acknowledging phone addiction, particularly among younger generations. This can prevent individuals from seeking help or discussing their struggles. Addressing

mobile addiction requires a collective effort from individuals, healthcare professionals, policymakers, and the technology industry and a multi-faceted approach involving education, awareness campaigns, and support services. Increasing public awareness of the signs and symptoms of mobile addiction can help individuals recognize problematic behavior and seek assistance when needed.

Mobile addiction has a lot of behavioral and social impacts. Social comparison through social media platforms can contribute to feelings of inadequacy and low self-esteem. MPA can negatively affect attention spans and concentration. It can guide to decreased face-to-face social interaction, potentially damaging social skills and relationships. Increased impulsivity associated with phone use can guide to risky behaviors. Excessive smartphone use has been linked to increased feelings of loneliness and social isolation.^{2,3}

Presently in the status quo, around 66% of respondents are afraid of being left out without their phones. 20% of individuals would prefer to have no shoes for a week instead of no phone. The 87% of mobile users check their phones within an hour of waking up or going to bed. Approximately 60% of consumers believe they can't live without their cell phones, 50% of young people admit to being addicted to their cell phones, 65% of people check their phones 160 times a day, 71% of individuals sleep with or near their cell phones, 40% of individuals never turn off their cell phones. Teenagers who spend five hours per day on electronic devices have a 71% greater risk of suicide than those who spend only 1 hour per day.¹

It has now become so important to focus our attention to the emerging problem of mobile addiction, which can lead to vast variety of non-communicable diseases. MPA is a concern for health because of its potential negative impacts on various aspects of well-being. Compulsive phone use might guide to increased vulnerability to online scams, privacy breaches, and cyber bullying. Smartphone addiction can disrupt dietary behavior by promoting unhealthy eating habits, increasing snack consumption, and potentially leading to nutritional deficiencies and health issues. Mobile addiction can hinder individuals from reaching their full potential and experiencing a fulfilling life. It can lead to a decline in quality of life by hindering real-world experiences, personal growth, and impacting relationships. The subjective nature of phone use and the blurring line between healthy and problematic use make it challenging to diagnose individuals definitively. The technology industry has a vested interest in promoting widespread smartphone use and engagement, which can create resistance toward acknowledging the potential downsides.

By synthesizing and analyzing the available research, we aim to increase awareness of this issue and highlight the importance of promoting a balanced lifestyle in the digital age. Our aim is to uncover gaps in the current research

landscape regarding the association between excessive smartphone use and lifestyle comorbidities. By identifying these gaps, we stimulate further exploration and advancement of knowledge in this vital field. Research on mobile addiction is still relatively young compared to other addictive behaviors. More studies are needed to realize its long-term effects and develop effective interventions. There can be a stigma associated with acknowledging phone addiction, particularly among younger generations. This can prevent individuals from seeking help or discussing their struggles. Addressing mobile addiction requires a collective effort from individuals, healthcare professionals, policymakers, and technology industry and multi-faceted approach involving education, awareness campaigns, and support services. Increasing public awareness of signs and symptoms of mobile addiction can help individuals recognize problematic behavior and seek assistance when needed.

This review article discusses various studies conducted on smartphone addiction. This article analyses concept of smartphone addiction, its prevalence, study methodologies, psychological features and associated psychiatric comorbidities. Problematic use of smartphones has been linked to personality variables such as self-esteem, impulsivity, self-identity, and self-image. An increasing number of studies have focused on the most prevalent behavioral addictions today, including the internet, video games, and smartphones. Findings of this study are expected to serve as foundation for future research endeavors in this field, offering valuable guidance for further exploration and understanding of subject matter.

The objective of the review of these papers and addressing this mobile addiction issue can be described as follows: Encourage accountable and balanced use of smartphones to maximize benefits and minimize risks. Promote overall well-being by encouraging real-world interactions, physical activity, and healthy sleep patterns. Encourage face-to-face social interaction and communication skills that might be hindered by excessive phone use. To focus the attention of people towards the MPA, on which the research is less as compared to other addictive behaviors.

By focusing on these objectives, addressing mobile addiction can significantly contribute to building a healthier and more balanced relationship with technology, ultimately guiding to a better quality of life and positive public health outcomes.

SMARTPHONE ADDICTION: AN OVERVIEW

Research suggests an increasing prevalence of MPA, particularly among adolescents and young adults.³ Excessive smartphone usage can have significant long-term health implications across various domains, including sleep, physical health, nutrition, mental well-being, cognitive function, behavior, and eye health. It is

essential for individuals to be mindful of their smartphone usage habits and take proactive steps to maintain a healthy balance between technology use and overall well-being. Excessive phone use also leads to musculoskeletal problems like neck pain and repetitive strain injuries. Eye strain and vision problems are also emerging concerns. Blue light emitted from screen can disrupt circadian rhythms, potentially impacting overall health.²⁻⁴ It also causes problems of depression and weight gain. Addiction to scrolling continuously on mobile at night is spoiling the health of the youth. To stay updated with social media and activity, youths keep scrolling online before going to sleep at night after completing the day's work. But this scrolling seems to last for several hours instead of a few minutes. This affects sleep and is making them a victim of other diseases. This obsession with being online on social media at night is revenge for bedtime procrastination it is called. In fact, some research has found that high blood pressure, diabetes, and heart problem are caused by scrolling and sleeping late at night.

In a research which was carried out in West Bengal, all students were found to be using mobile phones, with 28%

of them using it for more than 6 h/day. Of students, 43% experienced medical problems, with majority reporting a lack of concentration as the most common issue duration of mobile phone usage showed a positive association with development of medical problems.²

According to a survey conducted by physicians in Jaipur during the pandemic and reported in the Times of India, 70.7% of students reported behavioral issues, 40% reported carelessness and interruption in daily routines while 17% suffered from reduced attention span and lack of concentration accompanied by a significant increase in anxiety, physical ailments, headaches, etc. Studies have established links between MPA and anxiety, depression, and sleep disturbances. Excessive phone use can disrupt sleep patterns, guiding to decreased alertness and cognitive function.^{2,3}

SUMMARY OF RECENT STUDIES INCLUDED IN THE REVIEW

Summary of recent studies included in the review tabulated in Table 1 below.

Table 1: Summary of recent studies.

Authors	Year of publication	Study design	Measure	Results
Zhang et al	2024	Cross-sectional study among 18723 university college students in China in which 6531 males (34.9%) and 12391 were females (65.1%) for one year from 2022.	MPA was measured by MPA tendency scale (MPATS). NSSI assessed by Ottawa self-injury inventory. Binary logic regression models were used to assess relationship b/w MPA and NSSI.	During 1 year, the prevalence of NSSI was 65%. 1. Any MPATS score was 39.5±13. 2. Gender did not affect score. Restricted cubic splines regression showed that a monotonically increasing risk of NSSI was associated with MPATS score.
Rezwan et al ¹¹	2023	Six-month cross-sectional observational study among 295 university students in Dhaka ranging from 18-25	Questionnaire smart phone addiction scale	12.9% using smartphone for texting, 5.8 for email, 36.3% for surfing 4.4% for gaming and 40.7% for Facebook.
Alotaibi ⁶	2022	Quantitative study conducted among 545 Ug students in Umm Al-Qura University, Saudi Arabia from May 2017 to Feb 2021. Mostly were females aged <21 years old with large family size.	Questionnaires, GPA, smartphone addiction logistic regression evaluation	More than half owned smartphone for 5-8 years. Majority are using an average of 6-11 h/day for 82.6% social networking 66.2% entertainment, 59.6% web surfing, 67.0% were smartphone addicted who have-lower GPA, physically inactive, poor sleep, overweight they had pain in 39.2% shoulder, 62.2% eyes, 67.7% neck, 30.7% serious mental illness
Mukhdoomi et al ⁹	2020	Correlation Design, quantitative study among 500 students of LQRA university North campus	Questionnaire regression analysis PLS-SEM	Shows positive and significant relation of smartphone self-efficacy and behavioural intention with student academic performance.
Sarkar et al ²	2018	Cross sectional descriptive study in Murshidabad medical college, India among 200 medical students from first to final year, predominantly protocol approved by institutional ethical committee. Mean age -21.54 years	Duration of mobile usage binary logistic regression to study the effect of socio-demographic variables and mobile use on development of medical problems.	Response rate was 94% 28% were using mobile phones for >6 hours/day, 43% showed medical problems, 47.4% reported lack of concentration, 13% prolonged sleep, 10% numbness of the fingers

Prevalence of MPA among adolescents

One study attempts to assess the prevalence of MPA among adolescents in selected schools of Gurugram. Study concludes that prevalence of smartphone addictions shows majority 65% adolescent are at high risk to develop smartphone addiction, 26% are at mild level of addiction and remaining 9% at severe level of addiction.⁷

A study in China has been done to investigate the potential link between the MPA and NSSI (Non-suicidal self-injury) deliberate self-harm without suicidal intent, is prevalent among adolescents and young adults, often co-occurring with suicidal behavior.⁵

Over usage of the mobile phone leads to physiological health hazards like headaches, earache, warmth sensation, fatigue and musculoskeletal symptoms Smartphone addiction among students is a pressing issue that has sparked a debate in recent years.

Associated risks and negative consequences

Physical and mental health, social relationships, as well as academic and professional burgeoning is all affected by these flaws. Mobile phones are becoming increasingly important, especially for students, due to their rapid social rhythm, busy daily lives, and complex interpersonal relationships. Mobile phones have become increasingly popular in recent years. Excessive smartphone use can have detrimental effects on various aspects of health, including sleep patterns, physical well-being, and mental health, cognitive function, and eye health. The blue light emitted from screens can disrupt circadian rhythms, leading to sleep disturbances and decreased alertness. Prolonged phone use can also contribute to issues such as neck pain, repetitive strain injuries, and vision problems.³ Associated negative consequences with MPA on physical health and social behavior are as follows:

Physical health issues

Prolonged smartphone usage can contribute to a sedentary lifestyle, reducing physical activity levels and increasing the risk of developing non-communicable diseases like cardiovascular diseases and obesity in the future. Reduced physical activity can also lead to musculoskeletal problems and decreased muscle mass. Prolonged screen time on smartphones can cause eye strain, dry eyes, and vision problems such as digital eye fatigue and myopia. Blue light emitted from screens can also disrupt sleep patterns and affect overall eye health.^{2,3}

Psychological effects

Excessive smartphone usage has been linked to psychological issues such as depression, stress, anxiety, and addictive behaviours. Studies have shown a significant relationship between excessive smartphone use and depression. Early problematic smartphone use

has been identified as a predictor of depression, with high levels of depressive moods linked to excessive mobile use. It has also been linked to anxiety disorders. FOMO (Fear of missing out) has been identified as a mediator in the relationship between anxiety and problematic smartphone use. Excessive smartphone use has been linked to symptoms of OCD (Obsessive-compulsive disorder) and ADHD (Attention-deficit hyperactivity disorder). Long-term exposure to smartphones and social media can also impact self-esteem, social interactions, and mental well-being.²

Cognitive impairment

Excessive smartphone uses shares underlying mechanisms with other addictive behaviours, such as reduced cognitive control and impaired activity in the prefrontal cortex. This can affect decision-making processes and emotional regulation. Research suggests that excessive smartphone use may affect cognitive functions such as memory, attention span, and problem-solving skills.^{2,4} Constant digital stimulation and multitasking can impair cognitive abilities over time. In a study conducted in Saudi Arabia, it was found that University students who were addicted to smartphones were more likely to have a lower grade point average.⁶

Decreased focus and concentration

Excessive use of mobile can lead to decreased focus and concentration during study sessions and lectures. Constant notifications, social media distractions, and temptation to check phone frequently can disrupt students' ability to concentrate on academic tasks, resulting in reduced learning efficiency and comprehension.²

Sleep disturbances

Excessive smartphone use, especially before bedtime, can disrupt sleep patterns, leading to poor sleep quality, insomnia, and daytime sleepiness. This can have a negative impact on overall health and well-being.^{4,5}

Poor time management

MPA can impair students' time management skills, leading to difficulties in prioritizing tasks, meeting deadlines, and allocating sufficient time for studying. Students may spend excessive hours on their phones, neglecting academic responsibilities and compromising their academic performance.⁵

Increased procrastination

MPA can contribute to procrastination tendencies among students. The constant availability of entertainment, social media, and online activities on smartphones can tempt students to procrastinate on important academic tasks, leading to delayed assignments, last-minute cramming, and suboptimal learning outcomes.²

Non suicidal self-injury (NSSI)

There was a study conducted in China which discusses the relationship between non-suicidal self-injury (NSSI) and MPA among college students born after 1995 in China. NSSI, deliberate self-harm without suicidal intent, is prevalent among adolescents and young adults, often co-occurring with suicidal behaviour. MPA, characterized by excessive and uncontrollable mobile phone use, has been linked to psychological and social impairment.⁵

Effect on diet

Smartphone addiction has been associated with skipping meals, changing eating speed, and altering meal amounts due to excessive smartphone use. Smartphone addicted students have shown an increased frequency of snack consumption, often opting for unhealthy snack choices. Excessive smartphone users have been found to consume more unhealthy foods such as fizzy drinks, sugary beverages, junk food, noodles, and snacks, while showing lower consumption rates of healthier options like fruits, vegetables, and milk. Due to poor eating behavior associated with smartphone addiction, students may be at risk of developing nutritional deficiencies and suffering from health consequences and psychopathologies.³

Social and behavioral changes

Smartphone addiction can lead to changes in behavior, including irritability, impulsivity, and difficulty in managing emotions. It may also contribute to social withdrawal and decreased face-to-face interactions. Excessive smartphone use has been associated with poor communication skills, as individuals may prefer texting over verbal communication. This can hinder face-to-face interactions and lead to difficulties in interpersonal relationships. Excessive smartphone use has been linked to increased feelings of loneliness and social isolation. Spending excessive time on social networking platforms may replace real-life social interactions, contributing to a sense of disconnectedness.^{2,3}

Addressing smartphone addiction

Addiction is considered by WHO as dependence, as the continuous use of something for the sake of relief or stimulation which often causes cravings when it is absent. The two major categories of addiction involve either substance addiction e.g. drugs or alcohol addiction or behavioral addiction such as mobile phone addiction.¹⁵

Smartphones have become essential in modern life, offering a wide range of features beyond basic communication. While they provide convenience and access to information, their addictive nature poses challenges, especially for students. Excessive smartphone use can impact academic performance, moral values, and mental and physical health. Addressing smartphone addiction requires collaborative efforts and strategies to

promote responsible usage and mitigate its adverse effects. Smartphone addiction has emerged as a significant public health issue, with detrimental impacts on individuals' daily lives and mental health. Previous studies have highlighted the importance of individual judgment in determining actions, particularly in the context of smartphone usage. Self-efficacy, or one's confidence in using smartphones, has been identified as a crucial factor in this regard. The younger a person is when they first possess a cell phone, the more likely they are to develop problematic use of it in the future. Therefore, educating young people about responsible usage and the potential risks of excessive smartphone use is essential. Some psychiatrists consider MPA to be similar to other types of addiction, such as drug and internet addiction. It is also considered one of the most prevalent non-drug addictions.

Smartphone and gaming

Individuals with gaming disorders tend to have less face-to-face interaction because they spend most of their time playing games. Studies showed that social anxiety was lower when interacting online than offline, socially anxious gamers believe that online communication can avoid the distress of face-to-face social interactions, and the negative metacognitions about online gaming played a mediating role in the relationship between social anxiety and gaming disorder.¹⁴

Smartphone game addiction has emerged as a major public health problem in China and worldwide. In November 2019 and August 2021, the national press and publication administration of China implemented two increasingly strict policies, as a means of preventing smartphone game addiction in adolescents aged 18 or below.¹⁴

According to these studies, some suggestions were given to reduce this problem: Setting the usage time by minimizing text conversations.^{2,4} Establish recreational services.⁶ Develop and implement various educational programs which raise awareness about smartphone addiction among university students.⁶ Develop policies and guidelines limiting the usage of smartphones during lectures.⁶ Establish free and accessible sports facilities in all universities.⁶

SUGGESTIONS AND STRATEGIES TO REDUCE THE PREVALENCE OF MPA

Strategies focusing on attitudes, such as providing information and advice and promoting healthy usage habits, may empower young adults to set limits and boundaries for mobile phone accessibility, thus fostering a balanced approach to technology use and mental well-being. This approach is particularly relevant in today's digital age, where smartphones have become an integral part of our daily lives. This alarming trend highlights the need for effective measures to address smartphone

addiction and prevent its adverse effects on individuals' mental and physical health. China is among the few countries in the world that have national measures in place to prevent public health hazards related to online games. This model can serve as an example for other countries to follow in addressing the issue of smartphone addiction.

Several strategies can be implemented to reduce smartphone overuse and promote a healthier balance in technology usage. To get rid of this problem, it is very important for you to reduce your screen time. Scientists suggest that you don't watch your favourite shows at night to stay addicted. If you like to scroll social media before sleeping, then put a timer on the phone. You can block app notifications for a few hours. Try reading, sketching, painting, meditating, or finding information-enhancing things before bedtime. This will reduce screen time.

Here are effective approaches to reduce screen-time:

Setting usage limits: Emphasize the importance of limiting the time spent on mobile phones, especially for prolonged conversations or entertainment. Establishing specific time limits for smartphone usage each day can help individuals regulate their screen time and prevent excessive use.

Limit notifications: Disable unnecessary notifications to minimize distractions.

Customize your home screen: Rearrange app icons and remove tempting apps from the home screen to make them less readily accessible.

Grayscale mode: Switch your phone to grayscale to make it visually less appealing and decrease screen time.

Utilizing apps for monitoring: There are various apps available that can track screen time and provide insights into usage patterns, helping users become more aware of their smartphone habits and make necessary adjustments.

Creating tech-free zones: Designating certain areas or times as tech-free zones, such as during meals or before bedtime, can encourage individuals to disconnect from their smartphones and engage in other activities.

Engaging in physical activities: Encouraging physical activities and hobbies that do not involve smartphones can help individuals reduce their screen time and promote a more active lifestyle.

Promoting face-to-face interactions: Emphasizing the importance of face-to-face interactions and socializing without the use of smartphones can help individuals build stronger relationships and reduce dependency on digital communication

Seek support: Talk to friends or family about your goals to reduce phone usage and ask for their support.

Educating on healthy technology use: Providing education and awareness programs on the potential negative effects of smartphone overuse can help individuals make informed decisions about their technology usage and prioritize their well-being.

Mindfulness and self-reflection: Encouraging mindfulness practices and self-reflection can help individuals become more conscious of their smartphone habits and make intentional choices about when and how they use their devices.

Consider professional help: If your addiction is severe, consider seeking help from a therapist or counsellor who specializes in addiction treatment.

CONCLUSION

Conducting longitudinal studies to track the long-term effects of smartphone usage on academic performance and overall well-being, as well as exploring the efficacy of interventions aimed at mitigating smartphone addiction among students. Future research should focus on identifying groups at-risk for intervention or behavioral modification with respect to technology use. Further prospective studies are required to accurately evaluate each proposed association for smartphone addicted students. Understanding the impact of smartphone addiction on student's academic performance and mental and physical well-being is crucial for devising effective strategies to address this issue. A balanced approach to technology use is necessary to promote healthy smartphone usage habits and prevent the adverse effects of smartphone addiction and public health hazards of online games.

Recommendations

In today's fast-paced world, it's easy to get lost in the digital realm of smartphones and technology. However, amidst the convenience and connectivity they offer, we mustn't forget the importance of genuine human interactions. Face-to-face connections hold a unique power in fostering empathy, understanding, and emotional bonds that technology often cannot replicate. Therefore, rather than completely banning mobile phones, it's essential to moderate our usage. By consciously limiting screen time, we can prioritize spending quality moments with loved ones and nurturing meaningful relationships in the real world, while still appreciating the benefits of technological progress. In the era of smartphones, our health is slipping through our fingers. With every notification, we sink deeper into addiction's grasp. It's time to lift our heads from screens, reclaim our well-being, and rediscover life beyond the glow. "Click less, live more - that is the motto of wellness."

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