

Mapping Associations Between Smartphone Addiction and Physical Psychosocial Outcomes in Young Adults: A Review



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Abstract

Smartphones have become indispensable tools in modern life, particularly among young adults who rely on them for communication, education, and entertainment. However, rising patterns of excessive and uncontrolled use often described as *smartphone addiction* are increasingly linked to a wide spectrum of adverse physical and psychosocial outcomes. This review aims to synthesize current evidence on the associations between smartphone addiction and health consequences in young adults, with emphasis on physical, psychosocial, and interconnected outcomes, while identifying research gaps and future directions.

Evidence indicates that smartphone addiction is consistently associated with musculoskeletal strain, forward head posture, reduced neck muscle endurance, repetitive strain injuries, and sleep disruption. Psychosocial consequences include heightened anxiety, depressive symptoms, low self-esteem, fear of missing out (FoMO), and poorer academic performance. Notably, these outcomes interact bidirectionally: for example, sleep disturbance exacerbates musculoskeletal pain and psychological distress, while chronic discomfort increases vulnerability to stress and low mood. Cross-cultural research reveals varying prevalence and risk factors, with up to one-third of young adults in India exhibiting problematic smartphone use. Despite growing evidence, research is limited by inconsistent diagnostic criteria, heavy reliance on cross-sectional designs, and lack of longitudinal or mechanistic studies.

In conclusion smartphone addiction in young adults represents a multidimensional health concern with interlinked physical and psychosocial effects. Addressing current gaps requires standardized diagnostic frameworks, longitudinal and interventional studies, integration of objective measures, and greater representation of diverse populations. Future directions should focus on developing preventive and therapeutic interventions, including digital literacy programs, ergonomic training, and psychosocial support. A multidisciplinary approach engaging healthcare providers, educators, policymakers, and technology developers will be critical to mitigating risks and promoting healthier digital habits among young adults.

Keywords: smartphone addiction, young adults, musculoskeletal health, psychosocial outcomes, digital dependency, public health

Introduction

Smartphones have rapidly become an integral part of modern life, shaping the way individuals communicate, access information, and manage daily routines. For many young adults, smartphones are not merely tools for calling and messaging but extensions of their academic, social, and personal worlds. This increasing reliance reflects the broader digital transformation of society, where mobile devices function as educational platforms, entertainment hubs, and social connectors (Abdizaitovich *et al.*, 2025). However, alongside their undeniable benefits, smartphones have also raised serious concerns about overuse and its potential to affect health and well-being.

The term “smartphone addiction” has emerged to describe patterns of excessive and uncontrolled

smartphone use that interfere with normal life activities. Although not formally recognized as a clinical disorder, it shares features with behavioral addictions such as compulsive internet use and gaming. These features include persistent urges to check the device, preoccupation with digital content, distress when unable to use the phone, and disruption of sleep, study, or work routines. Young adults are particularly vulnerable because this life stage is marked by academic pressures, social transitions, and heightened sensitivity to peer approval (Ambat 2025). In this context, smartphones can easily transform from helpful tools into sources of dependency.

Initial concerns regarding smartphone overuse were largely psychological, focusing on anxiety, stress, and reduced academic performance. Over time,

researchers began documenting a broader range of outcomes, highlighting the interplay between physical and psychosocial domains. Excessive smartphone use has been linked to musculoskeletal complaints such as neck and shoulder pain, headaches, and postural alterations (Abdizaitovich *et al.*, 2025). Mechanically, these problems arise from sustained cervical flexion, repetitive thumb movements, and prolonged static postures associated with handheld device use. Terms such as “text neck” and “gamer’s thumb” illustrate how device-related behaviors manifest as recognizable syndromes in clinical practice. These musculoskeletal consequences may, in turn, affect daily functioning, reduce physical endurance, and contribute to long-term disability (Nambirajan *et al.*, 2025).

Equally significant are the psychosocial consequences of smartphone addiction. Studies consistently associate problematic use with poor sleep quality, depressive symptoms, social withdrawal, and low self-esteem. Constant exposure to social media increases the risk of social comparison, fear of missing out, and cyberbullying, which can erode self-confidence and emotional stability. Academic performance may decline as attention is fragmented by continuous notifications, while interpersonal relationships can suffer due to behaviors such as “phubbing” (phone snubbing). These psychosocial strains are not isolated phenomena; rather, they interact with physical complaints. For example, sleep disruption due to late-night phone use can worsen headaches and musculoskeletal pain, while chronic physical discomfort may elevate stress and mood disturbances (Aker *et al.*, 2017).

At the global level, patterns of smartphone addiction differ across cultural and socioeconomic contexts. In Asian societies, for instance, high academic demands and collectivist social structures may intensify vulnerability to problematic use, while stigma around mental health may reduce open acknowledgment of the problem. In India, recent studies report that nearly one-third of young adults show signs of problematic smartphone use, with younger age groups and those spending more than five hours daily on their devices at particularly high risk. These findings underscore the urgency of addressing smartphone addiction as a public health concern in rapidly digitalizing nations (Zhong *et al.*, 2022).

Despite growing literature, several challenges remain. Diagnostic criteria for smartphone addiction lack consensus, and measurement tools vary across studies, making comparisons difficult. Most research is cross-sectional, limiting causal inference, while longitudinal and experimental designs remain scarce. There is also limited exploration of protective

factors such as resilience, mindfulness, and physical activity. Finally, evidence from low- and middle-income countries remains underrepresented, despite rising smartphone penetration.

This review seeks to map the associations between smartphone addiction and both physical and psychosocial outcomes in young adults. By synthesizing existing evidence, it aims to highlight the breadth of consequences, underscore the interconnectedness between body and mind, and identify gaps that require further investigation. A clearer understanding of these associations will not only aid clinicians and educators in recognizing at-risk populations but also inform preventive strategies and policy measures that encourage healthier digital habits among young adults.

2. Understanding Smartphone Addiction

Smartphone addiction, although not yet recognized as a formal clinical disorder, is increasingly being understood as a type of behavioral dependency. It manifests through persistent urges to check the device, distress or restlessness when unable to use it, and significant disruption of everyday routines (Nambirajan *et al.*, 2025). A range of factors contribute to its development, including personality traits such as impulsivity and neurotic tendencies, external social pressures, and the deliberately rewarding design of many mobile applications (Pauline *et al.*, 2025). Research in neuroscience indicates that frequent smartphone use may alter activity in brain regions involved in impulse regulation and reward processing, influenced by the nature of the content being viewed and the way the brain interprets it. This highlights the importance of approaching smartphone addiction as a complex issue that spans biological, psychological, and social dimensions (Zhang & Li 2025). With the rapid expansion of smartphone access, concerns have also emerged regarding its influence on physical health, particularly in younger populations. Excessive use has been linked to reduced levels of physical activity and a tendency toward sedentary behavior, which may carry long-term health risks despite the many advantages these devices provide (Kumban *et al.*, 2025).

3. Physical health consequences

Excessive use of cell phones has also been increasingly associated with a range of physical, social, and mental health problems (Arooj *et al.*, 2025). Sleep disturbances are the most widely reported physical outcome, as nighttime smartphone use disrupts circadian rhythms and reduces melatonin secretion. This leads to poor sleep quality, insomnia, and daytime fatigue. Musculoskeletal problems, such as “text neck” and repetitive strain injuries, arise from prolonged device handling and

poor posture. Visual strain is another growing concern, with excessive screen exposure linked to dry eyes, blurred vision, and myopia progression. Emerging evidence also points to other physiological concerns, including reduced physical activity and metabolic disturbances due to sedentary behavior (Qin *et al.*, 2025).

Prolonged handheld screen viewing is a significant contributor to musculoskeletal disorders (MSDs), particularly among young adults and university students. Prolonged engagement with handheld devices often requires sustained postures such as forward head inclination, cervical spine flexion, and extended arm positioning that place considerable strain on the neck, shoulders, and upper limbs. These repetitive and static positions are strongly associated with chronic neck pain, hand and wrist discomfort, and shoulder fatigue. Forward head posture, a widely documented poor sagittal alignment, is especially prevalent in smartphone users and is linked to persistent cervical muscle strain (Alghadir *et al.*, 2025; George *et al.*, 2022).

The continuous use of thumbs and fingers for touchscreen navigation further predisposes individuals to tendon-related injuries like extensor pollicis longus tendinosis, myofascial pain syndromes, and joint overuse inflammation. Consequently, smartphone addiction is now closely tied to a global rise in MSDs, manifesting as tendinopathies, nerve compression syndromes, and joint impairments. These conditions not only cause physical discomfort but also contribute to disability, absenteeism from work or study, and an increasing economic burden on healthcare systems (Mustafaoglu *et al.*, 2021).

Static neck flexion and repetitive micro-movements of the upper quarter are increasingly recognized consequences of excessive smartphone use. These postural demands increase the mechanical load on the cervical spine and shift muscular recruitment away from the deep neck flexors toward superficial muscles such as the sternocleidomastoid and upper trapezius. Over time, this altered synergy promotes early fatigue of stabilizing musculature, reduces oxidative capacity in the deep cervical flexors, and diminishes overall neck-muscle endurance. Clinically, this presents as shortened hold times on deep neck flexor endurance tests, reduced scapulothoracic control, and a smaller craniovertebral angle indicative of forward-head posture (Elvan *et al.*, 2024).

Excessive smartphone use sustains low-angle cervical flexion, increasing the external flexion moment and shifting load from deep stabilizers to passive tissues, which promotes viscoelastic creep and reduced segmental stiffness. This load redistribution drives a recruitment shift from the deep neck flexors to superficial musculature,

lowering endurance and fine motor control. Typical “text-neck” coupling lower-cervical flexion with compensatory C0–C2 extension/rotation shortens suboccipitals and restricts isolated upper-cervical rotation despite near-normal global ROM. Prolonged malalignment and fatigue degrade proprioceptive input and body awareness often without changes in pain-pressure thresholds yielding an early, segment-specific sensorimotor deficit at the cranio-cervical junction that presents as forward-head posture and impaired control (Acet *et al.*, 2025).

Dominant-hand device biases activation of right-sided cervical extensors, fostering taut bands and localized hyperalgesia. Parallely it is also associated with postural alterations and myofascial trigger points most consistently in the bilateral levator scapulae and the right cervical erector spinae accompanied by forward-head posture and a reduced craniovertebral angle. Mechanistically, sustained neck flexion with scapular downward rotation increases tonic demand on the levator scapulae (Yaşarer *et al.*, 2025).

Beyond postural strain, emerging evidence underscores the role of biological mechanisms in the pathophysiology of smartphone-related MSDs. Serum biomarkers such as tissue inhibitors of metalloproteinases (TIMP-1, TIMP-2), total antioxidant capacity (TAC), malondialdehyde (MDA), serotonin (5-HT), and triglycerides (TG) reveal a strong association between prolonged smartphone use and altered physiological processes. Smartphone-addicted individuals often exhibit reduced TIMP activity, suggesting impaired collagen repair and tissue resilience, alongside elevated oxidative stress markers (MDA), heightened serotonin activity, and increased triglyceride levels. These changes point to a biological dimension of musculoskeletal pain and dysfunction, in addition to mechanical strain (Ahmed *et al.*, 2022; Mustafaoglu *et al.*, 2021).

4. Psychosocial consequences

Smartphone addiction has profound implications for mental and emotional health. High levels of use are strongly associated with anxiety, depression, and stress, likely mediated by sleep disruption, cyberbullying, and social comparison on digital platforms. Academic performance and cognitive functioning may suffer as constant notifications and multitasking impair attention and memory. On a social level, smartphone overuse can erode interpersonal relationships, reduce face-to-face interactions, and foster isolation. Additionally, overexposure to social media platforms has been linked to depression, low self-esteem, diminished life satisfaction, and decreased attention span, while compulsive checking behaviors impair concentration and decision-making particularly among young

adults with poor coping mechanisms (Alwazze et al., 2024; Yang et al., 2023).

5. Interconnectedness of physical and psychosocial outcomes

On a social level, excessive reliance on mobile devices diminishes face-to-face communication, fosters social isolation, and disrupts interpersonal relationships, with frequent phone snubbing called “phubbing” creating conflict among peers, families, and partners (Tufan et al., 2024). Academically and professionally, phone overuse interferes with productivity and collaboration. Social involvement is a core human necessity, shaping emotional well-being, resilience, and even long-term health outcomes. Strong and diverse social relationships foster feelings of safety, belonging, and prosperity, and are consistently linked to improved survival rates across the lifespan. Both behavioral interactions and biological processes contribute to these benefits, making social connectedness a powerful determinant of mental and physical health (Ni et al., 2025).

However, the rise of mobile phone overuse and smartphone addiction has begun to disrupt these natural patterns of social engagement. Excessive screen time often replaces face-to-face interactions, reducing the depth and quality of social bonds. Excessive smartphone use among adolescents has been closely linked to cognitive and emotional challenges during this critical period of neurodevelopment. High screen time and compulsive social media engagement can impair core executive functions such as attention, working memory, inhibitory control, and reasoning, which are essential for academic performance and emotional regulation. The constant flow of notifications, social comparisons, and fear of missing out (FoMO) place heavy demands on attentional resources, leading to distraction, stress, and diminished cognitive efficiency. Neuroimaging and behavioral studies suggest that prolonged smartphone exposure alters reward and control networks in the brain, fostering addictive behaviors and reducing the capacity for critical thinking and impulse regulation (Mendonça et al., 2025).

In this way, smartphone addiction can erode the very social connections that underpin human well-being, highlighting the urgent need for balanced technology use and stronger public health awareness around digital habits.

6. Global and cultural perspectives

Global smartphone adoption has surged due to increasing accessibility and affordability. Evidence from prior studies indicates that higher levels of smartphone use are often linked to declines in academic performance. Patterns of smartphone

addiction vary across regions and cultures (Afzali et al., 2025). In Asian societies, Sociocultural characteristics, including collectivist values, hierarchical family structures, and strong academic expectations, appear to shape both the expression and consequences of excessive smartphone use. Adolescents and young adults, in particular, are more vulnerable, as academic pressures and societal expectations can foster maladaptive patterns of technology engagement, often as a means of coping with stress. Furthermore, cultural constraints, stigma surrounding mental health and addictive behaviors in many Asian contexts may discourage open discussion and accurate reporting, thereby complicating prevention and treatment efforts (Lee et al., 2025).

Recent evidence suggests that nearly one-third of young adults in India exhibit problematic smartphone use (PSU), with prevalence estimates ranging between 30% and 45%. The Indian validation of the Smartphone Addiction Scale–Short Version (SAS-SV) has confirmed it as a reliable tool, identifying a score of 36 or above (≥ 75 th percentile) as indicative of high PSU. Younger age groups (18–23 years), individuals with lower educational attainment, those from nuclear families, and users spending more than five hours daily on their devices are particularly vulnerable, while gender and marital status appear less influential (Felix et al., 2025).

7. Research gaps and challenges

Although the evidence base on smartphone addiction has grown substantially over the past decade, several important research gaps and challenges remain. These limitations hinder the ability to generate consistent conclusions, compare findings across studies, and design effective interventions. Understanding these shortcomings is essential for guiding future work and ensuring that the field evolves in a scientifically robust and clinically meaningful direction.

One of the most persistent challenges is the absence of universally accepted diagnostic criteria for smartphone addiction. While tools such as the Smartphone Addiction Scale (SAS) and its short version (SAS-SV) are widely used, cutoff thresholds vary across countries and populations. Some studies use self-reported screen time or frequency of checking behaviors as proxies, while others apply multidimensional scales that assess withdrawal, tolerance, or daily-life interference. This inconsistency not only complicates prevalence estimates but also undermines the validity of cross-study comparisons. Without standardized definitions, it remains unclear whether smartphone addiction is best understood as a distinct clinical entity, a subtype of internet/gaming addiction, or a

broader behavioral dependency (George et al., 2022).

The majority of studies in this field employ cross-sectional designs, which capture associations at a single point in time but cannot establish causality. For example, while high smartphone use is correlated with depression and anxiety, it remains uncertain whether overuse leads to psychological distress or whether pre-existing vulnerabilities predispose individuals to addictive patterns of use. Similarly, musculoskeletal complaints such as neck pain may be both a cause and a consequence of excessive device use. Longitudinal studies that track exposure and outcomes over time are urgently needed to clarify these temporal relationships. Experimental and interventional designs such as digital detox trials or ergonomics-based interventions are also scarce, limiting evidence on effective preventive and therapeutic strategies (Ahmed et al., 2022).

Although mechanical explanations such as forward head posture, repetitive strain, etc are well described, biological pathways remain underexplored. A few recent studies have linked excessive smartphone use with biomarkers of oxidative stress, altered serotonin levels, or reduced tissue repair capacity, but these findings are preliminary. Neuroimaging work indicates potential alterations in brain networks governing reward and executive control, yet the field is still in its infancy compared with research on substance use disorders. A stronger focus on biopsychosocial mechanisms integrating physiological, neurological, and behavioral dimensions would provide deeper insights into why certain individuals develop addiction-like patterns and others do not (Elvan et al., 2024).

Another significant gap lies in the uneven geographical distribution of research. Much of the evidence originates from East Asia, Europe, and North America, while low- and middle-income countries where smartphone penetration is rising rapidly remain underrepresented. Cultural norms, family structures, and social expectations can profoundly shape patterns of smartphone use and addiction risk. For example, academic pressures in collectivist societies may exacerbate problematic use, while stigma around mental health may reduce reporting. Without diverse, cross-cultural data, current findings risk being culturally biased and less generalizable (Khan et al., 2022).

8. Future directions

Future work should focus on standardizing diagnostic frameworks to enable reliable prevalence estimates and cross-cultural comparisons. Interventions leveraging technology itself, such as screen-time management apps and digital detox

programs, hold promise but require rigorous evaluation. Educational and policy initiatives are also crucial, emphasizing digital literacy, healthy usage habits, and awareness campaigns targeting young adults. A multidisciplinary approach, integrating healthcare providers, educators, policymakers, and app developers, will be key to addressing this global issue.

A top priority for future work is the development of standardized diagnostic criteria for smartphone addiction. International consensus panels could establish core dimensions (such as withdrawal, tolerance, preoccupation, and functional impairment) and unify cutoff scores for widely used scales like the SAS-SV. Incorporating both self-reported and objective usage metrics (e.g., screen-time logs, app usage trackers) would enhance reliability. A harmonized framework will improve cross-study comparability and enable more accurate prevalence estimates globally (Khan et al., 2022).

9. Conclusion

Smartphone addiction poses significant risks to young adults, affecting both physical health—through musculoskeletal strain, headaches, and sleep disturbances—and psychosocial well-being, including anxiety, depression, and reduced academic performance. These outcomes are interconnected and amplify each other, underscoring the urgency of addressing excessive use. Standardized diagnostic criteria, longitudinal research, and culturally sensitive interventions are needed to advance the field. Promoting digital literacy and balanced smartphone use will be essential to safeguard the health and well-being of future generations.

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