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## Mini Review

# Understanding and addressing smartphone addiction: A multidisciplinary perspective

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## Abstract

The present study investigates the escalating dependency on smartphones, with tendencies toward severe addiction, thereby causing detrimental effects on both psychological and physiological well-being. The group addicted to mobile phones exhibits behavioral and neurophysiological differences compared to the non-addicted group. Non-invasive neural modulation techniques such as transcranial direct current stimulation and aerobic exercises such as HPCOSMOS exergaming (Treadmill-based, combining action control and motion perception in a Switch game) may represent cost-effective, adaptable, and promising therapeutic approaches. That will contribute to establishing a theoretical foundation for the rehabilitation and treatment of individuals afflicted with smartphone addiction.

## Introduction

Smartphones have become ubiquitous in our modern lives, revolutionizing the way we communicate, work, and entertain ourselves. However, their omnipresence has also given rise to concerns about excessive and addictive usage patterns, leading to a growing body of research aimed at understanding and mitigating “Smartphone addiction” [1,2]. This multifaceted phenomenon, characterized by compulsive and problematic smartphone use that impairs daily functioning and well-being, transcends disciplinary boundaries and necessitates a comprehensive approach.

To comprehensively address Smartphone addiction, it is crucial to adopt a multidisciplinary perspective that leverages insights from various fields. Four key keywords encapsulate different facets of this endeavor: “Smartphone addiction,” “Transcranial Direct Current Stimulation (tDCS),” “Exergame,” and “Event-Related Potentials (ERPs).” These keywords represent diverse approaches, from behavioral

and psychological aspects to neuroscientific investigations, offering a holistic understanding of Smartphone addiction.

This multidisciplinary approach aims to bridge the gap between research and practical solutions. By integrating knowledge from psychology, neuroscience, technology, and innovative interventions, it seeks to construct a comprehensive framework for understanding the complexities of Smartphone addiction and devising evidence-based strategies to mitigate its adverse effects [3,4]. In doing so, it contributes to the collective effort to promote healthier digital habits and harness the potential of smartphones as tools for personal enrichment rather than sources of addiction and distraction [5].

## Editorial

Historically, addiction was often regarded as indicative of moral laxity or a manifestation of weakened willpower. However, as various disciplines have evolved, a nuanced understanding has emerged, elucidating addiction as a complex psychiatric disorder rooted in chronic neurobiological



alterations [6]. Within the realm of neuropsychiatry, the term “addiction” is distinctly characterized by its presentation encompassing the development of tolerance, manifestation of withdrawal symptoms, and establishment of a propensity for dependency. Notably, this intricate phenomenon invariably intertwines physiological, psychological, and socio-cultural intricacies [7]. While its original application was confined to substances and psychoactive agents, the semantic scope of addiction has progressively expanded to encompass an array of non-substance-related behaviors. This extension encapsulates domains such as pathological gambling, pervasive internet usage, immersive gaming, and unabating engagement with mobile communication devices, among other manifestations.

The all-pervasive and progressively potent smartphones, marked by their ease of accessibility and operation, raise the question of whether they might ensnare individuals in their grasp, potentially culminating in addiction. The answer is affirmative. Regrettably, smartphone addiction [8] has not garnered sufficient attention, and its officially authoritative characterization remains elusive. Academic definitions of smartphone addiction may vary depending on the research field and the researcher’s perspective, and this area of study has been continuously evolving. Smartphone addiction typically refers to the excessive and uncontrollable use of smartphones, to the extent that it disrupts an individual’s daily life, work, studies, social relationships, and psychological well-being. It may manifest through a range of behaviors and characteristics, including withdrawal symptoms, tolerance, social isolation, and psychological health issues [9,10], with elevated impulsivity serving as its core symptom. Lin, et al. [11] posit that smartphone addiction constitutes a form of technological addiction.

Furthermore, these symptoms parallel those observed in substance addictions such as methamphetamine addiction. The etiological factors of smartphone addiction span diverse domains encompassing cultural, genetic, biological, social, and psychological aspects. Factors such as age and gender [12], self-cohesion or self-esteem [13], self-cohesion or self-esteem [14] including depression and social anxiety, family income, parental attitudes, educational environment, and living conditions [15], have emerged as focal points of recent research endeavors.

According to survey data, the estimated prevalence of smartphone usage issues among Chinese students is 21.3% [16], ranging from 10% to 25% in the United States [17], 10% in the United Kingdom [18], and 16.9% in Switzerland [19]. The prevalence of smartphone addiction among Indian adolescents varies from 39% to 44% [20]. In 2018, 89.5% of the population in South Korea owned smartphones, with 2.7% classified as high-risk and 15.9% potentially at risk of smartphone addiction [21]. Consequently, smartphone addiction may emerge as a latent public health concern [22], and the American Society of Addiction Medicine has identified it as a severe public health issue [23]. Urgent attention is warranted to address smartphone addiction.

At present, therapeutic interventions for smartphone addiction primarily encompass Cognitive-Behavioral Therapy (CBT), motivational interventions, and mindfulness-based cognitive therapy [24]. Furthermore, non-invasive neuromodulation techniques such as Transcranial Direct Current Stimulation (tDCS) are a focal point of research in the field of addiction treatment.

Researchers posit that both substance addictions (e.g., methamphetamine) and behavioral addictions (e.g., smartphone addiction) are influenced by neurobiological alterations, which are associated with brain networks governing reward and executive control. Transcranial Direct Current Stimulation (tDCS) [25] offers a means to investigate the relationship between cortical brain regions and addictive behaviors. Furthermore, Randomized Controlled Trials (RCTs) [26] and meta-analyses [27,28] have confirmed the constructive role of tDCS in treating smoking addiction and alcohol use disorder patients. Its capacity to modulate cortical activity and excitability has been demonstrated, thereby affecting changes in behavior, cognition, and sensory perception [29].

The advancement of neuroimaging techniques such as Electroencephalography (EEG) [30] and functional Magnetic Resonance Imaging (fMRI) is anticipated to enhance the potential of transcranial Direct Current Stimulation (tDCS) in the rehabilitative treatment of smartphone addiction. Furthermore, forthcoming research endeavors should aim to provide an in-depth understanding of the mechanistic attributes underlying the comorbidity between smartphone addiction and psychological symptoms, as this holds promise for the advancement of targeted interventions for smartphone addiction.

## Conclusion

Smartphone addiction is emerging as a progressively severe societal issue, with detrimental impacts on individuals’ psychological and physiological well-being. To gain a more comprehensive understanding and address this problem effectively, we have adopted a multidisciplinary research approach encompassing behavioral, neurophysiological, and therapeutic interventions. This integrative approach holds the promise of providing deeper insights and establishing a robust theoretical foundation for future interventions and treatments.

From a neurophysiological perspective, we have focused on the relationship between brain neural networks and addictive behaviors, exploring the potential of non-invasive neural modulation techniques such as transcranial Direct Current Stimulation (tDCS) for addiction treatment. The application of tDCS provides a novel avenue for intervening in addictive behaviors by modulating cortical activity to influence cognition and behavior. Its effectiveness has been demonstrated in the treatment of smoking addiction and alcohol misuse, and we anticipate its positive role in addressing smartphone addiction.

Additionally, we emphasize the significance of neuroimaging techniques such as Electroencephalography (EEG) and functional Magnetic Resonance Imaging (fMRI)



in understanding the mechanisms underlying smartphone addiction. These techniques hold the potential to deepen our comprehension of the complex relationship between addiction and psychological symptoms, offering support for the development of personalized intervention strategies.

In summary, smartphone addiction is a multifaceted issue that spans multiple disciplinary domains. Through the integration of behavioral, neurophysiological, and therapeutic research methods, we aim to gain a more profound understanding of the nature of this phenomenon and provide more effective strategies for its treatment and rehabilitation. We underscore the urgency of addressing smartphone addiction, not only through continued research but also through proactive public health measures to ensure societal well-being.

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