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A Critical Analysis of Smartphone Use and Mental Health Problems among Adolescents

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Abstract

Excessive smartphone use by adolescents is raising concerns due to negative effects on adolescents' mental health, even though smartphones, to some extent, bring advantages to their educational needs. Within this context, this study aims to analyze underlying reasons and potential risks of excess smartphone use, then propose appropriate interventions. Drawing on existing empirical and theoretical literature, this paper explored two reasons including rational adaptation for educational needs and the digital manipulation from platforms, and suggested potential interventions from family, school, and individual levels. This paper provides theoretical insights and practical implications for parents, educators, and mental health practitioners, and related stakeholders seeking to mitigate the negative psychological impacts of smartphone overuse among adolescents.

Keywords

smartphone use, mental health, intervention, adolescents

1. Introduction

Since the International Business Machines Corporation (IBM) patented the first smartphone in 1992 [1], smartphones have evolved rapidly and significantly changed our lives. By 2024, the global number of smartphone users reached 4.88 billion, and approximately 95% of U.S. adolescents had access to smartphones [2]. The National Health Interview Survey [3] indicated that about half of teenagers had 4 or more hours of screen time daily. Prolonged screen time is associated with addictive tendencies, and mental health issues such as anxiety, depression, and even suicidal ideation. A large-scale study indicated that smartphone usage has significantly affected adolescents' mental health [4]. Therefore, researchers worked to explore interventions aimed at reducing the adolescents' screen time. For example, the 2024 documentary *Swiped: The School That Banned Smartphones* reported that a 210-day smartphone ban among Grade 8 students led to improved sleep, reduced anxiety, and enhanced concentration. However, while forced bans may offer short-term benefits, they typically fail to address the underlying causes of excessive smartphone use. Moreover, there has been only limited research that has examined effective strategies to mitigate the negative mental health impacts of smartphone use. Existing studies have predominantly focused on investigating smartphone use and mental health problems among college or university students [2], with comparatively little attention given to adolescents. However, importantly, adolescents are particularly vulnerable to the influence of smartphones due to heightened emotional instability and an increased desire

for social acceptance during puberty [5, 6]. To fill these research gaps, the current study aims to: (1) examine factors leading to the over-usage of smartphones among adolescents; (2) critically evaluate both the educational benefits and mental health risks of smartphone use; (3) propose appropriate strategies to mitigate smartphone-related mental health problems among adolescents.

2. Reasons for Smartphone Adoption Among Adolescents

2.1 Rational Adaptation for Educational Needs

Smartphone popularity among adolescents is a rational adaptation in the current digital era with a variety of online resources. It is worth noting that AI is also rapidly transforming the digital world with higher efficiency and enhanced personalized experiences. This change has a significant influence and long-term impact on the delivery of education through mobile learning [7]. Considering this, smartphone usage can be important for adolescents as it influences how adolescents accommodate, select, and shape the innovative learning environment. One of benefits smartphones bring to learning is that adolescents can access knowledge virtually almost anywhere at any time, making it much easier to adapt to different learning contexts, therefore increasing learning efficiency. Moreover, mobile learning typically uses short formats such as videos or gamified content, which appeal to adolescents to explore by making learning more interactive and accessible [8]. Mobile learning helps improve information retention compared to pure class-based learning methods [9]. The entertainment in learning and improved knowledge retention directs adolescents to select mobile learning as a key supplement to mainstream schooling. To improve learner engagement, mobile learning platforms can be customized to meet the distinct needs of diverse learners, leading to personalized learning experiences. Meanwhile, learners with similar academic needs can connect to form a leaning community on those platforms, eventually boosting communication and diversity of cultures. Therefore, it can be concluded that adolescents' reliance on smartphones is a rational decision of human intelligence shaped and transformed by the digital era.

2.2 Digital Manipulation

Digital manipulation is a critical contributor to adolescents' smartphone overuse. Many smartphone platforms employ algorithms with nearly unstoppable and irresistible feedback loops. User behaviors—such as viewing short videos—are continuously tracked and analyzed, allowing algorithms to refine content recommendations and sustain dopamine-driven engagement [10]. The algorithm uses the recommendation system to decide what to deliver next, to ensure continuous dopamine release and to keep users engaged [11]. The apps on smartphones have been manipulated so that one's preference or curiosity is satisfied seemingly automatically. TikTok illustrates this dynamic, with over 600 million active users globally spending an average of 73.6 minutes per day on it [10], marking it as one of the most time spent social networks. Adolescence is a critical developmental phase in which individuals are more susceptible and vulnerable to external influences and manipulation. This can be explained by Steinberg's [12] metaphor of adolescent's brain as a car with a highly reactive "engine", an underdeveloped "brake", and an inexperienced "driver" with heightened emotional reactivity, immature executive control, and limited self-regulation. Driven by hormonal changes as puberty onset, the mind "engine" of adolescents is more easily aroused, more sensitive to social interactions, and seeking more sensation. Within the prefrontal cortex, synaptic pruning and myelination work like a brake, which strengthen executive functions such as decision making, problem solving, and planning. Biologically the development of the "brake" is not complete until at least early twenties. Therefore, it seems difficult for adolescents to manage their smartphone usage in a reasonable manner, in ways such as the content and screen time management. Plus, as a new driver, adolescents' neural connections between the prefrontal cortex and the limbic system are still developing, making hard for them to coordinate the "engine" and the "brake", which is key for self-regulation and impulse control. Smartphones exacerbate this imbalance by providing unrestricted access to algorithm-based platforms that continuously adapt to users' behaviors, thereby intensifying engagement and undermining self-control.

Building on these factors, the following section critically analyzes the impacts of smartphones on adolescents learning and psychological well-being.

3. Impacts of Smartphone upon Adolescents

3.1 Advantages of Smartphones on Adolescents Learning

Mobile interventions can boost self-regulated learning (SRL) skills, which benefit students by allowing them to effectively manage their own learning. According to Zimerman (2000), SRL includes three phases, which provide a suitable framework to explore and understand how smartphone use can benefit adolescents' learning. In the first phase, learners attempt to lay out possible paths and strategies to achieve goals. Some learning apps on smartphones are designed with customizable step-by-step plans, which are useful for complex learning tasks. In the second phase, learners execute the learning task with self-control strategies. Compared with traditional learning, mobile learning offers much more diverse activities, matching different preferences of learners. Learners are able to access learning resources online and to seek support from the learning community including instructors and peers, and to monitor self-study. In the third phase, learners evaluate their progress and performance in the learning session and reflect on it by making attributions about their success or failure. Such an evaluation and reflection, feedback to the next cycle of SRL and guide learners to update their plans for higher efficiency.

Beyond its positive influence on SRL, smartphones also contribute to learners' autonomy. The concept of autonomy can be traced to Betts and Kercher's [13] Autonomous Learner Model (ALM), which provides a structured framework for cultivating independent and self-directed learning among students. Although it was initially designed to foster the development of gifted students, the concept has been widely adopted to enhance autonomous learning for diverse student populations. Smartphones encourage both independent and collaborative learning experiences and promote learners' autonomy when they can learn at their own pace as well. Especially in the field of language education, learner autonomy has grown significantly with mobile learning [14]. Smartphones, if used properly, bring advantages to adolescents' learning experience.

3.2 Mental-Health Risks of Smartphone Overuse

Excessive smartphone usage may increase the risks of mental health problems among adolescents. One of its adverse consequences is the potential reduction in optimism and resilience, especially when adolescents face academic challenges or life stressors. A large-scale study of adolescents' risk behavior (n = 54,603) [15], indicated that the positive association between prolonged smartphone use and higher rates of depressive symptoms, suicidal thoughts, and suicide attempts. Heavy smartphone users in adolescents are more likely to experience difficulties regulating their emotions and to experience happiness in daily life [16]. In addition, excessive smartphone use is related to negative emotions such as loneliness and stress. In addition, it can potentially impair cognitive functions including attention control, inhibitory control, working memory, processing capacity, and capability in social cognition [17]. The Stimulus-Organism-Behavior-Consequence (SOBC) framework was employed to explain the consequences of short-video addiction, which increases the likelihood of developing a TikTok brain and impaired attention control [11]. Besides, excessive reliance on smartphones for academic aids, especially problematic AI involvement, can hinder adolescents' self-efficacy, which refers to the confidence in their capacity to perform or master a certain task [18]. For long-term academic success, it is important for adolescents to practice critical skills, creative and independent thinking. AI dependency potentially reduces the motivation of taking those practices and therefore reduces self-efficacy of adolescents.

4. Strategies and Intervention

Although smartphones bring benefits to learning, excessive usage may introduce potential issues to adolescents' mental health. To minimize the risks, the following session aimed to explore strategies and intervention from three levels: family, school, and individual.

4.1 Appropriate Parenting Style

Adolescence is a critical phase of transition from childhood to adulthood. An increasing number of studies indicated that parenting styles during this period play an important role in education and guidance [19]. Baumrind [20] proposed three parenting styles, and amongst them, authoritative parenting is believed to be the most beneficial as it emphasizes balanced management on adolescent behavior, which can promote

self-reliant and a healthy sense of autonomy [21]. The authoritative parenting style guides adolescents through a supportive control balanced with respect. It requires parents to work with adolescents to set up rules for smartphone usage and handle potential problems such as FOMO, nomophobia, anxiety or even bullying from social media. It may also help adolescents develop self-regulation, especially impulse control, which has a long-term impact in their adulthood [22]. Thus, authoritative parenting can help reduce the mental health problems caused by smartphone overuse [23, 24].

4.2 School-Based Support

Besides appropriate parenting style, schools play a critical role in supporting adolescents' mental health as their primary social environment. School counselors shall increasingly implement positive psychology-based interventions, incorporating mindfulness, optimism, character strengths, and hope to promote students' well-being [25]. As a goal-oriented psychotherapy, Cognitive Behavior Therapy (CBT) has been used to effectively treat adolescents with the internet addiction disorder, which is one of the key consequences of smartphone overuse [26, 27]. CBT focuses on the interaction between thoughts, feelings, and actions, then increasing motivation and behavior change through structured psychoeducation. In school settings, CBT typically involves increasing adolescents' awareness of smartphone use patterns, identifying negative consequences (e.g., stress and sleep problems), and replacing maladaptive behaviors with healthier alternatives aligned with personal values. The CBT method used in schools teaches adolescents skills to become their own therapists, and shall be an effective tool to mitigate smartphone's negative impacts on their mental health.

4.3 Individual-Level Efforts

One of the most important ways to cope with smartphone overuse is auto-psychotherapy at personal level, where one's mindset plays a key role. Dweck [28] distinguishes mindset into fixed and growth mindsets, with the former viewing ability as innate and failure as threatening, and the latter conceptualizing ability as malleable and improvable through effort. Mindset theory has inspired interventions across multiple domains, including increasing studies in the field of addiction [29]. Longitudinal evidence indicates that a growth mindset supports adolescents' mental health by promoting their coping strategies [30]. By fostering a growth mindset, adolescents may be less likely to rely on recreational smartphone use to cope with frustration and more likely to engage in self-regulated, problem-focused smartphone use. Guidelines or rules from family or school are more acceptable when one view critics as something to learn from or to improve.

5. Conclusion

Adolescents' excessive smartphone use can be attributed to two main factors: rational adaptation for educational needs and digital manipulation from platforms. While smartphones offer substantial educational benefits, excessive use poses significant risks to adolescents' mental health. Promoting healthy smartphone usage therefore requires efforts from families, schools, and individual levels. At the family level, authoritative parenting can build adolescents with higher self-cognition, confidence, critical thinking, and self-regulation, which are all key factors shaping adolescents' smartphone use behavior. At the school level, interventions such as CBT can help adolescents develop skills to identify and reframe maladaptive thoughts, emotions, and behaviors associated with smartphone overuse. At the individual level, cultivating a growth mindset may encourage adolescents to interpret challenges, effort, and failure more adaptively, thereby supporting healthier smartphone use. More empirical or intervention studies from those levels may have potential values to guide effective parenting style, school therapy, and growth mindset cultivation.

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