

Dysregulated Use of Mobile/ Smartphone

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1 Background

Mobile device ownership (e.g., mobile phones, cell phones, smartphones, or tablets) is prevalent among children and adolescents living in industrialized societies. In the United States, for example, nearly 90% of 13 to 18-year-olds and 40% of 8 to 12-year-olds have their own smartphone [1].

Children use or interact with smartphones in their early years. Csibi et al. [2] demonstrated that preschool children, along with young adults, are at the highest risk for dysregulated smartphone use. Given the ability to use the internet and applications (apps) that are both immediately accessible and highly rewarding to users (e.g., social media, gaming, pornography, streaming content), con-

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cern exists regarding the development of excessive and dysregulated smartphone use, also often referred to as ‘smartphone addiction.’

Children and adolescents are developing their self-regulatory capacities (e.g., executive and inhibitory control, emotion regulation) and are therefore vulnerable to potential harm due to dysregulated use of digital devices across childhood [3]. Research on dysregulated smartphone use in these age groups has thus far examined excessive phone use and its associated risk factors and correlates. Understanding contributors to dysregulated smartphone use in childhood is essential for tailoring prevention of this type of problematic use and its consequences; further, identifying mechanisms maintaining dysregulated phone use in children is necessary to inform clinical management with affected youth and families.

2 Current State

Most research on dysregulated smartphone use has surveyed samples of young adults or college students, with varying terminology used to capture the construct (e.g., problematic/addictive phone use or the smartphone or specific types of app). For the purpose of this chapter, research specific to dysregulated smartphone use in children under 18 years will be discussed. While this chapter focuses on what we know about children’s dysregulated and excessive smartphone use from a general standpoint, it should be noted that this use can manifest in different forms, including in the excessive use of mobile social media, video games, pornography, or other online activities (e.g., streaming, online gambling).

2.1 Measurement and Prevalence of Dysregulated Smartphone Use

There is a sizeable consensus among scholars that to be considered dysregulated, smartphone use needs to be associated with a (1) significant loss of control over the behavior, resulting in (2) severe and persistent functional impairment in

daily life. There are noted limitations in the conceptualization, and hence in operationalizing dysregulated smartphone use during childhood, it is thus important to outline some of these concerns when considering the strength of the evidence.

In particular, different terms have been used to define the construct, and existing measures do not necessarily assess the same construct. Although most assessment tools target excessive or addictive usage generically (e.g., Smartphone Addiction Scale [4]; Smartphone Application-Based Addiction Scale) [5], some measures focus more specifically on risky or antisocial patterns of smartphone use, such as smartphone use while driving, that could impair functioning (Problematic Mobile Phone Use Questionnaire) [6]. There also is a debate as to whether the term smartphone addiction itself—which we do not use in the current chapter—is a misnomer [7]. First, several criteria used to define substance use disorders, such as *tolerance* or *withdrawal*, have been criticized when applied to smartphone overuse [8], of which are devices increasingly involved in daily living and tasks. Second, smartphone users are not dependent on the device per se—rather it is a problematic involvement in specific activities facilitated by a smartphone (e.g., social media, gaming, pornography consumption) [8]. To clarify these distinctions, we refer readers to the comprehensive framework proposed by Billieux et al. [9] which theorizes different pathways (e.g., impulsive pathway, reassurance pathway) leading to various types of problematic usage patterns (e.g., addictive, risky, or antisocial use). Given the discrepancies in conceptualization and measurement of dysregulated smartphone use, prevalence rates vary widely across studies.

2.2 Risk Factors and Correlates of Dysregulated Smartphone Use

Most research conducted among children and adolescents is cross-sectional, using self-report surveys of dysregulated smartphone use (with

varying clusters of symptoms) and potential correlates. Regarding risk factors, early adolescents (i.e., between 11 and 14 years old) tend to display increased dysregulated use [10]. Concerning gender, a review of the literature suggests female adolescents may have higher rates of dysregulated smartphone use compared to male adolescents [11]. Primarily using social media or gaming apps appears to also increase the risk for dysregulated smartphone use [12]. Further, poorer emotion and behavioral regulation has been identified as a risk factor for dysregulated smartphone use [13–15].

The most consistent correlates of dysregulated smartphone use include psychiatric symptoms and poor sleep health. In particular, youth reporting greater dysregulated use also endorse more internalizing symptoms (e.g., depression symptoms and anxiety symptoms) [16, 17]. Further, excessive mobile device use, including dysregulated smartphone use, has been associated with poorer indicators of sleep health, such as poorer sleep quality and shorter sleep duration [18]. Evidence also indicates that dysregulated smartphone use is associated with lower academic achievement [19].

Because there are few longitudinal studies with rigorous methodology (e.g., behavioral observations, mobile phone usage tracking, multi-informant or multimethod approaches), it is not clear whether the correlates precede, co-occur with, or follow the onset of dysregulated smartphone use. Consistent conceptualization suggests that mental health problems could drive or precede dysregulated smartphone use [20]. One exception is an examination of problematic smartphone use among late adolescents over 3 years, which found that dysregulated phone use predicted later symptoms of depression [16]. Thus, conducting longitudinal research is imperative to assess temporality, and to clarify causal relationships, if any, between dysregulated smartphone use, psychopathology, and other health concerns. Such research could be especially attentive to the potential of bi-directional causality, which could trigger a downward co-morbidity spiral in children.

2.3 Limitations of Research on Dysregulated Smartphone Use

First and foremost, most of the research based on dysregulated smartphone use has been gathered in adult samples. Evidence collected in children and adolescents remains scarce, while the age of smartphone acquisition and use is diminishing at the worldwide level. Moreover, in addition to the limited research that uses longitudinal designs, a major weakness in the literature entails the sample characteristics. Convenience samples further limit what we know about dysregulated smartphone use in children who are racially and ethnically diverse, in children from lower-income households, and among youth with co-occurring mental health concerns. A few notable exceptions include research among adolescents who have been psychiatrically hospitalized, wherein smartphones have been removed during treatment [21].

As has been suggested with younger children, it is critical to consider how the settings and environments in which a child develops may influence a child's risk for problematic media use [22]. Examining parent- (e.g., parental mediation) and family-level influences [23], as well as individual risk factors (facets of self-regulation), could be particularly illustrative for prevention efforts [14]. To elaborate, future research needs to explore the embedding of children's dysregulated smartphone use within the peer group, and within the broader social organization of society. As for the peer group, young individuals are part of a mobile youth culture in which they are socialized in relation to particular values, norms, and behaviors, as well as in relation to smartphone use. Peer group involvement may lead teenagers to engage in risky and dysregulated smartphone use, as such behaviors may be 'currency' to achieve peer popularity and acceptance [24]. As for the broader social organization of society, future research needs to further scrutinize the role of the tech industry in fostering 'addictive design' principles to reap the rewards of our attention economy [25].

Finally, we lack research examining ways in which specific design features of smartphone-mediated activities (e.g., likes, repost, or forward functions in social media, or random loot boxes in video games) promote dysregulated smartphone use in children and adolescents [25]. Beyond this, most studies in the field do not investigate how smartphone use influences human neurobiology, and evidence—mostly from magnetic resonance imaging studies—is scarce (in particular when children and adolescents are the focus of the research) [26]. This is a critical gap in the literature because children and adolescents are in a phase of brain maturation, where self-regulation abilities still need to evolve. Finally, research about dysregulated smartphone use needs to be supplemented by objective recording of actual behavior [27]. Hence digital phenotyping and mobile sensing principles might help to obtain a deeper understanding of dysregulated smartphone use [28].

3 Future Research

- How can dysregulated smartphone use be better distinguished from dysregulated use of social media, gaming, pornography watching, or other excessive involvement in activities via smartphones?
- What is the nature of the relationship and interaction between various mental health problems (i.e., internalizing and externalizing symptoms) and dysregulated smartphone use across childhood?
- How can parents and clinicians recognize early problematic smartphone use in children, and what are the effective ways to handle it?
- What kinds of technology design features [25] promote dysregulated smartphone use in children and adolescents?
- What are the neurobiological effects of smartphone use and dysregulated smartphone use in children and adolescents?

4 Recommendations

- Considering the widespread and ever-increasing use of smartphones among the youth, research needs to delineate better criteria for distinguishing between normal (even if somewhat excessive) and dysregulated smartphone use. *For this reason, it is crucial to validate psychometrically sound screening instruments for dysregulated smartphone use in children and adolescents.* Parents' appraisal of their children's smartphone use could complement and validate subjective data obtained from children and adolescents.
- *Funding dedicated to research on the longitudinal trajectories of dysregulated smartphone use and psychopathology, as well as physical health outcomes, is recommended.* Given the high rates of smartphone ownership among children and young adolescents, clarifying how, and for whom, smartphone use interferes with functioning is critical. Funding is needed especially given the *costs for time-intensive, multimethod, and observational longitudinal or randomized controlled clinical trial studies.*
- Regardless of whether dysregulated smartphone use co-occurs with physical and mental health symptoms or is a contributing factor to poorer health (or both), *youth need support in learning how to use smartphones safely and develop skills to regulate their use. Those who are already experiencing negative consequences of smartphone use require support around harm reduction strategies.* In this context, *empirical research is needed to help answer at what age children should ideally receive a smartphone—often being accompanied by unregulated access.* In answering this question, researchers will have to account for the person-specific nature of digital media effects, however, as recent studies show vast among children in terms of vulnerabilities, uses, and effects of digital media [29].

- Importantly, given the links between dysregulated smartphone use and academic achievement, *schools may seek to evaluate multi-tiered systems of support (MTSS) for healthy/adaptive phone use*. Initial research suggests that at least some students could benefit from smartphone bans at schools in terms of better academic performance [30], which have been introduced in countries such as France and China at the moment of writing. Hence, in addition to universal prevention programming on healthy digital media use, targeted practices to support youth experiencing concerns related to smartphone use could be implemented. Since an MTSS framework has not been systematically tested as it relates to smartphone (or social media) overuse, *schools should evaluate strategies and their impact on student engagement, achievement, and well-being*.
- Finally, research needs to *explore whether the recent trend to ‘digitally disconnect’ from technology offers opportunities for children and teenagers to better regulate their smartphone use, both through the development of non-technological strategies for setting limits to connectivity*. These trends include banning the phone from the bedroom or generally practicing mindfulness in relation to one’s smartphone use, to technological strategies, such as removing ‘addictive’ apps from the phone or using apps that create ‘friction’ between the user and their smartphone. *Clarifying which strategies have a strong evidence base will help clinicians, parents, and policymakers determine ways to prevent or reduce dysregulated phone use in childhood*.

Conflict of Interest and Funding Disclosures SED receives honoraria to present research on problematic media use at non-profit organizations, schools, and hospital/health systems. She has consulted with health systems and private practice clinics on problematic media use and mental health. In 2023, SED consulted with Pixel Digital Health, LLC, on their school-based prevention curriculum. She is on the board of the SmartGen Society. JDE receives royalties for several books published on posttraumatic stress disorder (PTSD); occasionally serves as a paid, expert witness on PTSD legal cases; and receives

grant research funding from the U.S. National Institutes of Health. JL was a consultant to the WHO Department of Mental Health and Substance Use (Geneva, Switzerland) and worked on projects regarding disorders due to addictive behaviors from 2020 to 2021. OLF has no conflicts of interest relevant to this chapter to disclose. CM reports no conflict of interest. However, for reasons of transparency CM mentions that he has received (to Ulm University and earlier University of Bonn) grants from agencies such as the German Research Foundation (DFG). CM has performed grant reviews for several agencies; has edited journal sections and articles; has given academic lectures in clinical or scientific venues or companies; and has generated books or book chapters for publishers of mental health texts. For some of these activities, he received royalties, but never from gaming or social media companies. CM mentions that he was part of a discussion circle (Digitalität und Verantwortung: <https://about.fb.com/de/news/h/gespraechskreis-digitalitaet-und-verantwortung/>) debating ethical questions linked to social media, digitalization, and society/democracy at Facebook. In this context, he received no salary for his activities. Finally, he mentions that he currently functions as an independent scientist on the scientific advisory board of the Nymphenburg group (Munich, Germany). This activity is financially compensated. Moreover, he is on the scientific advisory board of Applied Cognition (Redwood, CA, USA), an activity which is also compensated. VS reports no conflict of interest. AS has no conflicts of interest relevant to this chapter to disclose. MVA has no conflicts of interest relevant to this chapter to disclose. ZD acknowledges that the University of Gibraltar receives funding from the Gibraltar Gambling Care Foundation, an independent, not-for-profit charity, and the ELTE Eötvös Loránd University receives funding from Szerencsejáték Ltd. (the gambling operator of the Hungarian government) to maintain a telephone helpline service for problematic gambling. None of these funding sources aren’t related to this study, however. JB reports no conflict of interest. JL states this research was supported by the Institutional Grant of Shanghai Mental Health Center (2021-YJ15). ZD’s contribution was supported by the Hungarian National Research, Development, and Innovation Office (KKP126835).

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