

Commentary: An updated agenda for the study of digital media use and adolescent development – future directions following Odgers & Jensen (2020)

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Adolescents' use of digital media has increased exponentially over the past decade. Epidemiological data suggest that adolescents may spend more hours each day communicating with peers via electronically mediated platforms than they do sleeping, attending school, or interacting with adults. It therefore is unsurprising that investigators interested in adolescent development have become increasingly focused on digital media, including the use of mobile devices, text messaging, online gaming, and social media platforms.

Rates of some forms of psychopathology, such as suicidal and nonsuicidal self-injurious thoughts and behaviors, depression, and anxiety, also have increased over the past decade, leading many researchers to suspect a potential link between digital media use and increases in the prevalence of adolescents' psychological symptoms. Anecdotally, there are mechanisms available to support such an association. Despite their frequent electronic contact with peers, many adolescents informally report that they feel lonely and isolated from authentic, in-person social interactions. The popular press often cites adolescents' exposure to dangerous, illegal, and perhaps manipulated content via digital media that also may pose risks for the development of mental health concerns. Interestingly, however, empirical data supporting the purported link between digital media use and adolescent psychopathology have yielded controversially mixed findings.

The review offered by Odgers and Jensen (2020) thus offers an important and compelling turning point in the literature by demonstrating that the length of time adolescents spend using digital media is not reliably associated with maladaptive outcomes, such as depression, anxiety, and risk behavior. As noted by Odgers and Jensen (2020), extant work remains plagued by several notable limitations. These include a paucity of longitudinal data, an under reliance on theoretical frameworks to guide this research area, and a rapidly evolving media

landscape that alters the meaning and relevance of constructs under investigation even before data have been analyzed. Indeed, investigators have examined other types of social interactions in similar ways for decades. However, within the digital context, it remains difficult to adequately operationalize behaviors before adolescents have moved on to a new app or begun to establish new norms for how to interact within it. Nevertheless, the data simply do not currently support that the number of hours adolescents spend using digital media is associated with increased risks for psychopathology or maladaptive behavior.

Yet, it is premature to conclude that adolescents' engagement with digital media represents a passing fad or an irrelevant pastime that merely mirrors the time-tested social relationship constructs that have been examined by psychological scientists for decades. Prior theoretical work has highlighted the unique affordances and technological features of digital media contexts that shape adolescents' behavior (e.g., Moreno & Uhls, 2019). Our own framework provides evidence that this online context has fundamentally transformed not only when and how adolescents socially interact with peers, but also the meaning and impact of social interactions online and offline (Nesi, Choukas-Bradley, & Prinstein, 2018). As noted by Odgers and Jensen (2020), it is therefore imperative that research efforts move away from straightforward hypotheses regarding screen time as a main effect predictor. Rather, more sophisticated approaches are needed to better understand how digital media may be incorporated within a more holistic developmental psychopathology framework. Further, given the inherently multidisciplinary nature of the study of digital media use, researchers must integrate what is already known from such fields as social and affective developmental neuroscience, media studies, and computer-mediated communication more broadly. Below, we offer six future directions supported by preliminary work that suggest adolescents' digital media use is a rich area worthy of further exploration.

First, it is worth noting that although the research literature and mass market press has focused

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predominantly on the deleterious effects of adolescents' exposure to technology, a more balanced view may be warranted and even supported by emerging data. Among the broader population of adolescents, digital communication tools serve as an important means of social connection and friendship maintenance (Anderson & Jiang, 2018). The use of digital media creates a forum that may allow for the development of rapid and nuanced communication skills, the solicitation and provision of empathy for even minor daily hassles, identity exploration, artistic creativity, and perhaps even increasingly gender-balanced opportunities to safely express emotional vulnerability. However, the beneficial role of digital media may be especially evident among adolescents who come from underrepresented or at-risk backgrounds. Adolescents who feel ostracized or stigmatized within their offline social contexts, such as members of ethnic, racial, gender, and sexual minority groups, often report access to online companionship, resource sharing, and emotional validation that is much harder to access otherwise (e.g., Ybarra et al., 2005). Social media also may create an opportunity among clinical populations of teens to develop supportive social relationships that would have been logistically challenging, or impossible, before the digital age. Notably, these relationships may contribute to psychological resilience in the context of stress. In a recent study, for instance, we found that compared to nonsuicidal youth, suicidal youth were more likely to develop online-only friendships (i.e., friendships with peers that are maintained exclusively through digital media, without offline interaction) and that participation in online-only friendships was associated prospectively with lower suicidal ideation protective in the context of interpersonal stress (Massing-Schaffer, Nesi, & Prinstein, under review). Thus, a focus on the ways in which digital technologies may be beneficial for youth is warranted in future research. This should include studies examining specific populations among whom digital interactions may be beneficial, types of digital media use that may confer benefits, and developmental competencies that may be enhanced or accelerated (perhaps related to identity development, communication skills, emotional expression, and biological stress-response systems) through digital media use.

Second, greater clarity is needed to guide questions regarding the putative developmental risks associated with digital media use. In part, this refers to semantic clarity, as new terms are rapidly developed and adopted without standardization. For instance, investigators have varyingly used the phrases 'digital media' or 'digital technologies' to refer to specific devices (e.g., smartphones) as well as specific activities or platforms (e.g., online gaming, texting, watching YouTube); similarly, 'screentime' may refer to both old (i.e., television) and new (e.g., phone, tablet) devices, as well as a range of activities

(e.g., FaceTime video conferencing, direct messaging or social media participation). But equally necessary are more refined and nuanced questions that may help to capture the developmental and dynamic relevance of digital media use. In future work, epidemiological questions (examining cohort-based associations between digital media use and mental disorder prevalence) could be better distinguished from the study of between-groups effects (i.e., whether adolescents who spend more time using digital technology are at greater psychopathology risk than are their peers) or within-person effects (i.e., whether more digital technology use than is typical for an adolescent on a given day may correspond to, or even predict, higher levels of mental health symptoms). Moreover, this research could explore direct effects of the benefits/risks associated with digital media use, indirect consequences (e.g., due to missed activities or opportunities) that are related to adolescents' use of digital media, or even compensatory/remedial effects by which digital media use offers opportunities for development that may otherwise have been neglected or missed. Each of these approaches yields related, yet distinct hypotheses that deserve greater attention.

Third, as research departs from a focus on the number of screen time hours as a primary predictor of adolescent adjustment, it will be worth examining instead the specific behaviors in which adolescents engage online, as well as individual differences in their motivations for doing so. Now that digital media usage has become ubiquitous, variability in how adolescents use technology has become a more frequent topic of research and warrants further exploration. Established theoretical frameworks within the media effects literature (i.e., Differential Susceptibility to Media Effects; Valkenburg & Peter, 2013) have highlighted the importance of these individual differences and provide a useful framework for future scholarship on adolescents and digital media. Note that recent research examining motivations for social media usage also reveals substantial variability, with some individuals primarily utilizing tools to facilitate close, intimate relationships, and increased face-to-face or voice-to-voice contact, and others reporting a variety of other uses, including to seek status or popularity, to seek information about peers of interest, to compare one's self to idealized role models, or simply because they desire easily accessible, curated, and personalized entertainment. Several of these motivations closely align with developmental tasks that are typically cultivated in adolescence (e.g., reflected appraisal processes, social reward sensitivity), and the availability of digital technology may accelerate or significantly alter these developmental trajectories. Recent work suggests important implications of specific online experiences for the development of psychopathology. For instance, adolescents' uses of social media not generally, but rather specifically for

social comparison and feedback seeking, may be associated with depressive symptoms, perhaps even more strongly than adolescents' engagement in offline excessive reassurance-seeking behavior (Nesi & Prinstein, 2015). Furthermore, a growing body of literature has established that the experience of cybervictimization, or victimization that occurs through digital media, is associated with heightened risk for internalizing and externalizing symptoms, as well as suicide and self-injury (e.g., John et al., 2018).

A fourth area for further research involves the examination of demographic or psychological characteristics that create unique vulnerabilities (i.e., serve as moderators) among adolescents who engage in particular types of digital behaviors. For instance, research has highlighted numerous differences between female and male adolescents in their uses of digital media, and associated risks for psychopathology. Prior work suggests that adolescent females are more likely than males to use visually oriented social media sites, to post 'selfies', and to edit photographs of themselves (i.e., through filters and other digital tools). This likely reflects, and perhaps contributes to, a hyper-focus on physical appearance among young women, a need for external peer validation, and body image concerns (McLean et al., 2019). As Odgers and Jensen (2020) note, demographic differences by age in adolescents' use of digital media also will be a critical future direction for research. For instance, developmental processes that may be amplified by the social media environment, such as identity exploration and hypersensitivity to peer evaluation, are likely to be more prominent among early, versus late, adolescents. Psychosocial factors also may change the potential effects of digital media use on psychological adjustment. For instance, our own work suggested that among low social status teens, but not among those with average or high levels of status, online social comparison (or status seeking) creates unique vulnerabilities for low self-image, social distress, and perhaps even online harassment (see Nesi et al., 2018). Unfortunately, too few studies offer a thorough examination of how demographic or psychological risk factors may transact with the affordances of digital environments to create both adaptive and maladaptive social experiences online.

A particularly intriguing and fifth new direction for research may reflect an intersection between research in developmental social neuroscience and digital media usage. In mostly disconnected literatures, findings have revealed a unique sensitivity to social rewards among adolescents that likely results from a proliferation of dopamine and oxytocin receptors within the limbic system at the outset of pubertal development. This neural reorganization orients adolescents toward social stimuli, increasing their sensitivity to attaining social rewards and

avoiding social loss (Nelson, Jarcho, & Guyer, 2016). Investigators have increasingly focused on the social motivations that may drive risky and impulsive behavior, particularly under conditions of emotional distress. Interestingly, social media seems exquisitely designed to capitalize on these normative adolescent vulnerabilities, offering truly irresistible opportunities for teens to 'bar-press' for social rewards all day and night, and a somewhat realistic fear of missing out on social experiences occurring online (i.e., which could contribute to significant 'digital stress' Steele et al., 2019). Yet, the extent to which adolescents' appetite for, or neural sensitivity to, social rewards may be affected by digital media usage has rarely been explored. Testing whether digital media use accelerates, exacerbates, or significantly alters teens' already heightened neural sensitivity to social rewards will be an especially critical direction for researchers interested in adolescent social development. Indeed, prior work reveals that social media stimuli trigger neural circuits involved in reward processing and may even do so in an especially powerful manner (Crone & Konijn, 2018).

Last, it is important to note that adolescents' digital media usage has not only transformed social behaviors online, but also perhaps changed the meaning of social constructs that have been studied in psychological science for decades before the advent of social media. While Odgers and Jensen (2020) note that prior work has described the use of online communication to support the traditional tasks of offline friendships, very little work has explicitly examined differences between online and offline social constructs. For example, no prior known research has examined whether adolescents' popularity may now be less relevant for adjustment in a world where teens may amass online status instead or whether the determinants of adolescents' friendships and romantic relationships (e.g., proximity, companionship) may now more strongly reflect behaviors that can be expressed online (e.g., emotionally intimate expression, number of followers). Similarly, it is unknown whether adolescents' specific digital media behaviors might inhibit the development of fundamental skills that were previously promoted largely through face-to-face interactions. For example, it is not known how digital media use may promote or restrict romantic relationship skills, written expression, adolescents' drive for external vs. intrinsic reinforcement, and the knowledge of the fallacy of an imagined audience.

In sum, Odgers and Jensen's (2020) review offers evidence that hopefully will close a door on the initial wave of studies examining adolescents' screen time as predictor of exclusively maladaptive outcomes, while opening opportunities for new research questions. We hope that the next decade of research on digital media use will leverage theory and prior work

on social relationships, developmental psychopathology, and a broad array of adolescent outcomes. Importantly, Odgers and Jensen (2020) call attention to the ways in which research on digital media is communicated to the public, practitioners, and adolescents themselves. We hope that the message conveyed from their review is *not* that digital media does not matter for adolescent mental health, but rather, that well-designed and interpreted studies on this topic are more important than ever. Digital media is here to stay, and we are excited for an ambitious new agenda that will guide the next generation of research aiming to improve the lives of adolescents in the digital age.

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