# 11 Digital Media in Adolescent Health Risk and Externalizing Behaviors

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Adolescent externalizing and health risk behaviors are some of the leading causes of morbidity and mortality among young people (Blum & Qureshi, 2011; Kann et al., 2018) and are of significant public health concern. Adolescence is a key period for understanding these types of behaviors, as they tend to emerge and peak in this stage (Claxton & van Dulmen, 2013; Krieger et al., 2018). Importantly, adolescence is not only a key risk corridor for risky and problem behaviors, but also for entry into new social and digital spaces; most social networking sites (and their regulators) set age 13 as the age at which youth can have their own accounts (Jargon, 2019). Co-construction theory (Subrahmanyam et al., 2006) asserts that adolescents create (and co-create) their online worlds and experiences to match developmental needs, and thus we should not be surprised that adolescents' developmentally appropriate affinities for risk taking, boundary testing, and affiliation would all manifest in some form in digital spaces, and that digital activities and offline behaviors would be mutually influential.

*How* youth digital media use and externalizing/risk-taking behaviors intersect is somewhat more complicated. In many domains, adolescent rates of health risk behaviors (substance use, sexual risk taking, violence perpetration) are at their lowest levels in decades (Lewycka et al., 2018; Twenge & Park, 2017), which some have asserted may be related to the proliferation of digital media and *displacement* of time (previously spent engaging in risk behaviors) in favor of time online and new forms of leisure, entertainment, and relationship formation (Kraut et al., 1998). Others have posited that youth engagement in online communities allows for covert or hidden coordination or reinforcement of deviancy and rule breaking, and thus technology may be linked with increased problem behavior (Ehrenreich & Underwood, 2016). In fact, the associations are not always straightforward, and thus this chapter seeks to summarize and integrate the research findings that have been published to date on these mutual influences and the mechanisms that underlie them.



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## State of the Evidence on the Role of Digital Media Use in Externalizing Behaviors

Here, we consider the intersections of digital technologies and several domains of externalizing and health risk behaviors (including delinquency, aggression, sexual risk taking, and substance use). For each externalizing or risk-taking behavior, we will review the research around two key questions: 1) Does the *quantity* of engagement with digital media impact adolescents' externalizing and health risk behaviors? 2) What is the role of adolescents' *qualitative* experiences online in these behaviors?

### Problem Behavior and Delinquency

Problem behavior is generally conceptualized to include rule breaking, delinquency, antisocial behavior, and other acts that go against societal norms. In the digital age, problem behavior can (and does) occur online, and thus here we attend both to online manifestations of problem behavior alongside the ways in which adolescent engagement with digital media is associated with offline delinquency. As with all the externalizing and health risk behavior outcomes included here, we first consider whether there are consistent associations between the *quantity* of adolescent digital media engagement (e.g., screen time) and their problem behaviors before turning our attention to the *quality/nature* of online experiences.

#### Quantity of Digital Media Use and Problem Behavior

Some recent studies have suggested that more frequent social media use is tied to more concurrent conduct problems and delinquency among both younger (Ohannessian & Vannucci, 2020) and older (Galica et al., 2017) adolescents. However, these cross-sectional associations have not entirely held up in longitudinal research, as seen in a recent study where time online was linked to later internalizing symptoms and to comorbid internalizing and externalizing symptoms, but not externalizing symptoms in the absence of internalizing (where externalizing was measured as a combination of inattention, impulsivity, and antisocial behavior; Riehm et al., 2020). Similarly, our own research suggests that social media use and phone ownership in early adolescence are not associated with later conduct problems (once baseline conduct problems are accounted for) and that days on which young adolescents use more technology for a variety of purposes do not tend to be days when they report a greater likelihood of conduct problems (Jensen et al., 2019). However, some longitudinal associations have been found: Research with Korean adolescents suggests that technology use for entertainment is related with later online and offline delinquency, and internet use for communication is related to later offline delinquency (though internet use for information seeking seems to

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protect against offline delinquency; Lim et al., 2019). Other studies have investigated the opposite direction of effects (that earlier conduct problems might increase later social media engagement), which has been supported from adolescence (delinquency) into young adulthood (social media use; Galica et al., 2017) but not from childhood (behavior problems) into adolescence (screen time; Männikkö et al. 2020). Taken together, the displacement hypothesis is not strongly supported by the literature (i.e., there is little evidence that those youth who are online most are getting into *less* trouble) and there is considerable inconsistency in findings around whether digital media engagement might be linked with higher problem behaviors over time. More experimental, longitudinal, and ecologically valid research is needed in this domain.

### Overlap between Online and Offline Delinquency

Online delinquent and problem behavior can take many forms. A commonly used typology classifies cybercrime and cyberdeviance into four types: cybertresspass (e.g., malware), cyberpornography, cyberviolence (e.g., cyberbullying, trolling, flaming), and cyberdeception and theft (e.g., digital piracy; Graham & Smith, 2019; Wall, 2001). For instance, some youth trespass into off-limits online spaces in ways that could have severe criminal penalties (e.g., cracking into bank accounts) whereas others trespass in ways that are less likely to be prosecuted but nonetheless problematic (e.g., hacking into a peer's social media account). The prevalence of these (usually covert) behaviors among teenagers is understudied and hard to ascertain, but surveys from the security industry suggest that up to 40% of youth have hacked into a social media account, email, or bank account (primarily "for fun" and "out of curiosity;" Richet, 2013).

In reality, the line between online and offline spaces in delinquency is a blurry one. Indeed, emerging evidence suggests that long-standing types of offline delinquency now also manifest online, and the two contexts are not entirely separable. For example, qualitative interviews with ex-gang members and violence-prevention workers have revealed the existence of so-called digitalist gangs (Whittaker et al., 2020) who use social media as a tool for attention for themselves and their gang. These gangs are more likely to be newer and less established (compared to less digitally connected "traditionalist" gangs), and to engage in activities like boasting, taunting, and posting videos of violent confrontations online. These types of online posts can serve to spark very real offline violence, as seen in the so-called Twitter feuds covered by the popular press (Patton et al., 2013). In a recent study of Black youth involved in gangs in Chicago, 11% of posts included a picture of a gun, although not all these pictures were necessarily shared with aggressive intent (Patton et al., 2019). Further, research suggests that gang members are more likely than nongang members to engage online in piracy,

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harassment, threats, and the facilitation of drug sales, assault, theft, and robbery (Pyrooz et al., 2015), suggesting considerable overlap between online and offline crime.

Youth who engage in delinquent behavior in both online and offline formats may be at particular risk. A recent study found that those adolescents (ages 12–17) who committed both online and offline delinquency were the most likely to experience increased risk factors and fewer protective factors, whereas the online delinquency only group had fewer risk and more protective factors and the offline delinquency only group fell in between the two (Rokven et al., 2018). In a rare longitudinal study, Korean youth who engaged in cyber-delinquency were more likely to report more engagement in later offline delinquency (Nam, 2020), which may suggest that, at least for some, online delinquency may serve as a gateway to later offline (and potentially higher consequence) crime.

### Online Depictions of Offline Delinquency

In addition to delinquent acts performed online, social media can be used to portray delinquent acts performed offline. A study of undergraduate students revealed that exposure to online depictions of delinquency (including abusing an intimate partner, illegally carrying a weapon, physical fighting, selling drugs, driving while under the influence, setting fire to property, stealing, and vandalism) was frequent, with 81% of students being exposed to at least one offending behavior online (McCuddy & Vogel, 2015). Furthermore, those students who viewed more delinquency in their online social networks were more likely to engage in delinquent behaviors themselves (though this was a much stronger association in smaller social networks). Unfortunately, the cross-sectional nature of this study does not allow us to ascertain the direction of effects (i.e., whether youth who engage in delinquent behaviors are more likely to affiliate with other youth who do so and post about it online, or whether exposure to online depictions of delinquency may shift youth norms and behaviors).

In an innovative program of research, the Blackberry project (Underwood et al., 2012) has followed a sample of students (and their text messages) over the course of high school. Qualitative coding of real, naturalistic text message data has revealed that most of these teens engaged in at least some antisocial text messaging, and that this text messaging about antisocial activities was associated with increases in multiple reporters' accounts of rule-breaking behavior (Ehrenreich et al., 2014). Furthermore, findings suggest that the reason for associations between peer network delinquent texting topics and youth externalizing problems might be better characterized as selection (externalizing adolescents choosing deviant peer groups) rather than socialization (deviant peer groups driving externalizing behavior; Ehrenreich et al., 2019).

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## Aggression, Bullying, and Violence

Here, we consider how digital media use may relate to both physical and social/relational forms of aggression (the latter of which is particularly relevant online; Archer & Coyne, 2005). Indeed, aggression online can take a number of forms, including online bullying, harassment, and discrimination. Prevalence estimates vary widely and range from 1.0% to 61.1% of youth experiencing cyber-victimization and 3.0% to 39.0% of youth engaging in cyber-perpetration of aggression, suggesting that social media is a prominent context for cyberbullying (Brochado et al., 2017; Kowalski et al., 2019; Thomas et al., 2015).

Research suggests that many of the social roles that serve to instigate and sustain traditional/offline bullying also can be seen online. Sterner and Felmlee (2019) identified distinct roles of Perpetrator, Reinforcer, Victim, Defender, Bystander, and Informer around cyberbullying on Twitter. Reinforcers and defenders tended to enact these roles by commenting or by liking posts of the perpetrator or victim respectively, whereas informers tended to alert a site administrator to the cyberbullying incident. Interestingly, there were an average of 12 people directly involved (in one of the above roles) in each case of aggression on Twitter, suggesting that some features of social media (e.g., its permanence; Nesi et al., 2018a, 2018b) may increase the reach of cyberbullying experiences beyond those typically seen in face-to-face bullying.

### Quantity of Digital Media Use and Online and Offline Aggression

Some have asked whether level of engagement with digital media (e.g., time spent online) presents a risk factor for cyber and traditional aggression. In a recent meta-analysis, links between general social media use and offline violence-related behaviors could not be formally synthesized because only three studies were available; however, the available studies each show that youth who are using social media more frequently tend to report more concurrent violence-related behaviors (Vannucci et al., 2020). Some cross-sectional research has also suggested that adolescents who spent more time online were more likely to be cyberbullying perpetrators (Hinduja & Patchin, 2008), with those who spend particularly high and problematic levels of time online being at the most risk (Kircaburun et al., 2020) and those with particularly low levels of time being (understandably) at very low risk of cyber-perpetration (Zych et al., 2019). It may be that in the average range of technology use, time online and time on social media are not closely related to cyberbullying perpetration.

### Overlap between Online and Offline Aggression

Youth who perpetrate bullying online appear to mostly be the same youth who perpetrate bullying offline (Fanti et al., 2012; Hinduja & Patchin, 2008;

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Olweus, 2012; Sourander et al., 2010) as confirmed by a meta-analysis that concluded that traditional bullying perpetration is among the strongest predictors of online bullying perpetration (Kowalski et al., 2014). It is common for cyberbullying perpetrators and victims to know one another in person – for example in 57% of the cyberbullying cases at a high school the victim reported that the perpetrator was a schoolmate (P. K. Smith et al., 2008). In a profile analysis, youth who engaged in cyberbullying tended to engage in all other types of bullying as well (relational, verbal, and physical offline bullying) and were at elevated risk for other externalizing behaviors (e.g., using substances and carrying weapons; Wang et al., 2012). A longitudinal analysis of the transactional associations between face-to-face bullying perpetration and cyberbullying perpetration found that higher levels of earlier offline bullying perpetration predicted increases in cyberbullying perpetration (controlling for previous cyberbullying perpetration), but cyberbullying perpetration did not predict increases in offline bullying perpetration (Espelage et al., 2012); this suggests that cyberbullying does not appear to be a first foray that grows into later offline bullying perpetration, but rather that offline bullying perpetration may come to extend to online environments.

### Exposure to Online Violent Content and Offline Aggression

The impact of exposure to violent content in video games has been much talked of and controversial. Scholars have proposed that violent video games normalize aggression and can elicit and reward aggressive cognitions (e.g., hostile attributions), quick violent reactions, and aggressive fantasies (Gentile et al., 2014), though others have noted that selection effects are also likely at play (Breuer et al., 2015; Heiden et al., 2019). Early in the field's history, a meta-analysis of early video game research concluded that evidence strongly supports exposure to violence in video games as a causal risk factor for increased aggressive behavior (Anderson et al., 2010), but this finding has not entirely held up over time, with more recent registered reports (e.g., Przybylski & Weinstein, 2019) and meta-analyses of high-quality longitudinal studies finding zero to tiny associations between violent video gaming and later violent behavior (Drummond et al., 2020). One domain that has not yet been extensively researched is that of the potential intersections between social aspects of online gaming and in-game aggression, which has gained growing attention with the advent of online multiplayer gaming (with live video, audio, and or/chat streams; Freeman, 2018). More information is needed on whether the synchronous and semi-anonymous online multiplayer gaming context may socialize and/or reinforce youth verbal (e.g., hate speech, insults) or even serious physical aggression (e.g., the phenomena of SWATting; Lamb, 2020) in ways not yet captured in the literature to date.

## Sexual Risk Taking

In adolescence, high risk sexual behaviors include behaviors that increase risk of unintended pregnancy, HIV infection, and other STIs, including early age at first intercourse, multiple sexual partners, concurrent sexual partners, having one-night stands, using drugs or alcohol prior to having sexual intercourse, having sex in exchange for money, and lack of pregnancy prevention methods (Kann et al., 2018). Sex and sexual risk taking have always been salient in adolescence, and in the digital age they are increasingly also taking shape in online spaces.

Social media and platforms that allow private messages are prevalent among youth to develop and maintain their romantic relationships, with only a small minority of adolescents accessing formal dating apps (which are meant to be illegal for minors; Vandenbosch et al., 2016). About 8% of all teens have met a romantic partner online (Lenhart et al., 2015) and 30% of sexually experienced adolescents have met a sexual partner online, with those who met partners online more likely to engage in unprotected sex and with multiple concurrent sexual partners (Ybarra & Mitchell, 2016). In this domain, social media may also contribute to health, safety, and privacy risks. Youth are exposed to and engage with sexual content in media, including pornography and sexting, that may impact their offline sexual behavior. In addition, youth may engage in online sexual behaviors such as cybersex or coordinating encounters with potential partners (including strangers). People have been very concerned about the risk that children will be targeted by sexual predators online, but empirical research suggests that this is in actuality very rare (Ybarra & Mitchell, 2016).

### Quantity of Digital Media Use and Sexual Risk Taking

In a recent meta-analysis, the average association (across 14 cross-sectional studies) between social media use and sexual risk taking was $r = 0.21$ (95% CI 0.15, 0.28), representing a small to medium significant association, with stronger associations for younger adolescents and very small associations for later adolescents (Vannucci et al., 2020). Three of these studies included in the meta-analysis captured online sexual acts, including frequency of sexy online presentation (Vandenbosch et al., 2016), frequency of risky sexual online self-presentation (Koutamanis et al., 2015), and frequency of sending sexts (Gregg et al., 2018) whereas the remaining 11 studies captured more traditional indicators of adolescent risky sexual behavior. It does, then, appear that social media use and sexual risk taking tend to co-occur, though the cross-sectional nature of all studies makes it impossible to parse the direction of effects.

### Exposure to Online Sexual Content and Offline Sexual Risk Taking

Exposure to sexual content online (e.g., internet pornography) has been linked to offline sexual risk taking, though, as with much research reviewed in this

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chapter, a lack of longitudinal or experimental designs limits ability for causal inference. For instance, a meta-analysis of six cross-sectional studies revealed that exposure to sexually explicit websites was linked to higher odds of intercourse without a condom in two studies and was perhaps related to having ever had sexual intercourse and having had multiple partners, though significant statistical heterogeneity made meta-analysis difficult, and most studies were weakened by their limited accounting for important potential confounding variables (L. W. Smith et al., 2016). In a relevant experiment on social norms, young adults who were assigned to and viewed sexual content posted by "peers" in a lab-generated Facebook feed tended to estimate that more of their peers engaged in sex without a condom, and in turn expressed higher willingness to engage in this risky behavior themselves (relative to young adults assigned to view nonsexual content on the Facebook feed; S. D. Young & Jordan, 2013). This highlights the important role of descriptive norms in intentions around risky behaviors and is consistent with longitudinal research that shows that adolescents' self-report of exposure to online sexual content is related to normative beliefs and, in turn, increased likelihood of intentions to engage in and actual sexual behavior (Bleakley et al., 2011).

### Sexting, Cybersex and Offline Sexual Risk

Sexting refers to the exchange of sexually explicit text or images, usually via private messaging, in a way that need not be synchronous or reciprocal (Daneback et al., 2005). Cybersex is a related concept that can occur via computer (rather than just by text or private message) and encompasses synchronous sexual talk and/or behaviors with a partner over video, voice, or text chat and that often includes an element of sexual gratification through masturbation (Daneback et al., 2005; Judge & Saleh, 2013). Although sexting and cybersex share some features with other types of exposure online to sexual content (e.g., pornography), they are also distinct, as they are usually characterized as more interactive as opposed to one-sided consumption.

Sexting is prevalent in adolescence, with between a quarter to a half of teens reporting engaging in sexting to some extent (Baiden et al., 2020; Frankel et al., 2018; Maheux et al., 2020). Sexting can take many forms, with qualitative research with emerging adults revealing that sexting occurs in various relational contexts including casual sexual, dating and intimate relationships, and nonsexual peer contexts (Burkett, 2015). A study conducted in Belgium found high rates of textual and visual online sexual behavior (with consistently higher rates among boys than girls); about half of teens (55% of boys, 40.6% of girls) had attempted to sexually arouse their romantic partner via online communication, 20% of teens reported sending sexy pictures to a dating partner, and 7.6% of adolescents reported undressing in front of a webcam for a romantic partner (Beyens & Eggermont, 2014). A profile analysis of adolescent women revealed that they tended to follow one of four

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patterns with relation to online sexual behavior: abstinent, participating in multiple behaviors including risky behaviors, mostly seeking sexual content, and mostly receiving sexual contacts (Maas et al., 2018). Motivations for sexting include sexual arousal, humor, flirtation, and seeking reassurance about appearance. Sexting and cybersex are in some ways normative (and present little risk for negative outcomes like STI and unintended pregnancy) but can also carry their own risks, including receiving unwanted and unsolicited sexts, privacy violations, and feeling pressured to engage in sexting (Burkett, 2015).

Cross-sectional research seems to suggest that those youth who are more sexually active and (to a somewhat lesser extent) who engage in certain types of sexual risk behaviors are also more likely to be engaged in sexting (Frankel et al., 2018; Romo et al., 2017), with photo-based sexting being more strongly tied to offline sexual activity than text-based sexting (Houck et al., 2014). A meta-analysis of 8 studies that examined sexting risk for sexual and risky sexual behaviors concluded that those youth who sexted were significantly more likely to be sexually active, to have had multiple past year partners, and to have used alcohol or drugs before sex (L. W. Smith et al., 2016). A separate meta-analysis of 15 studies (14 cross-sectional) with a wider age span (including adolescents and young adults) found that youth who engage in sexting are moderately more likely to have lifetime and recent sexual experience, and slightly more likely to engage in unprotected sex and have more sexual partners (Kosenko et al., 2017). Rare longitudinal studies on this topic suggest that sexting may serve to increase risk for later offline sexual activity and risk taking. For instance, one study concluded that sexting is associated with later sexual activity but not with later risky sexual activity (sex without a condom, substance use before sex, and multiple sexual partners; Temple & Choi, 2014). Similarly, degree of engagement with chat rooms, dating websites, and erotic contact websites has been associated with later sexual activity in both sexually experienced and nonsexually experienced Belgian adolescents (Vandenbosch et al., 2016). Finally, a study of objectively coded text message content suggests that evidence of sexting at age 16 was associated with reporting an early sexual debut, having sexual intercourse, having multiple sex partners, and engaging in drug use in combination with sexual activity two years later (Brinkley et al., 2017). This is consistent with a profile analysis that suggested that youth who engaged in the riskiest behavior over time engaged in both online sexual risk behaviors (e.g., sexting or arranging a sexual encounter with someone met only online) and offline sexual risk behaviors (e.g., hooking up and unprotected sex; Baumgartner et al., 2012).

As with the other outcomes reviewed here, more longitudinal and experimental research is needed to ascertain what drives these associations: Are sexually active youth more likely to also express that sexuality in sexting? Does sexting serve as a gateway to later in-person sexual behaviors and risk

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taking? Are sexting, sexual activity, and sexual risk taking driven by other risk factors (e.g., disinhibition; Dir & Cyders, 2015)? Only well-designed empirical studies will tell.

## Substance Misuse

Substance misuse is a major public health concern among adolescents, with implications for long-term mental and physical health (Grant & Dawson, 1998; Substance Abuse and Mental Health Services Administration, 2019). Here, we consider research at the intersection of technology and all classes of substance use (including alcohol, prescription and over-the-counter medicine, tobacco, marijuana, and other illicit drugs), though the existing literature (and thus too our review) focuses most closely on the most prevalent adolescent substance use type: alcohol use and misuse.

As with the other externalizing and health risk outcomes considered here, we will review studies on both the quantity of engagement with digital media (and its potential implications for adolescent substance misuse) and research on how adolescents engage around alcohol online. Unlike previously considered outcomes of problem behavior/delinquency, aggression, and sexual risk taking, substance use does not have an online analogue. Although teens can (and do) engage in online expression of sexual behavior and risk (e.g., sexting), delinquency (e.g., hacking and cracking), and aggression (e.g., cyberbullying), there is as of yet no way that adolescents can consume alcohol or other substances online. They do, however, post in both text and pictures (Moreno et al., 2015) about offline alcohol and drug consumption, view such posts from their friends, and use digital media to glorify, rehash, coordinate, and even lament drinking episodes online (D'Angelo et al., 2014; Hebden et al., 2015; Jensen et al., 2018). We will thus here consider whether engaging with digital media in these different ways is associated with riskier adolescent substance use outcomes. Although alcohol-related marketing does occur online, research suggests that most adolescent exposure to alcohol-related content online is noncommercial (posted by individuals in the social network; Cavazos-Rehg et al., 2015) and thus alcohol marketing is not considered here.

### Quantity of Digital Media Use and Substance Use

On the whole, research does seem to suggest that those youth who are most engaged with digital media are at least somewhat more likely to misuse alcohol and other substances. This is captured in a recent meta-analysis that identified 14 cross-sectional studies of amount social media use and adolescent substance misuse, with an average pooled effect size of $r = 0.19$, in the small to moderate range (Vannucci et al., 2020). Individual study findings suggested that adolescents who are more engaged with social media are also more likely to report regular alcohol use and binge drinking, tobacco use, and marijuana use compared to those who are less digitally connected (Gommans et al., 2014;

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Kaufman et al., 2014; Ohannessian et al., 2017; Sampasa-Kanyinga & Chaput, 2016; Spilková et al., 2017). These associations also seem to persist in adolescents even once potential confounds of impulsivity, sensation seeking, peer relationships, and symptoms of depression are controlled for (Brunborg et al., 2017). One recent longitudinal study suggested that frequency of social media posting and "checking in" on social media was associated with greater likelihood of subsequent initiation of tobacco and cannabis use, though other types of digital media use (e.g., "chatting and shopping" and "reading news/articles and browsing photos) were less consistently linked to risk of subsequent tobacco and cannabis initiation (Kelleghan et al., 2020). Of note, some research has suggested that much of these observed associations may be due to exposure to alcohol-related content on social media, and that once this mediator is partialed out there is no unique association between digital media engagement and alcohol use (Erevik et al., 2017). We thus turn our attention next to the types of alcohol-related content posted and viewed on social media.

## Alcohol- and Drug-Related Posting and Substance Use Behaviors

Adolescents post about substance use on social media in a myriad of ways and for various purposes. These can include text-based posts describing alcohol attitudes, intentions, and behaviors (that make up over half of youth alcohol-related posts) as well as image-based alcohol depictions (Moreno et al., 2015). For the most part, when images featuring alcohol or other substances are shared on social media, they tend to be posted by someone in the picture rather than others (Morgan et al., 2010). and alcohol depictions tend to be incidental images (e.g., a person holding a drink while a photo is taken) rather than the primary focus of the image (e.g., a picture of drinking games or a person visibly drunk; Hendriks et al., 2017). Among this sample of Dutch young people aged 12–30, alcohol posting among adolescents under age 18 (legal drinking age) was rare, but young adults endorsed mostly posting images that include alcohol for "entertainment" and choosing *not to post* alcohol-related images because they thought it was "stupid," because they drank little, to reduce risk of a future employer seeing it, and because it was not consistent with their identities (Hendriks et al., 2017). A distinction between legality or illegality of behavior is also relevant for marijuana depictions on social media, which an even larger majority of youth see as inappropriate to post (Lauckner et al., 2019). Nonetheless, when adolescents post about substance use on social media, posts are usually positive in nature, pro-alcohol posts outnumber anti-alcohol posts by a factor of more than 10, and negative consequences of use (e.g., hangovers or embarrassment) are rarely depicted (Cavazos-Rehg et al., 2015; Moreno et al., 2010, 2013).

It is quite clear from the literature that adolescents who post more alcohol-related content on social media tend to drink more (Roberson et al., 2018; Stoddard et al., 2012; Westgate & Holliday, 2016). In a meta-analysis of

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19 studies on alcohol-related social media use (that included posting, viewing, and liking others' alcohol-related posts), alcohol-related social media use was moderately and significantly related to alcohol consumption and alcohol-related problems, with stronger associations emerging in cross-sectional and self-report (of alcohol-related social media use) studies compared to longitudinal and observational research (Curtis et al., 2018). Indeed, posting about alcohol is associated with self-reported drinking frequency, heavy drinking, drinking quantity, and likelihood of alcohol use disorder (Glassman, 2012; Marczinski et al., 2016; Moreno & Whitehill, 2014).

Although far less studied, there is also some evidence that similar linkages may be at play for other substances as well. For tobacco, adolescents who posted positive tobacco-related content on Twitter were more likely to report past month cigarette and any tobacco use relative to those who did not post about tobacco on Twitter (Unger et al., 2018), and although posting about tobacco use is much less common than alcohol use among Dutch emerging adults, cigarette-related social media posts are nonetheless associated with real-life cigarette use (Van Hoof et al., 2014). For marijuana, research in young adults suggests that they do indeed post cannabis-related images on Instagram (Cavazos-Rehg et al., 2016) and that posting marijuana-related content to social media is associated with more pro-marijuana attitudes and actual marijuana use among racial-ethnic minority college students from low-income areas; however, no such associations emerged for alcohol depictions, alcohol attitudes, and alcohol use, which may suggest that these associations are most relevant when a behavior is illegal or less normative (Lauckner et al., 2019). Recent research suggests that marijuana-related posting is not uncommon even in adolescence, however, which underscores the necessity of more research in this domain. For instance, in Washington (a state where cannabis is legal for recreational use among adults over the age of 21), nearly a third of adolescents reported sharing marijuana-related content on social media, with about 11–13% sharing images or videos of people smoking marijuana and 24% sharing marijuana-related memes (Willoughby et al., 2020).

Nearly all of the above research has examined the role of alcohol- and drug-related posting to public (e.g., Twitter) or semi-public (e.g., Facebook, Instagram) platforms, but much less research has attended to the role of private communications (e.g., private direct messaging and text messages). However, the research that has examined private messaging suggests it plays a key role. One study found that about a quarter of late adolescents (in the summer after 12th grade) reported discussing substance use on public social media, whereas nearly half report doing so via private digital channels (George et al., 2019). In our own work (Jensen et al., 2018) college students in the USA and Korea have reported that they prefer private text messages to public-facing social networking sites to facilitate alcohol involvement, and private text messaging was more related than public social media to frequency of alcohol use and heavy episodic drinking. We have also shown that counts

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of alcohol-related words in sent and received private text messages are associated with higher odds of same-day drinking (Jensen & Hussong, 2019). Longitudinal research suggests that these associations may be bidirectional, with those youth who had previously been using substances being more likely to evidence later public and private substance-related discussions, and public and private conversations predicting later increases in marijuana use (but not alcohol or tobacco use; George et al., 2019). Taken together, these findings highlight the importance of future research that attends to how private digital communication channels may be uniquely indicative of substance use risk.

### Exposure to Others' Alcohol- and Drug-Related Posts and Substance Use Behavior

In addition to adolescents' own posting behaviors being associated with substance use and misuse, so too is there a sizable body of evidence to suggest that adolescents' peers' posts also have the potential to impact their behavior. The majority of studies seem to support the hypothesis that exposure to others' substance use online is related to pro-substance attitudes and actual substance use behavior (Cabrera-Nguyen et al., 2016; Curtis et al., 2018; Pegg et al., 2018). Results from recent longitudinal designs are particularly informative. Even after controlling for developmental risk factors for initiation of alcohol use, exposure to peers' alcohol-related social media content predicted an adolescent's likelihood of drinking initiation one year later (Nesi et al., 2017). Similarly, adolescent exposure to alcohol-related social media content predicted alcohol consumption six months after exposure after accounting for both the adolescent's and their peers' drinking habits (Boyle et al., 2016). Some studies suggest that different types of exposures may be more influential and long-lasting: Adolescents who had more exposure to pictures (but not text) about friends partying or drinking in their social networks were more likely to increase or maintain their smoking levels over time (Huang, Unger, et al., 2014). This is consistent with findings that image-based alcohol-related content posted by college freshmen may be more related to substance use intentions down the road than purely text posts on social media (D'Angelo et al., 2014). Among young adults in Norway, disclosure of and exposure to alcohol-related content online was tied to later alcohol use, though the strength and consistency of these associations were reduced once relevant covariates were accounted for (Erevik et al., 2017).

An innovative experiment confirms this pattern: Litt and Stock (2011) created two Facebook profiles, one that portrayed alcohol use as normal and a control that displayed no alcohol; after viewing one of the two profiles participants were assessed on willingness to use alcohol and alcohol attitudes. Participants who viewed the alcohol normative profile had higher levels of willingness to use alcohol, more favorable images of alcohol users, more positive attitudes toward alcohol, and lower perceived vulnerability to the consequences of alcohol use, suggesting that exposure affects attitudes

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concerning alcohol. Results from Roberson and colleagues (2018) build on this idea – higher numbers of people who display drinking in an individual's online network predict more pro-alcohol attitudes. Taken together, it does appear that exposure to substance use in adolescents' online peer networks is associated with increased risk for substance use and misuse, and we thus turn next to potential explanatory mechanisms for this association.

## Mechanisms

As seen above, largely separate literatures suggest that adolescent externalizing (aggression and delinquency) and health risk (substance use and sexual risk taking) behaviors intersect with digital media use in myriad ways, with more support for the importance of *activities* youth engage in online rather than just the *amount* of time they spend on screens in co-occurring with and potentially impacting their risky behaviors. Here, we consider several potential mechanisms for these observed associations (shared vulnerability, peer selection and socialization/influence, identity expression, and whether there are unique predictions to be gained) that largely apply across the spectrum of externalizing and health risk outcomes.

### Shared Vulnerabilities

A long body of research suggests that externalizing and health risk behaviors (e.g., sexual risk taking, substance use, aggression, and problem behavior) frequently co-occur, and are likely driven by the same vulnerabilities (S. E. Young et al., 2009). So too we are beginning to find that youth who are engaged in online risky or externalizing behaviors are likely to be involved in other behaviors on the externalizing spectrum. For instance, we have seen that perpetrators of online bullying are more likely to engage in substance use and offline conduct behaviors (Sourander et al., 2010; Ybarra & Mitchell, 2004). We also see that sexting is related to nonsexual risk-taking behavior, with adolescents who engage in sexting having higher odds of tobacco and alcohol use (Kosenko et al., 2017).

One compelling explanation for this co-occurrence is that the same risk factors likely predispose youth to multiple types of (online and offline) externalizing spectrum and health risk behaviors. For instance, online antisocial behaviors are associated with many of the same risk factors for in-person antisocial behaviors (i.e., narcissism, exhibitionism, and exploitativeness; Carpenter, 2012). Online aggression and cyberbullying seem to be facilitated by long-known individual (e.g., low agreeableness, moral disengagement, hyperactivity), family (e.g., low parental monitoring), peer (e.g., deviant peer group), and community factors (e.g., low school safety; Espelage et al., 2012; Kowalski et al., 2014; Marín-López et al., 2020). Likewise, similar risks are

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associated with youth engagement in online and offline sexual behavior: sensation seeking, low levels of education, less parental monitoring, and less family cohesion (Baumgartner et al., 2012; Ševčíková et al., 2014). In particular, risk factors for externalizing problems that are developmentally salient in adolescence (like behavioral disinhibition and its sister concepts of impulsivity, sensation seeking, and low self-control; Steinberg, 2010) stand out as contributors to both offline and online behaviors. This pattern of shared risk across outcomes highlights the importance of accounting for relevant covariates in studies that seek to parse the nature of associations between digital media and externalizing and health risk behaviors and for ensuring that observed associations are meaningful and interpretable, and not just a result of a "third variable" problem.

In fact, some theorize that the online environment may be particularly well-suited for disinhibition. The online disinhibition effect theory posits that a confluence of factors that facilitate disinhibition are inherent in the online space (dissociative anonymity, invisibility, asynchronicity, solipsistic introjections, dissociative imagination, and minimization of authority; Suler, 2004). Although social media is increasingly dropping some of these features (e.g., synchronous dyadic or group conversations via video or voice chat are increasingly common), it still may be the case that the Internet provides some psychological distance from the impact of one's actions and lowers the threshold to rash action to a lower point than what would be present in face-to-face interactions.

## Peer Selection

One of the most potent predictors of youth risk taking and externalizing behavior is the peer context, whether that be digital or in traditional, face-to-face spaces (Chan et al., 2019; Leung et al., 2014). Adolescence lies at the nexus of susceptibility to peer influence, concern for social reward, and engagement with digital peer contexts. Some features of digital media and online social networks make them particularly powerful conduits for peer influence: This is articulated in Nesi, Choukas-Bradley, and Prinstein's transformation framework (Nesi et al., 2018a, 2018b), which asserts that traditional peer relations constructs are *transformed* via the features of social media.

We know from decades of research that adolescents tend to be similar to their peers (homophily), with support for similarly minded peers choosing one another as friends (selection) as well as social influence by adolescents on their peers' attitudes and behavior (socialization). The classic question of whether peer similarity is driven by selection or socialization (e.g., Kandel, 1978) is equally relevant in the digital age. That is, are the many associations seen here between peers' online behaviors and adolescents' own online and offline behaviors a result of selection (i.e., choosing people with shared

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interests and behaviors) or socialization (i.e., peer influence)? Although peer socialization processes are the most frequent intervention target for preventing externalizing and health risk behaviors (Henneberger et al., 2020), selection is often also at play, and it can be difficult to disentangle the two and their influences (Gallupe et al., 2019; Samek et al., 2016). Selection and socialization processes are often mutually influential, such that youth select into antisocial networks and then they reinforce each other over time (Brechwald & Prinstein, 2011). Modern statistical methods like social network analysis and stochastic actor-partner modeling have allowed for scholars to parse the two more finely than ever before, and in fact, selection has been shown to be a stronger explanation for peer similarity in substance use behaviors than socialization effects (Rebellon, 2012).

In some ways, digital media is well-suited to help us better understand homophily, as online communication and social networks leave behind digital traces of the selection and socialization processes that we suspect are at work. Ehrenreich and colleagues (2019) used adolescent text messages over the course of high school, which were coded for antisocial content, to delve deeper into this very question. They found that those youth who were engaging in more externalizing behaviors (a combination of aggression and rule breaking) at each grade were more likely to be exchanging antisocial text messages (about substance use and rule breaking) with a larger proportion of their peers in the *subsequent grade* (evidence of a selection effect), but the proportion of antisocial dyads did not predict next-grade externalizing (lack of support for a socialization effect). Interestingly, they did find some evidence of a socialization effect when they homed in specifically on the first year of high school, such that the proportion of peers exchanging antisocial texts in the 9th grade was associated with one's own rule-breaking behaviors a year later. A study using social network analysis showed that both selection and socialization processes were relevant to adolescent substance use: Teens tended to select friends with similar social media use and substance use behaviors, but exposure to photos of substance use online also seemed to socialize adolescents' later smoking behavior (Huang, Soto, et al., 2014).

## Peer Socialization

Although studies of digital media and traditional peer interactions suggest that selection is likely more important than it is often given credit for, socialization is still relevant to understanding peer processes in externalizing behavior. Adolescent susceptibility to peer influence is evolutionarily driven (Ellis et al., 2012) and evident even in their neurobiology (e.g., Chein et al., 2011); adolescence is a period in which youth are keenly motivated for social affiliation (including romantic), and thus highly motivated to seek social approval. We review several forms of peer influence/socialization here.

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### Deviancy Training

Socialization takes many forms, and deviancy training is one mechanism of peer socialization (Dishion et al., 1996). The process often plays out with a youth discussing an antisocial topic, which is reinforced by the peer's response (e.g., by laughter, encouragement, or more antisocial discussion; Piehler & Dishion, 2007). One of the central difficulties of studying deviancy training in youth is the difficulty of capturing their interactions as they play out, and thus a promising direction for future research is the time-linked analysis of deviancy training in naturalistic peer-to-peer interactions via digital media. Digital communication offers an unprecedented window of opportunity to observe and understand how youth communicate and reinforce one another in their real interactions. Evidence gleaned from the content of youth text messages suggests that those youth whose antisocial text messages are reinforced by peers' positive responses are more likely to see increases in their problem behavior over time. A study of adolescents' text message exchanges noted that antisocial comments in text are often met with laughter (e.g., "lol" and "haha") from their conversational partners, which is similar to the deviancy training observed in past face-to-face observational research (Ehrenreich et al., 2014). Furthermore, these antisocial conversations were associated with increases in rule-breaking behavior a year later.

Some social networking sites include features that can serve to amplify the ability of peers to positively reinforce youth behavior. The Facebook Influence Model (Moreno et al., 2013) posits that peer influence is amplified within the online social networking environment, which in turn shapes downstream cognitions and behaviors around risk. Whereas the seminal studies on deviancy training in face-to-face interactions pinpointed communication features like laughing or encouragement as powerful (albeit minimal) reinforcers of deviant talk, Facebook and Instagram allow youth to send the same message with the click of a "like" or a "❤". In fact, research suggests that the "like" is a powerful reinforcer (Sherman et al., 2016).

### Social Norms

Selection and socialization processes on social media can alter perceptions of peer norms over time (David et al., 2006). Descriptive norms capture perceptions of how many of or how often peers *engage* in the relevant behavior (e.g., substance use, delinquency) and injunctive norms capture perceptions of how much peers *approve* of the behavior; both are strongly linked to adolescent behavior (Rimal & Real, 2005). Super Peer Theory (Strasburger et al., 2013) asserts that media can serve as a "super peer" in that it can expose teens to information that makes risk-taking behaviors seem normative, and that this normative influence will in turn cause youth to take risks themselves.

Research is generally supportive of the thesis that exposure to risky content online operates by reshaping youth perceptions of normativity. Qualitative

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studies with adolescents (Moreno et al., 2009) and college students (Moreno et al., 2012) tend to suggest that peers' references to alcohol use on social media are indicative of their actual alcohol use behaviors offline, with younger youth perhaps being most susceptible to the impact of online depictions on normative beliefs. Our research suggests that the amount of "alcohol talk" in received (but not sent) text messages from college students' entire text messaging network over the course of two weeks is associated with greater perceptions of peer descriptive and injunctive substance use norms, in addition to sent and received alcohol talk being tied to frequency of heavy episodic drinking (Jensen & Hussong, 2019). A longitudinal study of adolescents showed the exposure to sexual content in media increased youth perceptions of normative pressure (which captured both injunctive and descriptive norms), which in turn increased sexual activity intentions and behavior (Bleakley et al., 2011). This is highly consistent with experimental evidence that exposure to sexually suggestive photos impacts adolescents' perception that more of their peers engage in sexual risk taking (S. D. Young & Jordan, 2013) and that college students who viewed a social networking site with alcohol-related content estimated that the average college student drinks more frequently than participants who did not view the alcohol-related content (Fournier et al., 2013).

### Status

Adolescents have been known to engage in certain types of problem behaviors (e.g., carrying a weapon, substance use, physical aggression) in service of gaining the status that these behaviors confer (Dijkstra et al., 2010; Osgood et al., 2013; Rulison et al., 2013). Nesi and colleagues (2018b) assert that some features of social media (e.g., its publicness and widespread availability) may amplify youths' quest for status through online spaces through selective self-presentation. Although there have been relatively few studies to date that explicitly test the role of status striving as a driver of youth externalizing and risk-taking behavior, some new research suggests that some adolescents are (and are known by peers for) engaging in "digital status seeking" behaviors (behaviors intended to increase "likes" and approval) online, and that these digital status seeking behaviors are longitudinally tied to later increases in substance use and sexual risk behavior (Nesi & Prinstein, 2019). Indeed, the Internet's culture of "micro-celebrity" may facilitate the extent to which high-status "peers" can impact norms and exert influence (Marwick & boyd, 2011).

We are beginning to see the role of status in peer influence across the externalizing and risk-taking spectrum. For instance, partying is considered by many teens as a high-status activity, and attendance (and subsequent publishing online) of images and text about parties may boost status by association (Marwick & boyd, 2011; Nesi et al., 2018b). Students in a rural high school in the United States tended to drastically overestimate how many

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of their popular peers were sexting (and those who believed that popular peers had sexted were more likely to have sexted themselves than those who did not hold that perceived norm; Maheux et al., 2020). As reviewed earlier, digitalist gangs are also capitalizing on the attention and status that social media can afford (Whittaker et al., 2020). There is even some evidence that being a perpetrator of cyberbullying is predictive of increased peer status over time (Wegge et al., 2016).

Interestingly, youths' search for status and desire to be perceived positively could also exert a "chilling effect" wherein adolescents may self-censor their real-life behaviors to avoid unfavorable exposure on social media (Marder et al., 2016). A mixed-methods study of the chilling effect revealed that teens do engage in impression management around depictions of substance use (e.g., hiding their drink/cigarette when they know a photo will be taken and likely end up online, presumably to avoid potential consequences if it is seen by a parent) but that they rarely alter their actual substance use behaviors (e.g., choosing not to drink or smoke at the party in the first place; Marder et al., 2016). Further research on impression management, status seeking, and behavior change will certainly better elucidate the nature of these associations in the years to come.

### Unique Online Influences?

As reviewed here, online peer influence does seem to be a predictor of youth externalizing and health risk behaviors. An important question, though, is whether online peers exert *unique* influence, over and above that which would be expected (or is seen) from real-life, face-to-face peers (i.e., from school or neighborhood). Recent studies have tested this hypothesis, and overall, it seems that, although peers (in general) are still highly influential, there is significant overlap between online and offline networks, and online-only peer relationships seem to exert none to small effects. For instance, McCuddy (2021) sought to parse influence by adolescents' peers who are known in person (and also sometimes online) from those peers who are uniquely known online (and not in person). They uncovered little evidence that online peers expose adolescents to new/unique support for delinquency (e.g., only 7% of those exposed to any general delinquency in a peer network saw this influence from online-only peers, whereas 64% were exposed to both online and offline peer delinquency). Rates were similar for violence (8% exposed only via online peers) and slightly higher for theft (17%) and substance use (21%). Exposure to online peer support for general delinquency and violence were not associated with adolescent problem behaviors in these domains, though online peers appeared slightly more influential for theft and substance use behaviors. In all cases, online peer influence was of lesser magnitude than traditional (face-to-face) peer influence. Another study has similarly failed to find support for unique influence by online-only friends on marijuana use (Negriff, 2019).

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### Identity

Adolescent online and offline experiences are increasingly interwoven and often indistinguishable into what Granic and colleagues (2020) call "hybrid realities" that are both important for the attainment of developmental tasks like identity development. The Media Practice Model asserts that adolescents choose to interact with media in ways that are most consistent with their identity (or what they aspire for their identity to be; Brown, 2000). We must consider, then, that adolescents' online engagement in and depiction of risk-taking and externalizing behaviors (e.g., sexting, depictions of substance use, cyber-aggression) are best understood through the lens of identity development and intentional self-presentation.

This thesis is supported by evidence that adolescents engage in sexting and cybersex in ways that are consistent with sexual identity exploration and development (Eleuteri et al., 2017) and that depictions of alcohol use online are related to one's identity as a "drinker" (Thompson & Romo, 2016; Westgate & Holliday, 2016). This is also consistent with research in college students that suggests that depictions of substance use in highly visible areas (i.e., a profile or cover photo, which may seem more tied to identity) are more strongly tied to alcohol use and binge drinking than depictions elsewhere on social media (e.g., in a status update or a photo post; Moreno et al., 2015).

## Digital Media as a Tool in Reducing Externalizing and Health Risk Behavior

Although schools and community programs have traditionally been main avenues for health information and education, virtual spaces are also a growing venue for the delivery of educational information, interventions, and support related to externalizing and risk-taking behaviors. Particularly in 2020–2021, when most adolescents in the USA have been engaged in distance learning due to COVID-19 and many in-person intervention programs shuttered, the delivery of health information through social media is increasingly relevant. Social media platforms, text messaging, and web-based platforms offer three key affordances for the delivery of health information: accessibility, anonymity, and credibility. Adolescents often want answers to questions about risk-taking behavior in the moment (Selkie et al., 2011), and the temporal and spatial accessibility of information and support via social media offer youth this proximity and flexibility. Further, online spaces can offer the anonymity teens may need to seek out information related to the use of drugs or alcohol or sexual activity without worrying about their parents' or peers' reactions (Best et al., 2016). Social media also offers a degree of credibility to health information; adolescents can see who originally posted the information as well as those who have shared it, which may help them to determine the validity of the information (Dunn et al., 2018; Stevens et al., 2017).

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While existing research on the use of social media as a tool for health information is promising, further research is required, especially given the rapidly changing online mores of the adolescent population.

## Health Information

Social media can be a powerful tool in disseminating public health information to adolescents, particularly given the omnipresence of social media in the lives of youth. Even before the advent of social media, the Internet was the primary source of health information for adolescents, especially those with few alternative accurate sources of information and for sensitive topics (Borzekowski et al., 2006; Gray et al., 2005). More recently, a number of qualitative studies with adolescents have confirmed that social media and text messaging are accessible and appealing sources of public health information (e.g., sexual health), though youth are also wary of potentially inaccurate or uncredible online sources (and have encountered barriers like inadvertently opening pornographic content; Selkie et al., 2011). In a study of African American and Latinx youth, Stevens et al. (2017) found that social media was an important source of sexual health information, and that participants felt social media was a more credible source than internet searches. Further, exposure to sexual health information on social media was significantly associated with reductions in sexual risk-taking behaviors (Stevens et al., 2017).

## Delivery of Prevention Messaging

In addition to health information, social media can also be utilized to convey prevention messages to adolescents. Another qualitative study with US adolescents found that teens differentiate between social media platforms when engaging with drug prevention content and are highly conscious of how their peers might perceive their behavior (Dunn et al., 2018). Consequently, participants reported reading and liking prevention content, but were not likely to share it with their peers or create antidrug content themselves. Participants in this study recommended using short and humorous videos on platforms away from adult eyes, where teens might feel more comfortable, and the authors thus conclude that it is crucial to involve adolescents in creating effective prevention messaging on social media.

Numerous studies have found that internet-based interventions can reduce risk-taking behavior, albeit with small effects. Adolescent women who participated in a web-based drug prevention intervention were less likely to use drug and alcohol six months after the intervention than their peers in the control group. Further, participants in the intervention group also saw increases in understanding of normative beliefs and self-efficacy (Schwinn et al., 2010). A text-based intervention study of youth seen in the emergency department for drinking-related outcomes found that youth in the intervention group engaged

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in fewer binge-drinking episodes and drank fewer drinks per day than their peers in the control group at the three-months post-test (Suffoletto et al., 2014).

A 2014 systematic review of 11 intervention studies that examined social media and text messaging as a mechanism for sexual health education concluded that these mediums can increase knowledge of STI prevention and may reduce risky sexual behaviors (Jones et al., 2014). For example, a Facebook-based intervention saw small gains in condom use among adolescents in the intervention group at two months, though this difference diminished by the six-month follow-up (Bull et al., 2012).

### Online Support

Although many studies have documented the benefits of online support groups (using a variety of modalities including social media, text messaging, and internet browser) for adolescents with health problems (e.g., cancer, asthma, type I diabetes), very few studies have analyzed the efficacy of online support groups as strategy to reduce adolescents' externalizing and risk-taking behaviors (Selkie et al., 2011). We do know that adolescent participants report utilizing anonymous online chat rooms to discuss sensitive topics (e.g., drug and alcohol use), and that these anonymous interactions can yield feelings of emotional support (Gray et al., 2005).

Research with adults suggests that online support communities could also be a useful tool in mitigating risk-taking and externalizing behaviors in adolescents. Indeed, studies of adults suggest that web-based support through Adult Child of Alcoholic (ACoA) online support groups afford desired anonymity, accessibility, and support from any location or at any time of day (Haverfield & Theiss, 2014). Likewise, a 2020 study of adults in an online recovery group found that the social support offered through the online group interactions seemed to reduce social isolation and the risk of drug addiction alongside helping build "recovery capital" to aid in maintaining sobriety (Bliuc et al., 2020).

While further research with adolescent populations is needed to investigate the potential and efficacy of online support groups in mitigating risk-taking behaviors, we can likely assume that the affordances of online support (i.e., accessibility and anonymity) will also be prized by young people. The need for accessible and high-quality recovery and support services has never been as salient as it is today when most substance abuse recovery and mental health programs have been pushed online due to the COVID-19 pandemic.

## Conclusions and Future Directions

Although research on digital media and adolescent externalizing and risk-taking behaviors is still in its infancy, we have already accumulated evidence of several fairly consistent patterns. Adolescents are dual citizens of

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both online and offline spaces, and as such their identities and risk profiles manifest in both spheres as well. We are increasingly seeing that the *amount of time* adolescents spend online seems to be less important than *the ways in which they* spend that time, which can provide a valuable window into adolescent behavior and risk. Our glimpses into that window thus far suggest that adolescent disclosures and self-presentation online largely overlap with their offline identities and behaviors; our next challenge will be to devise ways to harness this information to enhance the efficacy and reach of interventions targeting these risky behaviors. For example, digital indicators of risk may be useful in targeting of public health messaging, invitations to prevention programming, or even timing of interventions. We have also seen that peer influence is alive and well online, that it largely overlaps with and operates similarly to the offline peer influence processes we have long studied, and that online peers do not seem to be presenting much unique risk compared to the peer influences adolescents encounter in their schools and neighborhoods.

These insights and implications notwithstanding, we still have much to learn. The field requires longitudinal and experimental research that allows for causal inference; only armed with this strength of evidence will we truly be able to parse the direction of effects in observed associations between digital media engagement and externalizing risk. This causal inference will only be possible in well-designed studies that adequately account for shared risk factors (e.g., disinhibition) that may potentially confound associations. Similarly, we require studies that use representative samples from diverse populations that allow us to generalize findings beyond just specific subsets of youth. Understandably, much of the research to date has focused on late adolescents, emerging adults, and college students (populations that are more easily accessible and more amenable to research on sensitive topics like sex, drugs, and crime). The next wave of research, however, must make sure to assess the range of experiences across the full span of adolescence (10–24; Sawyer et al., 2018), with particular attention to how the experiences of early adolescents (who are more likely to be newer residents of the digital world) may differ from those of late adolescents and early adults (Vannucci et al., 2020). We must also ensure that our research speaks to the experiences of youth from diverse backgrounds and identities, with attention to unique ways in which different groups of youth may engage in both online and offline spaces. Finally, we require more research-informed recommendations for how prevention and intervention scientists can best harness adolescents' deep attraction to and engagement with their online social networks in service of sustainable health behavior change.

As the digital world evolves, so too must our science. Researchers must be nimble to adapt their research questions and designs to the ever-changing digital landscape and adolescents' shifting preferences, though it is worth noting that we likely stand to learn the most from studies that tap digital manifestations of well-supported, theoretically driven processes that are much more stable than the platforms on which we study them.

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