Narrative Review Article

Reward and Impulse: Leveraging a Neurobiological Bidirectional Framework for Understanding ADHD and Social Media Addiction among Adolescents

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ABSTRACT

The rapid rise of social media use among adolescents has raised concerns for parents and researchers about its addictive potential and detrimental mental health consequences, particularly for individuals with Attention-Deficit/Hyperactivity Disorder (ADHD), a population characterized by reward dysregulation and impaired impulse control. This literature review examines the neurobiological vulnerabilities underlying ADHD and explains how these likely increase the susceptibility to social media addiction, as well as how addictive social media may in turn exacerbate ADHD symptomology, through dysregulated dopaminergic reward pathways and deficits in behavioral inhibition. The review proposes a bidirectional relationship between ADHD and social media addiction, arguing that social media platforms both exploit and exacerbate ADHD-related vulnerabilities to result in negative mental health outcomes. To illustrate this interaction, specific design features of Instagram, Snapchat, YouTube, and TikTok are considered to demonstrate how distinct and overlapping mechanisms of reinforcement, urgency, and personalization promote compulsive engagement with social media platforms for adolescents with ADHD diagnoses. Finally, the review synthesizes evidence linking the proposed bidirectional relationship between ADHD and social media addiction to adverse mental health outcomes, including anxiety, depression, and sleep disturbances among adolescents. Taken together, interpreting the growing body of research in this way suggests that reward dysregulation and impulse control underline the bidirectional relationship between ADHD and social media addiction, resulting in increased risk for poor mental health. Despite limitations of existing research, the proposed integrated bidirectional framework can help to guide future research, clinical interventions, and the development of social media platforms to better support adolescent mental health, especially among neurodivergent populations.

Keywords: ADHD; reward dysregulation; impulse control; social media addiction; anxiety; depression; sleep deprivation

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INTRODUCTION

With the emergence and rapid evolution of social media in the past two to three decades, and the shifting adolescent reliance on digital platforms for peer socializing, research examining the effects of social media use among adolescents has become

increasingly urgent. Although social media offers many proposed benefits such as access to information, social connection, and entertainment, it also carries risks including addiction, cyberbullying, privacy concerns, and negative effects on academic performance and mental health (1). Adolescence represents a particularly vulnerable developmental period because reward systems mature more rapidly than prefrontal regions involved in executive control, increasing sensitivity to immediate rewards and limiting impulse regulation (2-4). These vulnerabilities are especially relevant for adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD), which, according to the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), is neurodevelopmental disorder characterized by persistent inattention, hyperactivity-impulsivity, or both (5), in which reward dysregulation and impaired impulse control are more pronounced.

Individuals with ADHD often show hypoactivity in dopaminergic reward pathways and a stronger behavioral preference for immediately reinforcing stimuli over tasks requiring sustained mental effort (6-11). Because social media platforms are designed around rapid, repeated, and socially salient rewards, this review specifically focuses on examining the relationship between social media addiction and ADHD. Social media addiction is a subset of internet addiction and is characterized by spending excessive amounts of time online, compulsively checking online platform notifications, and often feeling distressed or anxious while offline (12). Although the DSM-5 does not quantify social media addiction as an official diagnosis, the increase in internet usage among adolescents makes social media addiction an important subcategory of internet addiction worth exploring. Given that 95% of youth ages 13–17 use social media and one-third report using it "almost constantly" (13), adolescents with ADHD may be especially vulnerable to developing problematic patterns of social media use. Emerging evidence supports this link, showing positive associations between ADHD symptoms and problematic internet or social media use (14-16). Because both adolescent social media use and ADHD diagnoses remain highly prevalent (17, 18), understanding how these factors interact is increasingly necessary.

Although recent research and a greater understanding of ADHD and social media use among youth are on the rise, the potential bidirectional relationship between ADHD and social media addiction remains underexplored. Furthermore, while the impact of social media on mental health has been explored independently in previous literature, the combined impact of both ADHD and social media addiction in shaping adolescent mental health remains largely unexamined. In order to address these gaps, this literature review examines the relationship between ADHD and social media addiction, proposing a bidirectional framework in which ADHD-related vulnerabilities and social media addiction mutually reinforce one another through dysregulation of reward processing and impulse control, thereby increasing the risk of adverse mental health outcomes in adolescents. In one direction, ADHD-related reward dysregulation and impulse control deficits may increase adolescents' vulnerability to addictive social media use. In the other, repeated exposure to the highly reinforcing design features of platforms such as Instagram, Snapchat, TikTok, and YouTube may in turn exacerbate ADHD symptomology by strengthening maladaptive reward-seeking and attentional fragmentation over time. Together, this reciprocal relationship between social media addiction and ADHD may further worsen negative mental health outcomes. Understanding this bidirectional relationship is critical because reward regulation and impulse control remain developmentally malleable during adolescence and may be further shaped by highly reinforcing digital environments (19, 20). This is especially important for neurodivergent youth, who may face heightened risk for both addictive behaviors and downstream mental health consequences (21).

THE PROPOSED BIDIRECTIONAL FRAMEWORK

This review proposes a bidirectional conceptual framework in which ADHD-related neurobiological vulnerabilities and addictive social media use mutually reinforce one another across adolescence (Figure 1). In the forward direction, core features of ADHD, such as reward dysregulation and impaired impulse control, may increase vulnerability to social media addiction by biasing adolescents toward digital environments that provide immediate, frequent, and socially salient reinforcement. In the reverse direction, consistent and repeated exposure to highly reinforcing platform features, including intermittent rewards, algorithmic personalization, and rapid content delivery, may further intensify existing ADHD symptom severity.

The following sections are organized to evaluate this proposed model. First, the review examines the neurobiological mechanisms underlying reward dysfunction and impaired impulse control in adolescents

with ADHD. Next, it addresses how these vulnerabilities may increase susceptibility to social media addiction across platforms. The review then turns to the reverse pathway, examining how addictive engagement with social media may in turn worsen ADHD-related symptoms through platform-specific reinforcement structures. Finally, the discussion considers how this reciprocal cycle combined may contribute to broader adverse mental health outcomes in adolescence. Together, this framework provides a structured model for understanding how ADHD and social media addiction may operate as a self-reinforcing developmental feedback loop.

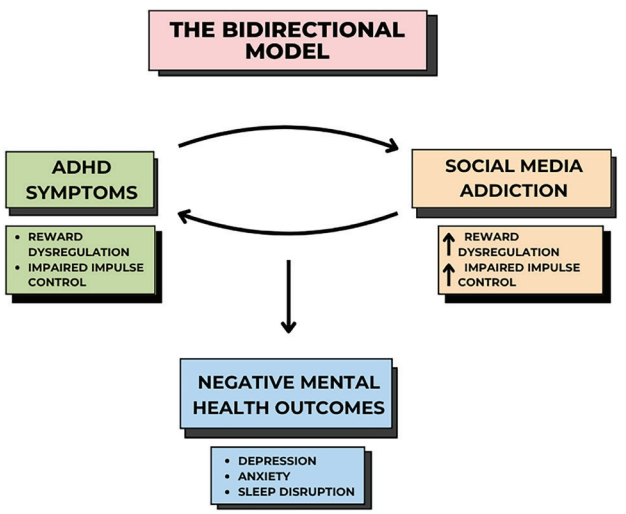

Figure 1. ***The Proposed Bidirectional Model Between ADHD Symptoms and Social Media Addiction.*** *ADHD symptoms, such as reward dysregulation and impaired impulse control, increase the susceptibility to social media addiction. Social media addiction in turn exacerbates these ADHD symptoms, creating a feedback loop. The combined effect of this bidirectional relationship between ADHD and social media addiction worsens negative mental health outcomes, such as depression, anxiety, and sleep deprivation.*

NEUROBIOLOGICAL MECHANISMS OF ADHD IN THE CONTEXT OF PROCLIVITY TOWARD SOCIAL MEDIA ADDICTION

Reward Dysfunction and Impulse Control

In order to understand why individuals with ADHD are particularly susceptible to developing social media addiction, it is important to examine the mechanistic vulnerabilities of ADHD from a neurobiological standpoint. The reward pathway in the brain is composed of the mesolimbic system, an array of brain structures ranging from the ventral tegmental area in the midbrain to the nucleus accumbens in the ventral striatum (22). This pathway regulates the processing of rewards, allowing the brain to identify various stimuli as desirable, which results in changes in an individual's behavior toward attaining that reward (23). Central to the reward pathway is the neurotransmitter dopamine, which is released upon activation of the mesolimbic system after an individual reacts to desirable stimuli (23). ADHD is often characterized by a hypoactive mesolimbic pathway and has been associated with polymorphisms in dopamine receptor genes and dopamine transporter (DAT) genes that produce underactivity in the dopamine pathway (7-9). In particular, the DAT, which is abundant in the striatum, is responsible for the reuptake of released dopamine. Studies have found that polymorphisms in the DAT1 gene, that cause a disparately efficient reuptake of dopamine, are associated with ADHD (7, 9). Other neuroimaging studies have attributed ADHD-related dopaminergic hypoactivity to a lower availability of dopamine receptors and DATs in the nucleus accumbens, resulting in decreased activity in the ventral striatum (22). Collectively, these findings support the involvement of mesolimbic dopaminergic hypoactivity in ADHD. This reduced reward responsivity has been proposed as one mechanism underlying reward dysregulation and may help explain reduced engagement with weakly reinforcing or low-intrinsic-motivation tasks (22).

In addition to reward dysregulation, impulsivity is another primary characteristic of individuals diagnosed with ADHD. Impulsivity is characterized by an immediate reaction to stimuli without processing information thoroughly first, associated with the inability to inhibit risky behavioral impulses (24, 25). Impulsivity is a core component of mental disorders like ADHD and has also been linked to outcomes in healthy individuals involving poor academic performance, self-harm, and problematic internet use (26, 27). The striatum, among other brain regions, is heavily implicated in regulating impulsivity, with research indicating a positive association between impulsivity and ventral striatum activity during activities of reward processing (26). Moreover, hyperactivity of the ventral striatum has been identified as a risk factor for developing disorders related to impulsivity, such as substance use disorders (SUDs), bipolar disorder, and ADHD (28). Impulse control typically improves across development as prefrontal cortical regions involved in

executive functioning mature throughout adolescence and into early adulthood, enhancing the ability to inhibit impulsive behaviors (29). Neuroimaging studies report that when performing response-inhibition tasks, ADHD individuals show less striatal activity than non-ADHD controls (30-32). Together, these findings support the involvement of a hyperactive striatum in impaired impulse control in ADHD. This inhibitory-control profile may also be relevant to later discussions of vulnerability to problematic social media engagement.

Importantly, reward dysregulation and impulse control do not function in isolation, and their interaction may contribute to increased risk for social media addiction. These processes appear to be closely linked through overlapping dopaminergic and striatal mechanisms and may reinforce one another over time by biasing behavior toward more impulsive responses (22, 26). In ADHD populations specifically, Sagvolgen *et al*.'s (33) Dynamic Developmental Theory asserts that low dopamine levels associated with ADHD add to a gradient of reinforcement in which reinforcers lose their value more quickly than in non-ADHD brains, giving rise to delay aversion, a deficiency in sustained attention for effortful tasks, impulsivity, and a stronger preference for immediate rewards (26). This steeper-than-normal decay of reinforcement value over time may help explain why individuals with ADHD often show a stronger preference for smaller-sooner (SS) over larger-later (LL) rewards, a pattern repeatedly observed in the literature (6, 10, 26). From this perspective, impaired inhibitory control may make it more difficult to inhibit the impulse towards SS rewards, even when LL rewards are objectively more valuable (10). Additionally, during reward anticipation, adolescents with ADHD have displayed a hypoactivity in the striatal area and lower dopamine release as compared to non-ADHD adolescents, further supporting a link between reward motivation and impulse control (24). These neurobiological findings suggest that dysregulated reinforcement processing in ADHD may link reward sensitivity and inhibitory control, strengthening the possibility that social media can turn into an addiction.

HOW ADHD INCREASES VULNERABILITY TO SOCIAL MEDIA ADDICTION

Often explained by difficulties with reward regulation and impulse control characterized above, ADHD is associated with an increasing risk of developing addictive disorders, such as SUDs (34). The DSM-5 describes SUDs as patterns of substance use that result in significant impairment of well-being (13). From a mechanistic standpoint, reward dysregulation in ADHD is characterized by reduced responsiveness to delayed or weakly reinforcing stimuli, which may bias individuals toward substances that provide rapid and potent dopaminergic reward. Critically, empirical evidence has found that individuals with ADHD are twice as likely to develop SUDs compared to those without ADHD (35). Moreover, substance use onset is earlier among patients with comorbid ADHD and SUDs compared to those without ADHD, suggesting an increased vulnerability among individuals with ADHD (36). Impaired impulse control may further exacerbate this vulnerability by limiting the ability to inhibit substance use once initiated, increasing the likelihood of repeated use and abuse. Rodent neuroimaging studies further support this relationship, demonstrating that reduced dopamine receptors in the ventral striatum are associated with cocaine addiction, while higher impulsivity, also characterized by dopamine deficiency in the same region, further exacerbates drug intake (37). Taken together, these findings suggest that central features of ADHD, including dysregulated reward processing and impaired impulse control, play a critical role in increasing vulnerability to SUDs, especially for adolescents.

While much of the existing literature on addictive behaviors and ADHD is centered around SUDs, and direct evidence remains limited, prior work on behavioral addictions suggests the mechanistic explanation between ADHD and SUDs can generalize beyond SUDs to other types of behavioral addiction, such as social media addiction. Similarly to the increased risk of SUDs among individuals with ADHD, research also suggests that individuals with ADHD are disproportionately vulnerable to social media addiction in particular (38, 14). For instance, adolescents diagnosed with ADHD report higher levels of Facebook overuse and addictive engagement, compared to peers without an ADHD diagnosis (38). Similar patterns have been observed in young adult populations, where individuals with ADHD demonstrate greater difficulty regulating overall internet use once engagement has begun, placing them at a higher risk for developing internet addictive behaviors (14). Despite limited research on this topic, these findings indicate that ADHD confers increased susceptibility to social media addiction.

The increased vulnerability to social media addiction specifically seems to be driven by impairments in reward processing and impulse control that characterize ADHD. Such reward-processing difficulties align closely with

the structure of social media platforms, which deliver immediate and predictable reinforcement through their constant notifications, likes, and rapidly updating content. These immediate rewards may temporarily compensate for lower dopamine levels in people with ADHD, while also strengthening patterns of habitual use through repeated reinforcement (14). Furthermore, Yen *et al*. (14) also found that deficits in impulse control may exacerbate the risk of social media addiction, as individuals with ADHD often struggle to disengage from rewarding activities once initiated, making it more difficult to regulate social media use after initial engagement. The reinforcing nature of social media on dopamine activity may be particularly pronounced in social contexts, since reward-related brain regions show heightened activation during social interaction (39), and social media platforms exploit this sensitivity by providing fast-paced, socially rewarding feedback, such as likes and comments on posts from online platform users (40). Taken together, reward dysregulation and impaired impulse control provide a strong mechanistic explanation for why adolescents with ADHD are especially susceptible to developing social media addiction.

HOW SOCIAL MEDIA ADDICTION EXACERBATES ADHD SYMPTOMS

Social media platforms have increasingly capitalized on the brain's reward pathways by delivering highly personalized content that elevates dopaminergic activity (41). Platform algorithms may exacerbate ADHD symptoms in individuals with underlying vulnerabilities related to hypoactive dopaminergic functioning. Heightened impulsivity and reward dysregulation, characteristics among individuals with ADHD, make this population particularly vulnerable to social media's addictive effects. Longitudinal studies conducted in adolescent samples without formal ADHD diagnoses found that higher levels of social media engagement and problematic use were associated with an increased frequency of self-reported ADHD symptoms over time in adolescents without an ADHD diagnosis (42, 43). Accordingly, the present review focuses on adolescents with diagnosed ADHD to examine how social media addiction may interact with underlying dopaminergic vulnerabilities to intensify symptom severity.

Given that diverse social media platforms differ in their features, examining how specific design elements sustain addictive behaviors is necessary to fully understand how platform-specific social media addiction can exacerbate ADHD symptoms. Furthermore, because platform features affect reward dysregulation and impulse control in overlapping ways, understanding these mechanisms is crucial to mitigate amplifying ADHD symptomology, especially for individuals with ADHD diagnoses who are at greater risk of social media addiction. The following section investigates the unique features and potential addictive properties of four different social media platforms: Snapchat, Instagram, YouTube, and TikTok. These platforms in particular were chosen because they are the four most used social media sites among individuals aged 13-17 in 2025 (18). Moreover, youth often use many of these platforms simultaneously (44), thus further exacerbating risks related to impulse control and reward dysregulation for youth with ADHD. The key platform features of each of these social media sites and their relevance to reward dysregulation and impaired impulse control is summarized in Table 1. (Table 1)

Social media users, especially adolescents who are pressured by the need to know all of the latest trends and fit in with their peers, rarely engage with a single social media platform and instead navigate multiple platforms in rapid succession and occasionally simultaneously (e.g., scrolling TikTok while a YouTube video is playing in the background). Each social media platform offers distinct features designed to capture and sustain attention, and these competing features may collectively exacerbate social media addiction as a whole by continuously redirecting users toward whichever platform provides the most immediate or relevant reinforcement. For individuals with ADHD, the diversity of platform features may be particularly problematic, as dysregulated reward processing and impaired impulse control increase vulnerability to rapidly shifting attention demands and frequent reward-seeking behaviors might lead youth to toggle between apps for several hours. The simultaneous use of multiple platforms creates a highly saturated digital environment in which addictive patterns may be amplified across contexts, increasing the risks to self-regulation and mental health among individuals with neurological and behavioral vulnerability such as those with ADHD.

INSTAGRAM

Instagram emphasizes highly visual self-presentation and social approval, making it particularly effective at engaging reward processing and impulse control mechanisms implicated in ADHD. Instagram allows users to share photos and videos with a network of "Followers," emphasizing curated visual content as a

means of both self-presentation and social information exchange. Although comments and messaging are possible, engagement is largely reinforced by external validation through the likes and views. As such, Instagram addiction may stem less from interpersonal communication and more from the pursuit of social approval (45). A neuroimaging study found that receiving positive social feedback in the form of "likes" activated the nucleus accumbens in the ventral striatum (46), a key region in dopaminergic reward processing. On the other hand, an fMRI study analyzing negative social feedback through negative comments showed that participants with impaired reward system activation exhibited greater sensitivity to perceived negative feedback (47). Together, these findings suggest that Instagram may amplify both positive and negative reward sensitivity, enhancing the salience of positive social feedback while simultaneously increasing vulnerability to negative feedback. This imbalance may increase dependence on external validation while heightening distress in its absence, reinforcing cycles of reward anticipation and feedback monitoring. Instagram's engagement metrics function as immediate social rewards, consistent with rewired-learning frameworks that suggest that dopaminergic pathways are involved in reward anticipation and reinforcement. Therefore, Instagram may be particularly salient for individuals with ADHD who exhibit heightened sensitivity to immediate rewards and diminished responsiveness to delayed reinforcement.

Instagram's emphasis on curated and often digitally altered visual content can also intensify upward social comparison and pressure for self-presentation. By tying positive reinforcement to quantifiable feedback such as likes and views, this environment may distort reward valuation and reinforce cycles of anticipation, reward-seeking, and social validation. Consequently, individuals may feel compelled to frequently post to obtain that validation (45). For individuals with ADHD, deficits in impulse control may further increase the likelihood of impulsive posting and may demonstrate difficulty inhibiting checking behaviors following platform engagement. This reinforcement pattern is supported by findings that individuals report significantly higher stress, anxiety, and cravings following Instagram cessation, suggesting withdrawal-like responses that reinforce continued use (48). Additionally, users with higher levels of social media addiction exhibit less prefrontal cortex activity when engaging with these high-reward cues (49). Lower activity in the prefrontal cortex, a brain region heavily involved in managing decision-making, particularly the decision to engage with a stimulus (50), may indicate diminished inhibitory control over reward-driven behavior. Platform characteristics, such as notifications, continuous content updates, and endless scrolling, promote repeated, prolonged engagement and habitual checking behaviors. For individuals with ADHD, these features may disproportionately reinforce reward dysregulation and impair impulse control, contributing to addictive use patterns.

SNAPCHAT

For individuals with ADHD, Snapchat's emphasis on time-sensitive communication and social interaction may exacerbate difficulties with impulse control and self-regulation. In contrast to other platforms, Snapchat is designed primarily for communication with known peers, with content visible only to approved users (51). This more intimate social media environment may increase motivation to remain engaged, as frequent interaction with close social networks can enhance perceived connection and reinforce social reward. Studies found that individuals who engage with their friends and family often on social media, as compared to those who do not, feel more personally connected to those loved ones and less lonely after using social media (52). Snapchat's defining feature is that content is temporary. Messages disappear within a limited time frame, such as in 24 hours, introducing urgency into users' behavior and perceptions of privacy and authenticity, encouraging greater dependence on Snapchat as one of the few platforms where individuals feel they are able to express their authentic selves without fear of persistent judgment or long-term visibility (53). This time-sensitive structure can reduce opportunities for reflective decision-making and reinforcing impulsive engagement (54). In addition, the temporary nature of content on Snapchat also creates a sense of urgency to view and respond before messages disappear, which may encourage impulsive checking behaviors and frequent engagement. For individuals with ADHD, who already experience difficulty inhibiting behavioral impulses, this time-sensitive structure likely intensifies compulsive use patterns.

Additionally, Snapchat's "Streak" feature introduces a gamified reinforcement system that rewards consecutive daily interactions (55). Game elements add immediate rewards and increase engagement with cognitive tasks (56). Meshi (55) adds that the Streak feature further incentivizes daily use and reinforces habitual engagement, increasing overall app usage and the risk of developing Snapchat addiction through

the compulsive daily checking. The potential loss of a Streak may also function as a negative reinforcer, motivating repeated daily use and increasing impulsive checking behaviors. Therefore, for those who are more sensitive to immediate rewards, such as individuals with ADHD, the gamification of Snapchat could be even more effective at maintaining engagement (57). Together, Snapchat's combination of urgency, social reinforcement, and gamified features may disproportionately engage impaired impulse control systems in individuals with ADHD, reinforcing addictive use.

YOUTUBE

YouTube's structural features promote prolonged engagement and difficulty disengaging, making it highly salient for individuals with ADHD who have difficulty with reward dysregulation and impulse control. Unlike short-form platforms, YouTube's long-form videos sustain attention over extended periods, allowing prolonged exposure to rewarding content and making it more difficult for users to disengage (58). This sustained activation of reward pathways may be particularly reinforcing for individuals with ADHD, who exhibit dysregulated reward processing, as sustained reward activation can compensate for lower baseline dopaminergic activity. Features such as autoplay and algorithmic recommendations further reduce natural stopping cues, encouraging continued viewing with minimal effort. This structure may impair users' ability to disengage once viewing has begun, particularly among individuals with ADHD who often experience difficulty terminating rewarding activities (59). As a result, prolonged engagement may emerge not only from reward sensitivity but also from deficits in impulse control. Despite YouTube's similarities with traditional television, it differs in that users can both consume and produce content on the same platform, increasing opportunities for engagement and time spent on the site (58). Additionally, YouTube functions across multiple platforms (smartphones, computers, tablet, television), which enhances its accessibility and use at and outside of the home (58). YouTube's long-form content, continuous reinforcement mechanisms, and reduced disengagement cues create a reward-rich environment that may disproportionately sustain compulsive use among individuals with ADHD.

In addition to its structural features, YouTube fosters parasocial relationships with content creators through a sustained "celebrity culture" of "YouTubers" (60, 61). These one-sided relationships, in which users form perceived emotional connections with media figures they do not personally know, can increase emotional investment and reinforce prolonged engagement (62). Gleason *et al.* (62) also suggested that adolescents are particularly vulnerable to developing parasocial relationships, since these figures can act as role models for identity formation in developing young adults. Additionally, increased engagement in parasocial relationships may provide individuals with shared topics and interests that facilitate social interaction with fellow fans, potentially serving as a foundation for developing friendships beyond what an individual might have access to in in-person settings (e.g., school and community). For adolescents with ADHD, these parasocial relationships may provide consistent social and emotional rewards without reciprocal demands, further strengthening reward-driven behavior and increasing time spent on the platform. Together, YouTube's combination of reward exposure, reduced stopping cues, and emotional reinforcement may disproportionately reinforce prolonged engagement and impaired disengagement in individuals with ADHD.

TIKTOK

TikTok's design creates a high-frequency reward environment that may strongly engage reward dysregulation and impulse control mechanisms in ADHD. The platform delivers short-form videos in rapid succession through continuous scrolling with no natural stopping point. This structure promotes repeated exposure to novel stimuli and frequent opportunities for reward, aligning with preferences for immediate gratification commonly observed in individuals with ADHD. In particular, research suggests that the endless scrolling feature of TikTok may promote a flow state, in which users lose track of time due to a sense of continuity and deep focus (63). While flow is typically associated with positive engagement, in this context it may reduce users' ability to monitor and regulate their behavior, increasing difficulty disengaging. Consistent with this, users report a lower sense of control when using TikTok compared to other platforms (64), suggesting difficulty inhibiting the impulses to stop scrolling. This structure also delivers rapid and repeated reinforcement, as each swipe presents an opportunity for reward. Importantly, not every post is rewarding to a user, and this unpredictability creates an intermittent reinforcement schedule that strengthens reward anticipation. Reward expectation can be more addictive than if every video was rewarding, as we saw in the case of YouTube (65). The expectation that the

next video may be more engaging sustains continued scrolling, even when individual videos are not rewarding, reinforcing patterns of compulsive engagement. A study on Thai students found an association between short-form video content use and attention problems, making individuals with ADHD particularly susceptible to the rewarding effects of TikTok (66). Additionally, an EEG study showed that excessive consumption of short-form videos was correlated with reduced activity in the executive control region of the prefrontal cortex (67). This reduction in neural activity suggests weakened top-down control, which may impair the ability to regulate behavior and resist ongoing engagement. Over time, TikTok's design elements may repeatedly activate reward pathways with little opportunity for disengagement, reinforcing impulsive use patterns and strengthening addictive engagement among individuals with an ADHD diagnosis.

TikTok is also more impersonal compared to other platforms, as users primarily engage with a "For You" feed composed of content from unfamiliar creators. The platform's algorithm rapidly personalizes content based on user behavior, increasing salience of reward by continuously delivering highly preferred stimuli. Neuroimaging studies show that personalized content, compared to non-personalized content, resulted in higher activation in the ventral tegmental area, which is an important part of the dopaminergic pathway (68). The constant availability of highly tailored content, combined with the short duration and fast-paced rewards may intensify compulsive engagement, particularly among individuals with ADHD, who exhibit impaired reward regulation. Together, TikTok's combination of intermittent reinforcement, continuous content delivery, and personalization creates a highly reinforcing environment that may amplify both reward dysregulation and impair impulse control in individuals with ADHD.

The platform-specific mechanisms described above clarify the reverse direction of the proposed bidirectional framework, that addictive social media use may in turn worsen ADHD symptom expression over time. Across Instagram, Snapchat, YouTube, and TikTok, repeated exposure to rapid rewards, intermittent reinforcement, urgency-based engagement, and limited stopping cues may strengthen habitual checking, attentional fragmentation, and difficulty disengaging from immediately rewarding stimuli (see Table 1 for summary). For adolescents with ADHD, whose reward regulation and inhibitory control are already compromised, these repeated behavioral patterns may further intensify inattention, impulsive responding, and difficulty sustaining attention on low-reward offline tasks. Therefore, while ADHD-related vulnerabilities may increase susceptibility to social media addiction, prolonged addictive engagement with these platform features may in turn amplify the very symptoms that contributed to that vulnerability in the first place.

PROPOSED IMPACT OF BIDIRECTIONAL RELATIONSHIP BETWEEN SOCIAL MEDIA ADDICTION AND ADHD VULNERABILITY ON MENTAL HEALTH OUTCOMES

A strong link between social media use and negative mental health outcomes has been well established in the literature (69); however, it is also important to discuss how the unique mechanisms of ADHD might contribute to a heightened relationship between social media use and mental health risks. Taking a mechanistic approach, reward dysregulation and impulse control characteristic of ADHD are implicated in several mental health disorders, including depression, anxiety, schizophrenia, and bipolar disorder (70, 71). Research also indicates that individuals who are more susceptible to mental illness, such as anxiety and depression, exhibit stronger negative mental health effects from social media use (72). Moreover, having ADHD constitutes a greater risk of developing comorbid mental disorders (73). Taken together, this risk assessment suggests that individuals with ADHD may be particularly vulnerable to the negative mental health effects associated with social media use, including anxiety, depression, and sleep disruption. Anxiety, depression, and sleep-related problems were selected specifically for focus because they are among the most prevalent and strongly associated mental health outcomes linked to both ADHD-related reward and impulse dysregulation and problematic social media use. This section focuses on how ADHD-related vulnerabilities amplify the mental health risks associated with social media use.

DEPRESSION

Within the proposed bidirectional framework, the risk of depression may be heightened through the interaction of ADHD-related reward dysregulation and addictive social media use. In a cohort study of children and adolescents, higher reported levels of social media use in the first two years of the study correlated with higher depressive symptoms in the following year (74, 72). One proposed mechanism is increased exposure

to unfavorable social comparison (72), which has been found to be linked to depression symptoms (75) and rumination (76), although causal pathways remain under investigation. For adolescents with ADHD, heightened sensitivity to external validation and reduced reward valuation of everyday experiences may further exacerbate depressive symptomology.

Analogous to mechanisms proposed in substance use research, repeated exposure to highly reinforcing social media stimuli may contribute to reduced reward sensitivity over time (77), though direct causal evidence in social media contexts remains limited. Excessive social media use has been associated with the activation of dopaminergic pathways and cognitive fatigue (78), potentially increasing the threshold of stimulation required for everyday experiences to feel rewarding. This reduced responsiveness may manifest as anhedonia, a core symptom of depression. For adolescents with ADHD, baseline reward dysregulation may further amplify this process, intensifying reduced sensitivity to non-digital rewards and increasing vulnerability to anhedonia and depressive symptoms.

Taken together, the effects of social media on depression may not operate uniformly across adolescents, but indeed may be magnified in those with ADHD, reinforcing the proposed bidirectional relationship between neurobiological vulnerability and digital environment exposure.

ANXIETY

Social media addiction may also influence anxiety risk, with adolescents with ADHD experiencing amplified vulnerability due to impairments in impulse control. Studies from Europe and China have consistently found an association between excessive social media use and anxiety (79, 80). One proposed explanation is that individuals with anxiety disorders exhibit higher levels of impulsivity compared to controls (81), potentially engaging in more impulsive behaviors to regulate negative internal states (82). For adolescents with ADHD, who already experience difficulties with impulse regulations, social media platforms may serve as a readily accessible, but short term, emotional regulation coping strategy by providing rapid distraction and relief through immediate social rewards. However, repeated reliance on social media as an emotional regulation strategy may reinforce impulsive engagement patterns and reduce opportunities to develop more adaptive coping strategies, ultimately exacerbating anxiety symptoms over time. Therefore, ADHD-related impulse control deficits may not only increase vulnerability to social media addiction, but also contribute to a feedback loop in which social media temporarily alleviates anxiety while reinforcing long-term symptom maintenance. This pattern supports the proposed bidirectional framework, in which ADHD-related vulnerabilities and social media use interact to amplify anxiety risk.

SLEEP DISRUPTION

Within the bidirectional framework, sleep disruption may emerge as a downstream consequence of the interaction between social media use and ADHD-related difficulties in behavioral regulation. Sleep plays a critical role in adolescent mental health and neurodevelopment and is closely linked to patterns of social media use among individuals with ADHD. Excessive social media usage has been associated with poorer sleep quality and shorter sleep duration among adolescents (83, 84). Greater emotional investment in social media, including how central social media is to an adolescent's daily life and the extent to which users compare themselves to others, has also been shown to predict worse sleep quality (84). Moreover, social comparison has been associated with increased levels of stress (85), and since exposure to stress can also impair normal sleep function, it can be more difficult to fall asleep and lead to more disrupted sleep for adolescents (86). Therefore, excessive social media use may specifically impair sleep in adolescents with ADHD by increasing emotional investment and social comparison, leading to elevated stress that disrupts normal sleep processes.

Addictive social media use may also impair sleep through heightened cognitive arousal and prolonged exposure to blue light, both of which interfere with normal sleep–wake regulation. While all forms of light exposure have been shown to suppress melatonin levels (87), blue light wavelengths in particular (the type of light that is most prevalent behind phone screens) are adept at withholding melatonin secretion (88). Melatonin is central to regulating the sleep-wake cycle by transmitting a time cue when it becomes nighttime (evolutionarily when the sunsets and it becomes dark), thereby signaling the body to sleep (89). In addition to blue light–induced inhibition of melatonin secretion, the abundance of simultaneous information presented on social media platforms further elevates cognitive arousal before sleep (90). This heightened arousal keeps neural systems that are typically less active at night due to the circadian clock, such as the reward pathway, engaged at elevated levels, making it more difficult to initiate

sleep (91). Thus, prolonged blue light exposure and heightened cognitive arousal can impair a user's ability to disengage from social media at night, especially among adolescents with ADHD, which can ultimately lead to sleep deprivation, thereby affecting mental health outcomes. For individuals with ADHD, who already exhibit difficulties with behavioral disengagement and cognitive regulation, these platform-driven disruptions may disproportionately impair their ability to initiate and maintain sleep. In turn, sleep disruption may further exacerbate ADHD symptoms and associated mental health risks, reinforcing the bidirectional relationship between ADHD and social media use.

Taken together, these findings suggest that ADHD-related vulnerabilities do not merely coexist with social media risks in adolescents but may amplify them systematically, reinforcing the proposed bidirectional relationship between ADHD symptomatology and social media addiction and increasing risk for adverse mental health outcomes including depression, anxiety, and sleep disruption.

LIMITATIONS AND FUTURE DIRECTIONS

Several limitations should be considered when interpreting the findings synthesized in this review. For instance, findings on social media included in this review may not fully capture the extent to present addictive properties of ever-changing platforms. Indeed, many social media companies have been including features that increase addictive properties, and conclusions in the paper may be underestimated.

Additionally, this review only examines the properties and potential implications for ADHD youth of four widely-used social media platforms (Instagram, Snapchat, YouTube, and TikTok) for the sake of having a focused analysis and prioritizing the platforms that are most relevant among adolescents, while excluding other contemporary platforms (such as Facebook, Discord, Reddit, BeReal). Because adolescents typically use a wide range of social media sites, and each site carries its own unique features, the four platforms mentioned in the review cannot be used to generalize across all social media research findings and implications. Similarly, this review discusses a limited set of mental health outcomes, including anxiety, depression, and sleep disturbances. While these mental health outcomes have especially high correlations with excessive social media use (69), they do not encompass all mental health problems and disorders that may be associated with the rise in social media addiction among individuals with ADHD (such as body image-related disorders).

Methodological limitations within the existing literature also constrain interpretation. Most studies included in review relied on cross-sectional, longitudinal, and self-report designs and measures, limiting causal and directionality inference and increasing susceptibility to reporting bias.

Finally, much of the existing research does not adequately account for gender differences or specific developmental stages within adolescence. For example, most research analyzing ADHD does not specify what subtype of ADHD they were evaluating, even though ADHD can be classified into three different subtypes (inattentive, hyperactive/impulsive, combined) (92). Given that these subtypes reflect distinct symptom domains, a lack of specificity in some research makes it unclear which aspects of ADHD are being examined. Indeed, gender-related social and biological differences may moderate the relationship between ADHD, social media use, and mental health outcomes. Moreover, the category of adolescence discussed in this review encompasses a wide range of age groups and represents a population with continuously developing brains and behaviors (93) that differ among early and late adolescence. For example, while early adolescence (10-13 years old) primarily involves exploring the world alongside one's parents and limited autonomy, research findings by Konrad *et al.* (93) suggests that individuals in middle to late adolescence (14-17 years old) have a stronger inclination for peer approval and experience more autonomy generally. Therefore, the higher exposure to varying levels of internet culture that occurs as teenagers get older might influence how much social media they use or which apps they choose to prioritize as well as how they interpret social validation and rejection through these apps. Consequently, the lack of developmental stratification within adolescent samples may limit the precision and generalizability of findings regarding reward processing, impulse control, and social media use.

CONCLUSION

This literature review proposes a bidirectional framework, in which ADHD-related vulnerabilities and social media addiction mutually reinforce one another, increasing risk for adverse mental health outcomes in adolescents. By integrating neurobiological mechanisms with platform-specific design features, the present work

highlights how reward dysregulation and impaired impulse control may interact with highly reinforcing digital environments to sustain maladaptive patterns of engagement. This proposed framework has important implications for both clinical practice and platform design. Clinicians may benefit from incorporating digital behavior management into ADHD treatment plans and developing more targeted interventions that address impulse control-related and maladaptive reward-seeking behaviors exacerbated by social media platforms. Platform developers should consider design features that reduce excessive reward stimulation, limit compulsive engagement, and promote healthier patterns of engagement, particularly for vulnerable neurodivergent populations.

Future research should further investigate causal pathways using experimental and longitudinal designs, examine a broader range of platforms and consider moderating factors such as developmental stage and gender. Advancing this work may help inform more targeted interventions and contribute to the development of digital environments that better support adolescent mental health.

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CONFLICT OF INTEREST

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