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Why do individuals with Attention Deficit/Hyperactivity Disorder (ADHD) struggle to disengage from social media, and what do their eye movements reveal?

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ABSTRACT

Background:
A considerable body of research has been published on the impact of ADHD on brain function and cognition in relation to exposure to digital media. However, many popular digital platforms have been developed using engagement-based architecture (e.g. variable schedule reinforcement, endless scrolling, personalization algorithms, push notification systems and content curation via algorithms).

Method:
This narrative review synthesizes extant theory and research on the issues of ADHD, the design of digital media platforms, social communication processes, and oculomotor behaviors. The search for relevant studies was conducted using key electronic databases (e.g., PsycINFO, MEDLINE, Web of Science, Scopus, and Google Scholar) without strict date restrictions, to balance foundational theoretical models with contemporary empirical findings.

Results:
This literature review suggests that engagement-oriented digital architectures may exacerbate vulnerabilities associated with ADHD, such as those involving inhibitory control, reward sensitivity, delay aversion, and difficulty regulating attention and behavior. The feedback mechanisms inherent to social media platforms, such as the number of likes, views, followers, and response times, have the potential to act as frequent triggers for Rejection-Sensitive Dysphoria (RSD). Research has identified a correlation between neural responses to social rejection and specific regions, such as the dorsal Anterior Cingulate Cortex and the Anterior Insula. However, the question of whether these activations specifically characterize RSD in ADHD remains unanswered.
Eye-tracking studies have reported ADHD-related differences in selected oculomotor measures, particularly in saccade inhibition and anti-saccade initiation; however, findings are heterogeneous, and their diagnostic and ecological validity remain insufficiently established.

Conclusion:
The combination of salient bottom-up cues with engagement-driven features such as variable reward

schedules, infinite scrolling, content selection based upon algorithms, and notifications may contribute to creating an environment that amplifies the top-down self-regulatory deficits associated with ADHD. Eye-tracking may provide an objective measure of overt oculomotor behavior, although the generalizability of laboratory-based findings to naturalistic digital contexts remains uncertain.

Keywords: Attention-deficit/hyperactivity disorder (ADHD); social media use; reinforcement; eye tracking; rejection-sensitive dysphoria (RSD).

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Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a developmental disorder of brain function marked by chronic difficulty controlling behavior, focusing attention, and interacting socially or academically in an appropriate manner. Prevalence estimates suggest that ADHD affects approximately 5-7% of children and 2-5% of adults worldwide (Polanczyk et al., 2015). Although it was historically considered a childhood disorder, studies indicate that 50-65% of children diagnosed with ADHD continue to exhibit significant symptoms into young adulthood (Faraone et al., 2021). Adults with ADHD are more likely than those without a diagnosis to experience employment, interpersonal, and psychological well-being problems (Barkley & Fischer, 2010; Doshi et al., 2012; Faraone et al., 2021; Kessler et al., 2006).

According to the DSM-5 TR, there are three ways in which an individual's ADHD symptoms can manifest: predominantly inattentive type, predominantly hyperactive-impulsive type, and combined type. While these types reflect how ADHD is currently classified, researchers increasingly emphasize identifying transdiagnostic characteristics common to many forms of psychopathology that predict functional impairment. For instance, Nigg (2017) has identified several transdiagnostic traits, such as emotion regulation difficulties, altered timing of sensory events, greater sensitivity to rewarding events, and executive dysfunction , that partially overlap with Sedgwick et al.'s (2019) conceptualization of ADHD within the neurodiversity framework (see also Shaw et al., 2007; Shaw et al., 2014; Faraone et al., 2021). This framework views ADHD not as solely a deficit-oriented concept, but as a unique cognitive processing style involving both vulnerability factors and possibly compensatory advantages (Schippers et al., 2022; Sedgwick et al., 2019).

To explain why digital spaces may pose a particular challenge for neurodivergent users, a better understanding of the cognitive and neurological basis for ADHD is necessary. According to Barkley's inhibitory deficit theory, individuals with ADHD have an inability to suppress prepotent impulses due to failures in inhibition. This results in impairments in working memory, internal speech, motivation, and affect. According to Sonuga-Barke's dual pathway model, ADHD arises via two pathways: one involving executive dysfunction and another involving delay aversion. Each pathway is believed to be supported by different components of the nervous system (Sonuga-Barke, 2002; Sonuga-Barke et al., 2010).

Kahneman's theoretical work provides a general cognitive framework for understanding how attentional constraints arise under conditions of high cognitive demand, independent of any clinical diagnosis. In his work, *Attention and Effort* (Kahneman, 1973), he provided a capacity model suggesting that people have a limited amount of mental resources to allocate among multiple simultaneous tasks. Thus, the level of cognitive performance one can achieve depends directly on the percentage of their total cognitive capacity allocated to each task. Kahneman (2011) later developed a dual process theory, which provided an additional layer of depth to his original theory. He distinguished between two forms of information processing: System 1 is the first form of information processing, which is typically automatic, quick, and involuntary. It generates perceptions, emotional responses, and behaviorally based impulses with little to no expense of cognitive resources. The second type of information processing is referred to as System 2. System 2 involves effortful, intentional processing and is used when prolonged attention is needed to perform a cognitively demanding task. Systems 1 and 2 can operate simultaneously; however, because they draw on the same limited capacity, environmental factors will increasingly deplete the resources available for controlled thinking. Digital environments provide a unique space in which this systematic advantage of automatic over controlled processing is intentionally built into the structure. Most modern digital

platforms are designed to maximize users' exposure to specific content and enhance their overall experience on the platform. They accomplish this by designing digital experience in several ways, such as using random rewards, infinite scrolling, algorithmic content curation, autoplaying videos, and notifications. These design elements reflect the broader socioeconomic philosophy identified by Simon (1971). Simon stated that, although we have an abundance of information, we now face a scarcity of the attention needed to absorb it. The concept of an "attention economy," in which users' attention is viewed as a valuable and measurable resource, has been used as the organizational principle for developing most major digital platforms, with maximizing user engagement being the primary objective of most of them (Davenport & Beck, 2001; Fogg, 2003). These architectural design elements may therefore create a structural advantage for automatic processes over effortful cognitive control; this effect is unlikely to be an accidental consequence of digital interaction.

Given the nature of cognitive vulnerabilities associated with those presenting with ADHD symptomatology, such as inhibitory control deficits, reward sensitivity, and delay aversion, it is reasonable to hypothesize that these vulnerabilities could interact with the reinforcement structure inherent in digital platforms. Delay discounting, or the tendency to prefer immediate rewards over future ones, has been shown to be significantly higher in people with ADHD (Jackson & MacKillop, 2016; Marx et al., 2021; Scheres et al., 2008). This is especially relevant to social media platforms, which provide instant rewards based on user activity. Users receive constant feedback through various mechanisms, including likes, comments, followers, and notifications, which provide immediate rewards.

Additionally, recent computational models demonstrate that users employ prediction-error-based learning processes like those in dopaminergic reward systems. These processes reinforce platform engagement by continuously updating expectations based on received feedback (Lindström et al., 2021). However, limited evidence has directly examined whether prediction error signaling is altered in individuals with ADHD (Volkow et al., 2009). Such findings would support Sonuga-Barke's delay aversion pathway. However, more empirical research is required prior to drawing causal conclusions.

Given the cumulative effect of architectural features described above, there appears to be a potential systematic threat to the regulatory capabilities of this clinical population. Since these effects are continuous, an objective method of assessing attentional processes is necessary. One such method, eye tracking, provides a continuous record of where users direct their gaze. Additionally, eye tracking has been shown to reduce some biases in retrospectively reported data (Maron et al., 2021). However, eye tracking does not assess covert attention shifts that do not correlate with eye movement (Deubel & Schneider, 1996; Posner, 1980). Thus, limitations are present when using eye tracking in digital environments where users may visually remain engaged with screen content while repeatedly switching their attention across content items, notifications, and platform prompts.

This review integrates biological, behavioral, architectural, and oculomotor levels of analysis into a comprehensive framework that elucidates the relationship between ADHD and digital media. As such, the review outlines a preliminary bridging model that illustrates the conditions under which laboratory-derived findings on ADHD-related cognitive vulnerabilities can be applied to digital platforms.

This review addresses two specific research questions. First, do the architectural features of digital media exacerbate ADHD-related neurocognitive vulnerabilities? Second, can eye tracking provide a valid, observer-independent measure of overt gaze allocation and related oculomotor behavior during digital interaction?

Materials and Methods

Research strategy

Relevant literature for this narrative review was identified through repetitive searches across key electronic databases (PsycINFO, MEDLINE, Web of Science, Scopus, and Google Scholar). The search was conducted through June 2026 without strict date restrictions, in order to capture both foundational theoretical contributions and contemporary empirical findings.

Searches were built around keywords representing ADHD and executive function constructs, digital media and reinforcement-based platform design, and oculomotor/eye-tracking measures. An illustrative search string used was: ("ADHD" OR "attention deficit hyperactivity disorder") AND ("social media" OR "digital platforms") AND ("eye tracking" OR "oculomotor behaviors"). The search process was adapted across databases and conceptual domains rather than following a single fixed protocol.

Inclusion was limited to peer-reviewed empirical articles. Book chapters were incorporated where they provided comprehensive theoretical syntheses not readily available in peer-reviewed journal format. Non-peer-reviewed materials were excluded from the formal analysis, though a minimal number of references were retained for contextual purposes. As this is a narrative rather than systematic review, literature selection was guided by relevance to the two research questions and methodological quality rather than a rigid systematic protocol. Because the search was iterative and no formal screening log was maintained, approximate numbers of records identified, screened, and included cannot be reliably reported; this is consistent with the conventions of narrative rather than systematic review.

Results

The findings reported below are organized in relation to the two research questions guiding this review. Sections addressing reinforcement architecture, social communication dynamics, and ADHD comorbidity bear on RQ1, concerning the extent to which digital platform design exacerbates neurocognitive vulnerabilities in ADHD. The eye-tracking sections bear on RQ2, concerning the potential of oculomotor measures to serve as an objective index of attentional engagement within digital environments.

Reinforcement Architectures and Attentional Capture

Social media platforms employ several key architectural features designed to maximize engagement, including infinite scrolling, which eliminates natural stopping points (Rixen et al., 2023); variable reward schedules, which provide unpredictable reinforcement mirroring gambling mechanisms (Ferster & Skinner, 1957); algorithmically curated feeds, which continuously surface novel and emotionally arousing material; and push notifications, which create external interruptions drawing users back to the platform (Fogg, 2003; Davenport & Beck, 2001). These factors serve to perpetuate a state of heightened alertness or vigilance, thereby escalating the "cost" associated with disengagement from the activity (Kross et al., 2021). Furthermore, the absence of contextual cues that would normally signal the conclusion of scrolling can potentially lead to an endless cycle of scrolling

due to a lack of external controls (Ferster & Skinner, 1957; Rixen et al., 2023). While these design features impose behavioral barriers to disengagement for users across the spectrum, it has been argued that their impact may be greatest upon individuals with ADHD who have greater sensitivity to immediate rewards and whose prefrontal cortices have poor inhibitory control (Barkley, 1997; Dekkers & van Hoorn, 2022).

Social Communication and Interpersonal Vulnerability

Beyond passive consumption, social media platforms introduce a range of interpersonal dynamics that may exacerbate pre-existing vulnerabilities in individuals diagnosed with ADHD. Digital communication facilitates interaction at the user's discretion, thereby allowing individuals to engage in communication without the constraints imposed by the reactions of others (Walther, 1992; Suler, 2004). This phenomenon stands in contrast to the conventional social restraint mechanisms, also known as social norms, that are typically employed to regulate impulsive responses in face-to-face communication contexts (Barkley, 1997; Barkley & Fischer, 2010; Shaw et al., 2014).

Furthermore, even in the context of asynchronous communication platforms such as e-mail and Twitter, there exist inherent structural social cues, including read receipts, time delays between responses, and "online" statuses, that can imply social obligations. Consequently, the absence of an immediate response may be interpreted as a signal of social avoidance or disengagement (George & Odgers, 2015). These phenomena may pose significant challenges for individuals with lower levels of frustration tolerance and higher degrees of social reactivity (Barkley & Fischer, 2010; George & Odgers, 2015; Nijmeijer et al., 2008; Turel & Bechara, 2016).

Social media platforms offer a variety of metrics by which to gauge the extent of social approval received by users. These metrics include the number of likes received on posts, the number of views accumulated on videos, the total number of followers, and the speed at which others respond to the user (Andreassen, 2015; Fogg, 2003).

The Rejection-Sensitive Dysphoria (RSD) is characterized as an acute emotional response to experiences of rejection or criticism (Dodson, 2024). For those with ADHD particularly prone to RSD, the metrics described above may function as continuous, quantified proxies for social acceptance or rejection. While this phenomenon has been demonstrated to occur in a significant proportion of individuals diagnosed with ADHD and is acknowledged in the extant clinical literature regarding ADHD, it has not been incorporated as a diagnostic criterion in DSM-5-TR (Ramsay & Rostain, 2008; Faraone et al., 2021). The neurobiological substrates of RSD remain incompletely characterized. Important research has revealed the activation of the dorsal Anterior Cingulate Cortex and the Ventral Striatum in response to social rejection (Eisenberger et al., 2003; Plichta & Scheres, 2014). However, the specific relationship between these activations and RSD remains to be elucidated, as does the broader question of whether these activations represent a general tendency toward emotional dysregulation that is characteristic of many neurodevelopmental disorders (Nigg, 2017; Bunford et al., 2015).

Individuals diagnosed with ADHD, particularly those grappling with RSD, may utilize this information to assess social acceptance or rejection. This utilization can potentially perpetuate a cyclical pattern of monitoring notifications, self-comparison with others, and the pursuit of social validation (Shaw et al., 2014; Bunford et al., 2015).

In accordance with Sonuga-Barke's (2002) dual pathway model, RSD could be conceptually related to both pathways, although this has not been directly tested. The delay aversion pathway could theoretically contribute to heightened intolerance of social ambiguity and compulsive reassurance-

seeking. Similarly, the executive dysfunction pathway may be hypothesized to contribute to inflexible interpretation of social feedback arising from deficits in cognitive reappraisal and attentional set-shifting (Nigg, 2017; Ramsay & Rostain, 2008; Shaw et al., 2014).
The combination of RSD with the architectural structure of most social media platforms creates a potentially highly detrimental interaction. The continuous stream of quantified social feedback may act as a series of high-frequency triggers for episodes of RSD (Andreassen, 2015; Dodson, 2024). Moreover, experiences of digital exclusion may intensify negative affect, particularly among individuals with heightened RSD or limited emotion-regulation abilities (Engelskirchen et al., 2025). Such feedback, rather than resolving feelings of rejection, exposes users to additional rejection-related cues, perpetuating discomfort (Shaw et al., 2014; Bunford et al., 2015). However, it remains unknown whether individuals with ADHD-related RSD demonstrate heightened vulnerability to these digital exclusion effects.
Moreover, Ding et al. (2025) recently conducted a large-scale meta-analysis demonstrating a statistically significant positive correlation between problematic social media use and ADHD symptoms using data from case-control and cross-sectional studies. These findings are consistent with a proposed model in which increased emotional instability due to digital engagement contributes to increased motivation for further digital engagement (Volkow et al., 2012).

Eye-tracking in digital context

Although individuals with ADHD exhibit differences in oculomotor behavior compared to their neurotypical peers, the functional significance of these differences in real-world digital contexts remains to be fully established. For example, previous studies have shown that individuals with ADHD have difficulty controlling where they focus their eyes, are unable to suppress "intrusive" saccades, and have inconsistent eye movements from one trial to another (Muñoz et al., 2003). More recently, however, Maron et al. (2021) conducted a comprehensive analysis of 26 studies on the use of eye tracking as an assessment tool for various aspects of cognitive functioning in children and adults with ADHD. The results were largely consistent with previous findings; however, while earlier studies were primarily limited to laboratory-based cognitive assessments, Maron et al.'s study extended beyond this limitation to include a broader range of saccadic movement parameters. That said, relatively little evidence supported the notion that oculomotor deficits account for impairments in other aspects of cognitive functioning, such as smooth pursuit. The Maron et al. (2021) study is significant because it suggests that the observed oculomotor impairments in children and adolescents with ADHD may reflect difficulties in impulse control and attentional maintenance rather than primary deficits in the mechanics of eye movement. These findings can guide future research into whether similar oculomotor mechanisms underlie ADHD-related cognitive and behavioral deficits when using digital technology. In a recent study, Chen et al. (2023) demonstrated the efficacy of an artificial intelligence-driven eye-tracking system integrated into a tablet device in accurately distinguishing between typically developing children and children diagnosed with ADHD. These findings suggest the potential of technology for screening in non-traditional clinical settings. It should be noted, however, that this assessment was conducted within a structured paradigm rather than a naturalistic digital context, and its ecological validity for real-world social media use remains to be established. Specifically, it has been demonstrated that saccadic suppression, visuospatial working memory, and anti-saccade initiation are all significantly impacted in children with ADHD compared to those without (Maron et al., 2021). Additionally, numerous studies have demonstrated higher micro-saccade rates in ADHD populations, especially unmedicated individuals, who fail to suppress

micro-saccades during visual tasks relative to controls (Fried et al., 2014; Panagiotidi et al., 2017). It remains an open empirical question whether oculomotor deficits observed during laboratory reading tasks generalize to naturalistic behaviors such as scrolling through social media. Recent efforts have attempted to answer this question by replicating the oculomotor effects found in laboratory studies using eye tracking in more natural digital settings (e.g., Yoo et al., 2024).

Methodological potential and constraints

The difference in methodology between laboratory-based eye tracking and naturalistic digital use is a classic "precision-ecology tradeoff". Laboratory-based eye tracking is often done with precise, high-resolution infrared eye trackers. For example, the EyeLink 1000 Plus system from SR Research is capable of a 2,000-Hz sample rate per eye. When used with typical spatial resolutions of 0.25°–0.50° and 0.010°, it provides researchers with extremely accurate measures of saccadic parameters, such as saccadic duration, amplitude, and velocity; anti-saccade latency; and micro-saccade frequency and duration variability. However, these high-resolution systems are also subject to certain constraints. Obtaining accurate measurements requires participants to sit still while wearing an HMD or sitting in front of a monitor. This makes it difficult to replicate how people normally interact with digital media, such as uncontrolled scrolling, switching between multiple apps, and being interrupted by notifications. Conversely, low-cost, portable eye trackers such as Labvanced and NielsenIQ, which operate at 30–60 Hz, typically have relatively poor spatial precision (1–2°) and are thus incapable of providing a detailed picture of oculomotor behavior.

Webcam-based systems have been shown to identify some basic oculomotor characteristics; however, they are not capable of providing a comprehensive overview of oculomotor behavior. Reliable measurement of saccadic latency may necessitate temporal sampling rates of approximately 250 Hz or higher, contingent on the event-detection method and the parameter of interest (Andersson et al., 2010). Consequently, webcam-based systems operating at 30–60 Hz are likely to be inadequate for measuring anti-saccade latency and microsaccade rate, both of which are critical components of ADHD assessments. Therefore, it is imperative to maintain a clear empirical distinction between testing environments. Oculomotor markers, such as increased micro-saccade rates (Fried et al., 2014; Panagiotidi et al., 2017) and anti-saccade impairments (Maron et al., 2021), have been firmly established in highly controlled laboratory settings using high-resolution infrared equipment operating at sampling rates up to 2000 Hz. These settings utilize static or highly structured stimuli, which minimize environmental noise. Conversely, evidence derived from naturalistic digital environments remains in its infancy and is heavily constrained by environmental noise and the lower spatial precision characteristic of consumer-grade devices. Consequently, these devices currently capture broad macro-attentional shifts rather than precise mechanical deficits (Yoo et al., 2024). It has been demonstrated that certain parameters (e.g., fixation duration) may maintain greater diagnostic integrity than others (e.g., saccadic velocity) under lower sampling conditions. The findings derived from one context should not be assumed to generalize to another context without further validation.

Therefore, the main challenge is not whether eye tracking is valuable or useful. Rather, the primary challenge is determining which oculomotor characteristics maintain sufficient diagnostic integrity when sampled at lower rates in environments containing "ecological" sources of noise. Several recent

studies have employed machine learning on device-based eye-tracking data collected in naturalistic settings to screen for ADHD. One such study reported similar levels of accuracy (approximately 76%) for their screening tool as traditional neuropsychological tests do for detecting ADHD (Yoo et al., 2024). However, the authors note that this was performed under highly structured neuropsychological testing paradigms rather than with naturalistic digital stimuli.

Discussion

This review provides provisional but consistent answers to the two research questions guiding this study. First, the reviewed literature shows that the architectures of digital platforms, especially variable reinforcement schedules, infinite-scroll interfaces, and algorithmic content curation (Simon, 1971; Fogg, 2003; Davenport & Beck, 2001; Rixen et al., 2023), can elicit and perhaps exacerbate ADHD neurocognitive vulnerabilities, specifically those related to inhibitory control, reward processing, delay intolerance, and emotion regulation (Dekkers & van Hoorn, 2022; Kross et al., 2021). Second, the literature shows that eye-tracking paradigms can reliably identify oculomotor signs of ADHD in screen-based environments (Muñoz et al., 2003; Maron et al., 2021). However, the ecological validity of these measures in real-world digital environments remains uncertain (Yoo et al., 2024). Therefore, the main problem is not the inherent value of eye-tracking technology itself, but rather, how and under what conditions, laboratory-determined ADHD vulnerabilities can be transferred into digital platform settings.

A Model of Provisional Generalization

To bridge the gap between findings determined in laboratories and digital platform usage contexts in everyday life, this review proposes a model of provisional generalization. The model outlines three conditions that may help evaluate whether laboratory-derived findings can be cautiously extended to digital platform contexts. One proposed criterion is structural homology, which stipulates that the relevant digital feature should engage neurocognitive mechanisms that are meaningfully comparable to those examined in the experimental setting. For instance, if a laboratory experiment uses a variable-ratio reinforcement schedule to stimulate ventral striatal dopaminergic responses, the digital platform's corresponding feature should use a similar reinforcement structure (Ferster & Skinner, 1957; Volkow et al., 2012). The second condition is parametric overlap: the temporal and sensory features of the digital platform should be sufficiently comparable with those of laboratory experiments that have used similar stimuli (Andersson et al., 2010; Maron et al., 2021). The third condition is population specificity, which requires that research establish whether ADHD-related vulnerabilities are present in adults diagnosed with ADHD compared to neurotypical adults (Muñoz et al., 2003; Panagiotidi et al., 2017; Fried et al., 2014).

Together, these three conditions provide a practical means of assessing the degree to which inferences derived from laboratory studies can be applied to digital platforms. Stronger generalizations would require evidence that all three conditions are adequately addressed, and the inference would remain provisional if one or more conditions were absent. If only one or two conditions are met, the inference must be acknowledged as speculative and require additional empirical validation.

An Alternative Explanation Based on Motivation

Several researchers suggest that the explanations provided for the vulnerability hypothesis for ADHD, outlined above, may need to be compared with an alternate interpretation based upon theories of motivation of ADHD. Studies have shown that this clinical population exhibits enhanced self-regulation when engaged in activities of intrinsic interest or when receiving extrinsic rewards. These studies demonstrate that deficits in executive function are not consistently present in all situations (Antrop et al., 2006; Sonuga-Barke, 2002; Luman et al., 2005). Increased engagement with social media may reflect two complementary processes. On the one hand, it is driven by motivation-based attentional adaptation. On the other hand, it is a consequence of the dysfunction associated with the disorder. In other words, engagement with digital media can be seen as evidence of a context-dependent attentional response: when the environment provides salience, pace, reward potential, and interaction, the altered dopaminergic reinforcement gradients characteristic of ADHD, which generate a strong preference for immediate and highly stimulating rewards, may sustain directed attention in ways that are less apparent in low-stimulation contexts (Antrop et al., 2006; Sagvolden et al., 2005 ; Volkow et al., 2011).
The above view can be combined with a dual process model. According to Kahneman (2011), there are two forms of cognitive processing that rely on a common source of limited attentional resources: System 1, which is fast, automatic, and intuitive, and System 2, which is slow, deliberative, and effortful. Turel and Qahri-Saremi (2016) used this conceptualization to describe social media usage habits, demonstrating that social media usage patterns in the general population are largely influenced by System 1 processes. Given the established deficits in voluntary inhibition and executive functioning characteristic of ADHD (Barkley, 1997), one could hypothesize, as a theoretical extension, that individuals with ADHD rely more on System 1 processing than others do in fast-paced digital environments, although this has not been directly investigated. This perspective limits the applicability of the model discussed in this article because it is only applicable in contexts where the relevance of the task and motivational salience are considered.

Developmental and Clinical Implications

Adolescents are particularly susceptible to the effects of digital technologies because their brains are exposed to the potentially adverse impact of these technologies over an extended period. This exposure has been demonstrated to render adolescents more sensitive to stimuli associated with rewards. Furthermore, there is a growing body of evidence suggesting that adolescents are spending increasing amounts of time using digital devices and interacting with digital environments (Blakemore & Mills, 2014; Casey et al., 2008; Maza et al., 2023). Longitudinal studies employing neuroimaging methodologies have demonstrated that frequent social media usage among adolescents is associated with alterations in observable aspects of brain activity related to reward network. Furthermore, evidence indicates that disparities in pubertal trajectories of social feedback responsiveness correspond to subsequent addictive or substance abuse-like behavior patterns (Maza et al., 2023; Flannery et al., 2024). This research lends support to the notion that adolescence constitutes a critical developmental period during which neurobiological vulnerability (e.g., increased reward sensitivity) and repeated exposure to reinforcing digital environments interact to increase the risk of problematic behaviors.

More broadly, chronic exposure to high-demand digital environments may also contribute to fatigue as a symptom of regulatory imbalance, reflecting alterations in shared neurophysiological mechanisms that have been identified across heterogeneous clinical conditions and that are sensitive to local neurodynamics (Armonaite et al., 2025; De Ventura et al., 2026). When such regulatory dysregulation is protracted and begins during sensitive developmental periods, the cumulative stress burden may extend beyond cognitive and behavioral domains to encompass epigenetic processes. Evidence suggests that traumatic experiences may epigenetically alter gene expression, with potential consequences for stress reactivity and long-term behavioral outcomes (Persichilli, 2024a). These mechanisms are particularly relevant for adolescents diagnosed with ADHD who are repeatedly exposed to cycles of social rejection and digital exclusion.

Digital communication is fundamentally different from face-to-face communication because it eliminates most of the nonverbal cues that are normally relied upon. These cues encompass gaze direction, facial expressions, prosody (the rhythm and inflection of speech), and body language. A substantial body of research on computer-mediated communication has demonstrated that the elimination of these cues has a considerable impact on the manner in which individuals communicate and results in a reduction of interpersonal inhibition. Consequently, the contextually dependent framework for establishing common meaning and intersubjectively exchanging ideas through communication becomes disrupted (Suler, 2004; Walther, 1992). It is important to note that these nonverbal signals do not merely facilitate communicative efficiency; they constitute the substrate for relational mirroring.

While a full treatment of these developmental mechanisms falls outside the primary scope of this review, they are noted here as contextual dimensions that may compound ADHD-specific vulnerabilities in digital environments. Relational mirroring is defined as the dynamic, contingent responsiveness between individuals that underpins mentalization and the development of a coherent Self. This disruption of relational mirroring has broader implications: dysfunctional or absent mirroring has been proposed to interfere with mentalization processes and may affect the coherence of the Self, while contingent mirroring has been theorized to support the development of a coherent Self (Persichilli, 2026). Beyond communicative efficiency, the reduction of embodied cues in digital environments may also affect the interpersonal processes that regulate emotion, mentalization, and experiential integration (Persichilli, 2024b; Gallese & Morelli, 2024).

The significance of these embodied channels becomes particularly evident at the nexus of regulatory failure and adverse experience. Sensorimotor and visual-system involvement are not peripheral to neural integration but rather constitutive of it. This viewpoint aligns with the extant literature suggesting that sensorimotor interaction and visual-system involvement play a significant role in trauma-related processing (Grifoni et al., 2023; Persichilli et al., 2022), given that the consequences of trauma manifest through complex neural and social interactions (Persichilli, 2025b). For individuals diagnosed with ADHD who have experienced social adversity, the systematic reduction of embodied signals in digital environments may therefore compound pre-existing vulnerabilities in experiential integration. These considerations, while extending beyond the core clinical focus of this review, highlight the broader neurodevelopmental consequences that may arise when embodied regulatory channels are systematically reduced. Finally, given the significance of social exclusion as a factor that activates neural networks responsible for processing physical pain (e.g., the dorsal Anterior Cingulate Cortex and the Anterior Insula), further research in this area is warranted (Eisenberger et al., 2003; Persichilli, 2025a).

A Lack of Research

Prior research has not studied whether pharmacologic or behavioral treatments for ADHD reduce susceptibility to the engagement structures of digital platforms. Although medication has been found to improve certain neuropsychological deficits in individuals with ADHD, such as inhibitory control and delay-related processing, the results are inconsistent. It is unclear whether the benefits of medication will extend to naturally occurring digital environments, which are much more complex and dynamically driven by algorithms than typical clinical paradigms (Sonuga-Barke et al., 2010). Recently, several reviews have examined the relationship between ADHD, digital media use, and mental health. Evidence from multiple sources suggests an association between problematic digital media use and ADHD symptomatology. However, this relationship appears reciprocal within adolescent samples (Thorell et al., 2022). To the author's knowledge, however, no study has investigated how digital environments interact with treatment response in terms of risk factors in adult populations. Thus, it is unclear whether the effects of treatment on performance in standardized testing extend to daily engagement with digital environments.

Limitations

The development of a narrative review enabled the integration of theoretical frameworks and empirical evidence from multiple disciplines, including cognitive neuroscience, developmental psychopathology, and digital media. This approach also entailed the application of diverse methodologies, such as eye tracking, functional magnetic resonance imaging (fMRI), and self-report, without the capability to conduct comparative analyses or meta-analyses. The utilization of a systematic review methodology was precluded by the inherent limitations of such an approach in integrating theoretical perspectives and empirical data. Consequently, the selection of literature was conducted with a focus on its relevance to the conceptual framework under investigation, as opposed to adhering to a systematic protocol. Given these limitations, the results of the present review can be more accurately described as a conceptual interpretation of the extant literature on the subject rather than as the magnitude of the effect derived from statistical results. It is important to note that the interpretations provided here may be subject to a certain degree of selection bias. The substantial inclusion of WEIRD participants (Western, Educated, Industrialized, Rich, and Democratic) in this review is a significant limitation, as it restricts the generalizability of the findings. As a narrative review, rather than a systematic review, these findings represent a conceptual reframing of the extant literature. They are not quantified effect sizes derived from meta-analytic procedures. Additionally, while the Rejection-Sensitive Dysphoria construct is clinically recognized and acknowledged in the extant ADHD literature, it has not yet been incorporated as a diagnostic criterion in DSM-5-TR. Consequently, causal claims regarding the relationship between digital architecture and ADHD symptomatology should be interpreted as indicating possible exacerbation or harmful interaction rather than direct causation. These qualifications ensure that claims remain aligned with the conceptual and non-quantitative nature of this narrative synthesis. Moreover, the Methods section delineates the general search approach and furnishes an illustrative search string. However, it does not report precise counts of identified or screened records, as would be anticipated in a systematic review.

Conclusion

This narrative review has examined whether selected cognitive and neurobiological characteristics associated with ADHD may overlap with reinforcement features of contemporary digital media.
The evidence suggests that engagement-oriented platforms may exacerbate core ADHD vulnerabilities, including deficits in inhibitory control, delay aversion, and reward sensitivity. The quantifiable feedback loops inherent in most social media , such as likes, views, follower counts, and response latencies, may exacerbate Rejection-Sensitive Dysphoria (RSD), an emotional response to rejection reported in a clinically significant proportion of individuals with ADHD in the extant literature. This construct has been associated with brain regions and neural circuits involved in emotion regulation and social pain.
ADHD is associated with alterations in dopaminergic signaling in the basal ganglia and with what appears to be reduced activity in fronto-striatal circuits that support anticipatory motivation, goal-directed action planning, and decision-making. These neurobiological and cognitive characteristics may render individuals with ADHD particularly susceptible to the salient, rapidly shifting reinforcement schedules that characterize modern digital environments. Eye-tracking has emerged as a promising method for objectively measuring how visual attention is organized and disrupted by digital stimuli, though it cannot currently be used as a proxy for the covert attentional difficulties that are central to the ADHD experience.
The following four points are proposed for further investigation:

1) Empirically testing the proposed model of provisional generalization by measuring oculomotor behaviors and cognitive performance in individuals with ADHD within semi-naturalistic environments that emulate selected real-world platform features (such as live push notifications and infinite scrolling), moving beyond static neuropsychological paradigms.
2) Investigating how pharmacological and behavioral interventions for ADHD interact with digital reinforcement architectures, including whether medication status or behavioral strategies modulate susceptibility to engagement-driven design.
3) Further elucidating the neurobiological substrates linking digital exclusion to Rejection-Sensitive Dysphoria, particularly whether prediction-error signaling is altered in ADHD populations.
4) Extending this work through longitudinal designs and across diverse, non-WEIRD populations to determine how cultural, developmental, and socioeconomic contexts shape the interaction between ADHD and digital media architectures.

Overall, this review provides a working model based on structural homology, parametric overlap and population specificity. This can help distinguish between reasonable generalizations and unjustified extensions. Future empirical work is needed to validate the proposed framework and to determine how digital platforms might be redesigned to better support individuals with ADHD and other neurodivergent users.

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