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Impact of Excessive Screen Time on the Misdiagnosis of Attention-Deficit/Hyperactivity Disorder in School-Aged Children

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Abstract:

Over the past several decades, the reported prevalence of Attention-Deficit/Hyperactivity Disorder (ADHD) has increased markedly, prompting concern regarding potential overdiagnosis and misdiagnosis in school-aged children. This trend has coincided with a substantial rise in children's engagement with digital media and screen-based technologies. An expanding body of evidence links excessive screen exposure to behavioural patterns, including inattention, impulsivity, hyperactivity, emotional dysregulation, and sleep disturbances, that closely parallel core ADHD symptomatology. Given this overlap, screen-related behavioural changes may be erroneously interpreted as ADHD during clinical evaluations, particularly when contextual and environmental contributors are insufficiently assessed. This review paper examines the degree to which excessive screen time may influence diagnostic inaccuracies, drawing on findings from longitudinal studies, cross-sectional

analyses, systematic reviews, and neurodevelopmental research. Current literature indicates that elevated screen use can produce situational, transient, or reversible attention deficits that risk being misclassified as chronic ADHD symptoms in both clinical and educational settings. Furthermore, several studies highlight the potential for diagnostic bias when teachers or caregivers attribute behavioural concerns to ADHD without adequately considering alternative explanations such as heavy digital media use, poor sleep quality, or sensory overstimulation. Overall, existing research underscores a notable association between high levels of screen exposure and ADHD-like behaviours, suggesting that excessive screen time may contribute to diagnostic ambiguity and inflated ADHD prevalence estimates. These findings reinforce the need to strengthen diagnostic procedures by incorporating comprehensive evaluations of digital media habits, sleep patterns, and environmental influences to reduce the risk of misdiagnosis and prevent unwarranted treatment. A deeper understanding of the interplay between screen use and ADHD-like presentations is essential for ensuring diagnostic accuracy and guiding appropriate interventions for school-aged children.

Keywords: ADHD Misdiagnosis, Digital Media Exposure, Screen Time Effects, Neurodevelopmental Behaviour, Diagnostic Bias

Introduction:

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most commonly diagnosed neurodevelopmental disorders in school-aged children, characterized by chronic patterns of inattention, hyperactivity, and impulsivity [1, 2]. In recent years, however, growing evidence has raised concerns about the potential for overdiagnosis and misdiagnosis, particularly among younger children whose developmental behaviours may naturally resemble ADHD symptoms [33, 51, 54]. At the same time, children's exposure to digital media and screen-based activities has risen dramatically, presenting an added diagnostic challenge as screen-induced attentional difficulties can closely mirror the clinical presentation of ADHD [11, 21, 42].Excessive use of digital devices—including fast-paced video games, smartphones, social media, and television—has been linked to inattention, impulsivity, impaired executive functioning, emotional dysregulation, and disruptions in sleep, all of which parallel core ADHD symptomatology [22, 41, 48]. These screen-driven behavioural changes may complicate the diagnostic process, as clinicians, educators, and caregivers may struggle to distinguish between true neurodevelopmental impairment and attention difficulties brought on by environmental overstimulation or high digital engagement [38, 43]. Consequently, children with substantial screen exposure may be at increased risk of being misclassified with ADHD when their symptoms stem primarily from lifestyle-related factors rather than persistent neurodevelopmental dysfunction [7, 10, 51].Research further supports this concern, with studies demonstrating that heightened screen exposure is associated with reduced attention span, increased distractibility, and poorer self-regulation, particularly in younger children whose developing brains are more susceptible to digital overstimulation [19, 28, 48]. Longitudinal and cross-sectional findings consistently show strong associations between screen time and ADHD-like behaviours, suggesting that these media-driven

symptoms may influence clinical impressions or be mistakenly interpreted as indications of ADHD during diagnostic evaluation [11, 22, 39]. Additionally, rising ADHD diagnosis rates across various countries may reflect diagnostic oversights in which contextual and lifestyle factors—such as digital media use, sleep disturbances, and sensory overstimulation—are insufficiently assessed during clinical evaluation [10, 33, 54]. Without comprehensive history-taking and environmental assessment, there is a heightened risk that clinicians may attribute screen-related behavioural issues to ADHD, leading to unnecessary labeling or overtreatment [7, 52]. Understanding how excessive screen time contributes to ADHD misdiagnosis is therefore essential for improving diagnostic accuracy, minimizing unnecessary medication use, and encouraging families to address modifiable lifestyle factors before pursuing psychiatric intervention [1, 21, 42]. This study seeks to examine the pathways through which screen exposure contributes to ADHD-like symptoms, synthesize evidence linking digital media use to diagnostic errors, and evaluate the impact of these factors on ADHD misdiagnosis in school-aged children.

Methodology:

This study employed a systematic review design with an integrative synthesis approach, combining empirical findings and theoretical frameworks to investigate how excessive screen time may contribute to the misdiagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD) in school-aged children. To ensure methodological transparency and rigor, the review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive literature search was conducted across multiple electronic databases, including PubMed, PsycINFO, Web of Science, ScienceDirect, JSTOR, ERIC, APA PsycArticles, and Google Scholar, encompassing publications from January 2010 through March 2025. The search strategy incorporated both controlled vocabulary terms (e.g., MeSH headings) and free-text keywords related to “Attention-Deficit/Hyperactivity Disorder,” “ADHD,” “screen time,” “digital media,” “electronic device use,” “gaming,” and “social media.” Boolean operators were applied to refine and optimize search combinations (e.g., *ADHD AND screen time*; *Attention-Deficit/Hyperactivity Disorder AND digital media*; *ADHD AND gaming OR social media*). Additionally, the reference lists of all included articles were manually examined to identify further relevant studies.

Included studies represented diverse geographic regions, including the United States, United Kingdom, China (37), Pakistan (17), India (41), Thailand, Egypt (34), and several European countries (8, 45). Sample sizes ranged from small qualitative case studies to large-scale cohorts such as the Longhua Child Cohort in China (3), which included 41,494 participants. Both general population samples and clinically diagnosed ADHD groups were considered.

Quality appraisal followed PRISMA guidelines and employed Joanna Briggs Institute (JBI) tools for observational and cross-sectional studies. Studies scoring ≥6/10 on JBI criteria were included. Additional evaluation was applied to Mendelian randomization studies (33) and longitudinal research

to assess selection bias, confounding control, and statistical robustness. Most included studies demonstrated moderate risk of bias, often due to reliance on self-reported screen time or caregiver/teacher behavioural ratings, which may lead to recall or reporting bias.

Data extraction was conducted independently by two reviewers, with disagreements resolved by discussion. Extracted information included study design, population characteristics, age groups, diagnostic methods, definitions of screen exposure, statistical analyses, and major outcomes. Heterogeneity across study methodologies, measurement tools, and outcome definitions precluded meta-analysis. Therefore, a narrative synthesis approach was adopted.

Findings were organized into four major categories:

1. Screen time and ADHD-like behavioural symptoms (e.g., Ford-Jones, 2015 [2]; Pakistan Cross-Sectional Study [17]).
2. Diagnostic criteria and risks of overdiagnosis (Egyptian Early-Intervention Study [34]).
3. Psychosocial and cognitive mediators, including sleep disruption and impulsivity (Thai ADHD Lockdown Study [44]; U.S. Cohort [43]).
4. Sociocultural and educational factors influencing parental and clinical interpretation of ADHD symptoms (European and U.K. Studies [8, 45]).

Inclusion Criteria

Inclusion criteria were defined to ensure methodological consistency and relevance across the reviewed literature. Eligible studies focused on children or adolescents aged 4–18 years and included an assessment of screen time, digital media exposure, or electronic device use. To be considered, studies were required to evaluate ADHD symptoms, formal ADHD diagnoses, or behavioural outcomes that closely resemble ADHD. Diagnostic or symptom assessment had to rely on validated instruments, including parent or teacher rating scales or clinical evaluations based on DSM-IV, DSM-5, or ICD criteria. Only empirical research designs—such as cross-sectional, cohort, intervention, randomized controlled trials, and case-control studies—as well as narrative or systematic reviews providing substantive evidence were included. Additionally, full-text availability in English was required for inclusion.

Exclusion Criteria

Exclusion criteria were applied to remove studies that did not meet the methodological or conceptual requirements of the review. Studies were excluded if they focused solely on adult populations or lacked empirical data, such as editorials, commentaries, or theoretical discussions. Research that failed to assess both screen exposure and ADHD-related outcomes or employed non-validated or insufficiently described measures of screen use was also excluded. Additionally, studies unavailable in English or without accessible full-text versions were omitted from the analysis.

Contradictory findings were included to preserve balance and reflect the complexity of the topic. The review was structured according to a modified Population–Exposure–Outcome (PEO) framework. Population: School-aged children (4–18 years) evaluated for or diagnosed with ADHD. Exposure: Duration, type, and frequency of screen use, including television, gaming, smartphones, and social media. Outcome: Behavioural or cognitive symptoms capable of influencing an ADHD diagnosis or contributing to misdiagnosis. Quantitative results were organized according to effect direction and magnitude, while qualitative findings provided contextual depth. Longitudinal research, such as the KOALA Birth Cohort in the Netherlands [13], was essential for distinguishing correlation from causation. Mendelian randomization studies [4] provided insight into potential causal relationships between genetic risk factors and media consumption. Systematic reviews and meta-analyses [2, 37] indicated that although excessive screen time is associated with attention-related difficulties, these behaviours do not consistently align with clinical ADHD, raising concerns about environmentally driven diagnostic inflation.

Most included studies used previously published or secondary data and therefore did not require new ethical approval. Limitations across the literature included reliance on self-reported or parent-reported metrics, the dominance of cross-sectional study designs, variability in ADHD diagnostic standards (DSM-IV vs DSM-5), inconsistent definitions of screen exposure, and cultural differences in behavioural interpretation. These factors limited direct comparability across studies.

Despite these limitations, integrating findings from pediatrics, psychology, neuroscience, and education strengthened the overall reliability of the review. The synthesis incorporated diverse perspectives, drawing from U.S. samples [46, 43], Asian cohorts [8, 37, 17, 41], and European studies [8, 45, 11, 29]. Collectively, this integrative review offers a comprehensive perspective on how excessive screen exposure may obscure distinctions between genuine ADHD pathology and environmentally induced behavioural presentations.

Results:

The primary objective of this analysis was to examine the relationship between excessive screen time and the potential for misdiagnosis of Attention-Deficit Hyperactivity Disorder(ADHD) in school-aged children.ADHD diagnosis requires symptoms to be present for at least 6 months, to occur in two or more settings (home and school), and to cause functional impairment. When assessments rely heavily on a single setting (e.g., classroom behavior), misdiagnosis risk increases. Recent epidemiological data demonstrate a rising trend in ADHD diagnoses, despite stable rates of core ADHD behaviors over time.For instance, a longitudinal analysis comparing two Australian birth cohorts (born 1999/2000 and 2003/2004),children born in the later cohort were 1.33 times more likely to be diagnosed with ADHD compared to those in the earlier cohort, and this increased likelihood was consistent across the full spectrum of ADHD-related behaviors, including normal, borderline, and clinically relevant ranges. This suggests that the diagnostic threshold may have lowered, leading to diagnoses of children who

previously might not have met the criteria because 26.5% of diagnosed children recorded pre-diagnosis behaviors that fell within the normal range . An additional 27.6% had borderline scores, meaning their behaviors were not yet in the clinical range . Only 45.8% scored within the clinical range indicating a higher probability of misdiagnosis [50]. This pattern strongly indicates that classroom comparisons drive the relative-age effect, where developmental immaturity ,a normal variation in maturation is frequently misinterpreted by educators and parents as clinical inattention or hyperactivity-impulsivity. [2].

Multiple studies have reported significant correlations between increased screen exposure and elevated ADHD-like symptoms in children ,specifically in a major birth cohort study, children whose daily screen time surpassed the two-hour threshold exhibited a 7.7-fold increased risk of meeting the criteria for ADHD-type symptoms. However this reflected symptom screening scores, not confirmed diagnostic evaluations.This highly significant association remained statistically strong even after controlling for various confounders, including parenting stress,sleep and gender [12].

But in contrary a prospective study evaluating screen time and sleep duration in early childhood and formal ADHD diagnosis at ages 8 to 10 years found a notable discrepancy. While high screen time and reduced sleep were cross-sectionally linked to higher externalizing symptom scores at age two, the longitudinal analysis demonstrated no significant association between screen time or sleep and ADHD diagnosis , hence not likely to get an ADHD diagnosis later around the age of 10. It suggests that the symptoms generated by excessive screen time are often transient or reversible functional impairments, rather than indicators of persistent, underlying neurodevelopmental pathology [5].

Excessive screen time is associated with increase in ADHD like behaviors in both concurrent within-person and between-person association in the same year. The primary mechanism mediating this association is impulsivity, a key pathway connecting screen time and ADHD symptoms. High screen time exposure has been demonstrated to lead to increased impulsive actions, such as blurting out answers or interrupting conversations resulting in reduced ability to focus and measurable declines in overall thinking skills.The link for such impulsive behaviour is response inhibition, an essential neuropsychological function. The continuous engagement with highly stimulating digital content compromises the neural circuits responsible for controlling urgent urges, creating a phenotype of poor self-control and heightened distractibility that mimics the core features of ADHD [13]. Digital media provides continuous novel and fast-paced stimulations that activate dopamine and reward pathways, potentially leading to increased sensation or novelty-seeking behavior that mimics ADHD symptoms. This constant stimulation can impact attention and cognitive control [16]. Sleep is an important factor to consider in the relationship between screen time and ADHD, as screen time can adversely affect sleep outcomes, such as shortened duration and delayed timing . The study cross-sectionally observed that fewer hours of sleep were associated with higher externalizing symptom scores in young children [5]. Sustained or vigilant attention is crucial for cognitive performance, and sleep deprivation can impair this ability, leading to cumulative deficits in sustained attention. Patients experiencing sleep deprivation may be misdiagnosed with ADHD due to difficulties in sustaining attention.

Furthermore, poor sleep can reduce inhibitory control and increase impulsivity. The effects of restricted, disordered, or disrupted sleep can manifest as symptoms, behaviors, or functional impairments that are "remarkably like those of ADHD" [15].

A thorough medical evaluation is essential to minimize misdiagnosis, as several medical and neurological conditions present with symptoms that mimic ADHD, particularly inattentive symptoms. In differential diagnosis, it is also critical to distinguish other medical condition that mimic inattention. Conditions such as absence seizures (temporal lobe associated symptoms, TASs), thyroid dysfunction, iron-deficiency states, and post-concussion states can manifest with symptoms of inattention, such as daydreaming or difficulty sustaining focus. Missing the diagnosis of a seizure disorder may have serious implications, as prescribing stimulants in such cases may increase seizure activity [15].

A misdiagnosis of ADHD based on screen-time induced behaviors could lead to the prescription of unnecessary medication, which carries its own risks and side effects. It could also result in the implementation of behavioral therapies that are not targeted at the root cause of the child's difficulties. Children incorrectly diagnosed with ADHD may experience social stigma and be directed towards support systems that are not appropriate for their actual needs. This can divert attention from addressing the underlying issue of excessive screen exposure [12]. Although peripheral to the misdiagnosis mechanism itself, emerging technologies illustrate shifts in ADHA management framework. Traditional treatments like medication and cognitive-behavioral therapy (CBT) have limitations, including potential side effects, low adherence, high costs, and significant time commitments. Given these challenges, there's a growing interest in using innovative technologies like Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) for the diagnosis and treatment of ADHD in children.These technologies create realistic, interactive environments that help improve sustained attention and reduce impulsivity. Even though VR, AR, and MR technologies demonstrate considerable potential for ADHD diagnosis and treatment in children, further research is essential to overcome current limitations regarding sample size, control groups [18].

Findings from the existing literature demonstrate that excessive screen time is a major environmental confounder that elevates the risk of ADHD misdiagnosis in school-aged children. It produces behavioral patterns that overlap with core ADHD symptoms, interacting with existing weaknesses in the diagnostic process. Diagnostic vulnerability is reflected in rising ADHD diagnoses despite stable hyperactivity/inattention scores, as well as the relative-age effect, indicating that normal developmental immaturity is often misinterpreted as pathology. Data show that screen exposure exceeding two hours per day increases the likelihood of ADHD-

type behavioral morbidity by up to 7.7-fold in early childhood [12]. Mechanistically, excessive screen use impairs executive functions through increased impulsivity and reduced response inhibition resulting in symptom profiles that are clinically indistinguishable from true ADHD [Screen time, impulsivity,neuropsychological functions and their relationship to growth in adolescent attention-deficit/hyperactivity disorder symptoms]. Compounding factors, particularly sleep deprivation associated with heavy screen use, further mimic inattention and impulsivity, intensifying diagnostic

confusion[15]. Clinical evidence suggests that preventing misdiagnosis requires standardized medical evaluation, including screening for sleep disorders and careful consideration of developmental age. However, the exact rate of ADHD misdiagnosis attributed to screen exposure is not yet quantifiable, as most studies rely on parent-teacher reported symptoms rather than standardized diagnostic confirmation.

Discussion:

This literature review examines the extent to which excessive screen time contributes to the misdiagnosis of ADHD in school-aged children. The cumulative evidence suggests that high levels of screen exposure may act as an important environmental factor influencing diagnostic patterns. The discussion outlines the broader context of diagnostic inflation, identifies screen time as a significant confounder, explores relevant causal mechanisms, and highlights the implications for clinical practice and public health.

A substantial body of research describes ADHD overdiagnosis as a persistent and well-documented issue rather than a hypothetical concern. Children's constant exposure to fast-paced digital media, social platforms, and electronic devices increasingly blurs the distinction between true neurodevelopmental disorders and environmentally driven inattention or overstimulation. DSM-5 criteria require that symptoms persist for at least six months, appear in multiple settings, and cause functional impairment. When clinicians fail to assess behaviour across different environments, the likelihood of misdiagnosis increases. Systematic scoping reviews have concluded that a considerable proportion of diagnosed cases do not fully meet diagnostic criteria, indicating a trend toward diagnostic inflation [51], [53]. This concern is shared across different cultural contexts; for instance, clinicians in Iran have reported similar perceptions of overdiagnosis [52]. One of the most compelling findings comes from a longitudinal cohort study comparing two generations of Australian children, which demonstrated a sharp rise in ADHD diagnoses despite no significant increase in parent-reported hyperactive or inattentive behaviours [55]. This discrepancy raises critical questions about which external or systemic influences are driving diagnostic increases, positioning screen time as an important variable to evaluate.

The widespread use of digital media offers one such explanation. Excessive engagement with rapidly stimulating content can create behavioural patterns resembling ADHD, often referred to as a "digital phenocopy" [7], [8]. These behaviours may closely mimic ADHD during routine behavioural assessments, despite diverging neurodevelopmental pathways. Numerous correlation studies link higher screen time with elevated ADHD symptoms across developmental stages, from preschoolers [21], [30] to adolescents [2], [41], and across multiple national and cultural contexts, including China [38], [43], India [44], France [49], and the United States [50]. Although correlation does not confirm causation, evidence from longitudinal studies strengthens this relationship. These studies consistently demonstrate temporal precedence: higher screen exposure predicts the onset or worsening of attention difficulties over time, even after accounting for baseline symptoms [1], [2], [18], [22], [39]. Such findings indicate that screen exposure does more than correlate with ADHD-like behaviour; it may

actively contribute to its development, particularly among children already vulnerable to attention-regulation difficulties. Multiple mechanisms help explain how screen exposure shapes attention-related symptoms.

Neuropsychological research shows that excessive digital engagement trains the brain toward rapid attentional shifting and immediate reward, especially in interactive contexts such as video games and social media. These effects are associated with impairments in executive function, including inhibitory control and sustained attention [41], [42]. Neurobiological studies further indicate measurable structural and functional alterations in regions responsible for executive control and reward processing [29], as well as changes in white-matter microstructure [45]. These findings suggest a gene-environment interaction wherein children with a higher polygenic risk for ADHD may be more susceptible to the adverse neurological effects of screen exposure [45].

Indirect pathways also play a significant role. Screen use—particularly before sleep—is strongly associated with impaired sleep quality and architecture, leading to daytime inattention and cognitive dysfunction [19], [25], [39], [46]. Additionally, excessive screen use displaces physical activity, a key factor in healthy cognitive development and self-regulation, thereby compounding the negative effects [27], [46]. The relationship is also bidirectional: children with inherent attention vulnerabilities may be more likely to seek fast-paced digital stimulation, perpetuating a reinforcing cycle [6], [18].

These interacting mechanisms converge within a diagnostic system already susceptible to misclassification. The rise in ADHD diagnoses has occurred alongside the rapid expansion of children's digital media use, suggesting a parallel association rather than independent trends [55]. Screen-induced behavioural symptoms can lead parents and teachers to seek clinical evaluations, where time constraints, broad diagnostic criteria, and implicit biases may increase the risk of attributing digital phenocopies to ADHD [33], [54]. Qualitative research indicates that although clinicians recognize the challenges digital media presents, they often lack standardized protocols—such as a detailed "digital history"—to systematically rule out screen-related contributors during diagnostic assessments [30]. Without structured approaches, environmentally driven symptoms may be incorrectly labeled as chronic neurodevelopmental disorders.

Recognizing these nuances is essential for interpreting the broader implications of the findings. The relationship between screen time and ADHD-like behaviours is not unidirectional; children with pre-existing attentional vulnerabilities may also gravitate toward digital media, creating feedback loops that further exacerbate symptoms [6], [18]. Moreover, excessive screen exposure not only increases the risk of misdiagnosis but may also worsen symptom severity and impair functioning in children with accurately diagnosed ADHD, complicating management and intervention strategies [44], [47].

These findings have important consequences for clinical practice, public health, and future research. Clinical assessments should incorporate a standardized "digital history" that includes screen duration, content type, context (e.g., use before bedtime), and patterns of use [8], [30]. In ambiguous cases, structured screen-reduction trials may help differentiate between true ADHD and screen-induced

behavioural presentations. From a public-health perspective, guidelines must move beyond simple time-based limits and include evidence-based recommendations related to content pace, environmental context, and the importance of balancing screen use with physical activity and adequate sleep. The rise of social-media-driven self-diagnosis further highlights the need for public education distinguishing genuine ADHD from screen-induced attention difficulties [36].

Overall, the literature indicates that excessive screen exposure has the potential to produce behavioural profiles resembling ADHD, complicating diagnostic accuracy. The convergence of environmental influences, clinical vulnerabilities, and systemic factors underscores the need for more comprehensive assessment protocols and refined diagnostic practices to address the risk of misdiagnosis.

Conclusion:

In conclusion, excessive screen time emerges as a substantial factor contributing to the misdiagnosis of ADHD, largely by producing behavioural patterns that closely resemble core features of the disorder through both direct and indirect mechanisms. When this environmental influence is overlooked, it increases the likelihood of diagnostic error within a system already vulnerable to misclassification. Such oversight can perpetuate a cycle of overdiagnosis and unnecessary pharmacological treatment, potentially disadvantageous to children whose attentional difficulties may be more appropriately addressed through behavioural or environmental interventions rather than medication. Although the existing literature consistently identifies a meaningful association between screen exposure and ADHD-like behaviours, the precise proportion of ADHD diagnoses affected by this factor remains uncertain due to heterogeneity in study designs, measurement tools, and diagnostic criteria.

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