

Understanding Problematic Media Use in Children and Youth with ADHD, Early Neurological
Risk and a Community Sample: Exploring Parental Cognitions and Perspectives

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Abstract

While children at risk of attention difficulties, such as those with ADHD or early neurological risk, are recognized as more susceptible to problematic media use (PMU), less emphasis has been placed on understanding these vulnerable groups. Current theories of PMU draw from a psychopathology framework, aiming to distinguish normal variation from pathological behaviour. Measures like the Problematic Media Use Measure (PMUM) predict children's challenges over and above the amount of screen time. In light of the current literature, parent perspectives, grounded in a theoretical framework of developmental psychopathology, were used to explore the following interrelated research questions: (1) *How do attention difficulties interface with PMU and how do these interactions manifest across various developmental stages?* (2) *How do parents understand PMU when asked to consider their child's perspective?* Two studies were conducted. In Study 1, three samples of parents with children aged 6-18 were collected: community (N=386), ADHD (N=66) and early neurological risk (N=65) samples. The purpose of Study 1a was to evaluate PMUM factor structure across ages and compare PMU across samples. Parents also completed an adapted version of the PMUM with questions from their child's perspective to explore discrepancies between parents' own perspective and what they thought their child would report (Study 1b). In Study 2, interviews were conducted with a subset of parents in the ADHD sample. The ADHD sample showed higher levels of PMU and experienced more negative outcomes related to screens than the other samples. Parents fell into four groups based on 1) whether a discrepancy in perspective was reported and 2) the level of parent-reported problems (high or low PMU), with most parents reporting no discrepancy. Similar patterns were observed in the early neurological risk sample, while parents in the ADHD sample mainly fell into groups with high PMU, without or without

discrepancy. In Study Two, thematic analysis revealed that children with ADHD face unique challenges with screen use and parents may not fully consider their child's perspective with respect to PMU. Clinical implications and future research directions are discussed with respect to the utility of understanding parent cognitions about their child's screen use.

Dedication

For Trevor.

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Chapter One: General Introduction

As access to screen media devices continues to expand among children and youth, concerns about healthy child development are mounting, particularly regarding issues of excessive and problematic use. The rapid proliferation of screen media use underscores the urgent need for a deeper understanding of its impact on the younger generation. Furthermore, it has become evident that not all children and youth are affected in the same way by our ever-increasing adoption and use of screens. Vulnerable populations, such as those with attentional difficulties, appear to be disproportionately affected by the pervasive integration of mobile and internet-connected devices into every aspect of children's lives.

While our understanding of these challenges has largely been framed within a psychopathology framework adapted to fit the developmental context, there remain significant gaps in our knowledge. Exploring parental perspectives can offer valuable insights into the landscape of problematic screen media use among youth and guide intervention strategies. In Study One, we evaluated the factor structure of the Problematic Media Use Measure (PMUM) across ages and compared problematic media use (PMU) across community and clinical samples (ADHD and neurological risk). We then explored parents' consideration of their child's perspective on PMU. Specifically, we examined whether there was any discrepancy between parent-reported perspectives and what parents thought their child or youth would report about their own PMU. In Study Two, we conducted semi-structured interviews with a sub-sample of parents of children with ADHD to better understand screen media use in this population. Specifically, the purpose of the current study was to examine the unique context of children and youth with attention difficulties, such as ADHD, and how parental perceptions can shed light on the nature of the challenges surrounding screen media use. We begin with a review of the

literature on screen media in childhood and problematic media use, and then describe the current project in greater detail.

Current Landscape of Screen Media Use among Children and Youth

Broadly, screen media use includes any screen-based activity such as internet use, computer use, mobile phone use, engagement of social media, television viewing, and video game playing (Marshall et al., 2006). Over the past decade, the landscape of screen media use among children and adolescents has undergone profound changes, driven by advancements in technology and shifting social dynamics. The accessibility of mobile devices such as tablets and smartphones has surged, becoming ubiquitous for toddlers, preschoolers, and school-age children. These devices are not just tools for entertainment but also serve as educational aids and platforms for social interaction, particularly crucial during the COVID-19 pandemic when online schooling and virtual socialization became the norm (Rideout & Robb, 2018).

Adolescents, in particular, have increasingly integrated digital technology into their daily lives, spending substantial amounts of time engaged in various screen-based activities. Before the pandemic, adolescents aged 13–18 were reported to spend nearly seven and a half hours daily on digital entertainment media, with a significant portion dedicated to social media interactions (Rideout & Robb, 2018). The pandemic further intensified these trends, accelerating the adoption of digital platforms for education, socializing, and entertainment purposes. Although increases in screen time during the early phase of the pandemic may have been inevitable as many parents transitioned to work from home and children attended online school, screen time among children has remained elevated even after public health precautions were lifted (Hedderson et al., 2023).

Moreover, the devices themselves have evolved significantly, becoming more portable, equipped with advanced cameras, and seamlessly integrated with social media platforms. These

devices serve as "hooks" within social media ecosystems, where constant connectivity and engagement are encouraged and rewarded. This integration has raised concerns among researchers, educators, and parents alike about the implications for cognitive development, mental health, and social behaviour among young users. As society continues to navigate the implications of increased screen time and digital engagement among children and adolescents, ongoing research is essential to understand both the risks and benefits associated with these technologies. Identifying the difference between typical, benign media use and problematic use in children and youth is a critical endeavour for both scientific research and clinical understanding. While acknowledging the potential benefits of children engaging with age-appropriate, educational, and prosocial media content, it is essential to recognize when and how problematic media use develops during childhood. Currently, there is a lack of clear methods for distinguishing between problematic and normative screen media use. Consequently, professional and clinical guidelines, such as those from the American Academy of Pediatrics (2016), Canadian Paediatric Society (2023), and World Health Organization (2019), often caution against prolonged or inappropriate screen media use at a broad level without providing clear guidance for parents on when to be concerned about their child's media habits. This lack of clarity may lead to some parents excessively worrying about screen media risks while others may overlook signs of problematic use in their children and youth.

Problematic Media Use

Problematic media use (PMU) is one construct that offers some clarity on the boundary between problematic and normative screen media use. PMU is defined as excessive use that interferes with a child's functioning (Domoff et al., 2020). Critically, what is considered to be "problematic" is not determined solely based on the number of hours of screen time. This

construct borrows from frameworks of developmental psychopathology and addiction, to focus on functioning when differentiating normal variation from a pathological level of behaviour. Thus, the concept of “problematic use” captures difficulties in social, behavioural, and academic development due to excessive or maladaptive screen media use (i.e., loss of interest in other activities, preoccupation with media, withdrawal from others, high tolerance for media, and deception surrounding media) (Domoff et al., 2019).

The phenomenon of problems resulting from screen media use is not new: the widespread adoption of television in homes in the 1950s and 1960s marked the beginning of concerns regarding the impact of screens on children and adolescents. In the past two decades, various terms have emerged to characterize problems resulting from or related to screen media use, including Internet addiction (Gioia & Boursier, 2019; Kuss et al., 2013; Young & Rogers, 1998), problematic Internet use (Caplan, 2002, 2003, 2010; Kormas et al., 2011), problematic gaming (Haagsma et al., 2013), gaming addiction (Bonnaire & Baptista, 2019; Gioia et al., 2022), problematic smartphone use (Casale et al., 2022), and problematic social media use (Boursier et al., 2020). This reflects the absence of a unified scientific agreement on theoretically defining, operationalizing, and measuring this phenomenon (Ferrante & Venuleo, 2021; Moretta et al., 2022). However, the inclusion of **Internet Gaming Disorder (IGD)** in Section III of the DSM-5 has provided some consensus on criteria for internet- or screen-based behavioural addictions among researchers in the field (APA, 2013). Recently, the World Health Organization (2018) introduced **Gaming Disorder** in the 11th Revision of the International Classification of Diseases (ICD-11). These diagnostic inclusions acknowledge the phenomenon as necessitating further investigation and clinical-empirical research, and IGD criteria are commonly applied to other forms of behavioural addictions, such as screen media. In a recent meta-analysis of 50 measures

purporting to assess PMU, most scale items captured compulsive use and adverse outcomes associated with use (Abendroth et al., 2020). As such, these dimensions can be considered central across various conceptualizations of problematic screen media use, and serve as the theoretical basis for the present study.

Preferred language in children and youth. Parents and caregivers often express concerns about their child's excessive screen time by using terms like "addicted" or "obsessed." However, the terminology "problematic" is favoured for this construct and will be used throughout this study for several reasons. While behavioural addictions are recognized in adolescents and adults, it is likely that children exhibit problematic patterns that precede a diagnosable disorder. Using the term "problematic" encourages a dimensional view of concerns rather than a dichotomous cutoff. Conversely, using the clinical term "addiction" can be misleading in the context of children and their behaviour, and may hinder clinical efforts to promote healthy screen use. Additionally, various factors in children's environment, including family, school, and peers, influence children and youth, which shape their behaviour around screens and may not reflect a pattern related to a disorder.

Current tools for measuring PMU. Several tools are available for measuring problematic media use in children, each with its own strengths and limitations. These tools encompass a range of methodologies, including self-report questionnaires, parental reports, observational assessments, and technology-based monitoring. Some commonly used measures include the Problematic Media Use Measure (PMUM; Domoff et al., 2019), the Media and Technology Usage and Attitudes Scale (MTUAS; Rosen et al., 2013), the Internet Addiction Test (Young, 2009), the Internet Gaming Disorder Scale (IGDS; Lemmens et al., 2015), the Problematic and Risky Internet Use Screening Scale (PRIUSS; Jelenchick et al., 2014), and the

Bergen Social Media Addiction Scale (BSMAS; Andreassen et al., 2017; Andreassen et al., 2012). While these tools offer valuable insights into media usage patterns and associated issues among children and youth, they vary in their focus, scope, and psychometric properties. Thus, selecting an appropriate tool requires careful consideration of the specific research or clinical objectives, population characteristics, and methodological preferences.

The PMUM was developed in response to the demand for a comprehensive measure of problematic screen media use and stood out for its ability to evaluate a wide array of screen media behaviours, including gaming. By expanding its scope beyond gaming and integrating the proposed criteria for IGD outlined in the DSM-5, the PMUM presents a more comprehensive and adaptable tool for evaluating problematic media use. It encompasses items designed to assess various aspects of problematic screen media use, such as preoccupation with screen media, interference with daily activities, withdrawal symptoms, diminished interest in other pursuits, and deceptive usage practices. Additionally, the PMUM evaluates the impact of screen media on interpersonal relationships. Its development mirrors the evolving understanding of screen media consumption patterns and their potential ramifications, aligning with the imperative to address the multifaceted aspects of PMU among children and adolescents. In addition to the full 27-item form, a short form (PMUM-SF) comprising 9 items has also been validated in parents of children 4-11 years (Domoff et al., 2019). Given its strengths and alignment with our research objectives, the PMUM was selected as the measure to assess PMU in this study.

Developmental limitations of current measures. Current tools for measuring PMU are restricted to either young children or adolescents, with no measure assessing behaviour across development. One reason for this siloing within the developmental context may be the understandable intention to take into account age-related differences in media usage patterns,

environment (e.g., parental involvement) and associated impacts. However, there are striking commonalities in how problems related to screen media use manifest in young children and adolescents, which underscore the applicability of this concept across development. Research indicates that children and adolescents alike struggle with excessive screen time, finding it difficult to control their usage and experiencing withdrawal symptoms when unable to access screens (Coyne et al., 2021; Nielsen et al., 2020; American Academy of Pediatrics, 2016). Neglecting responsibilities and facing social and emotional challenges due to screen media use are common issues across both age groups (Hinkley et al., 2018; Mundy et al., 2017; Rega et al., 2023; Valkenburg et al., 2022). Additionally, both children and adolescents suffer from physical health issues like headaches and disrupted sleep patterns (Garrison et al., 2011; Hale et al., 2019), and experience functional impairments such as academic challenges (Adelantado-Renau et al., 2019) as a result of screen media use. Recognizing these shared challenges underscores the persistence of problematic media use across developmental stages, suggesting that the associated impairments or symptoms may not differ significantly despite differences in the types of screen-based activities associated with different age groups.

The shared manifestations of PMU underscore the importance of assessing and monitoring these behaviours from early childhood through adolescence. Employing a single measure for children and adolescents facilitates longitudinal studies, allowing researchers to track the development and progression of PMU and related behaviours over time. This approach offers the opportunity to capture changes in screen use patterns across different developmental stages and, with it, valuable insights into the factors contributing to impairment onset and persistence. Furthermore, a single measure aids in establishing a common language and

framework for assessing problematic media use, thus fostering a more nuanced understanding in young individuals.

Developmental considerations for the construct of PMU. The distinct age divide in our understanding of and research on PMU is essential to carefully consider. It is possible that PMU symptoms in children (< 12 years) present differently than in adolescents. Young children rely more on parents for screen media access than adolescents, who have relatively more autonomy in their media use and have higher personal media ownership rates (Rideout et al., 2022). For example, the symptom of “preoccupation” in younger children may be experienced by parents as frequent requests or strategies to access media, whereas “preoccupation” in adolescents is often defined as intrusive thoughts or rumination about content and/or use (Groves et al., 2015) and may be more difficult for parents to observe. While problematic use in children may present as strong resistance and reactions to parental restrictions of screen access, parents of teenagers may anticipate more self-regulation and consequently employ this strategy less frequently, resulting in fewer conflicts over screen media use.

However, parents and clinicians are increasingly reporting the types of disruptions and impairments commonly associated with younger children among older children and adolescents, highlighting the urgent need to comprehend the emergence of these concerns. Recognizing the distinct developmental stage and family context of adolescents, just as we do for young children, is missed when we apply adult conceptual frameworks or fail to consider constructs continuously across development. Adolescence is marked by rapid physical, cognitive, and socio-emotional changes, shaping how adolescents navigate their environments and form identities. Understanding their unique developmental needs and challenges is essential for conceptualizing PMU, as well as effective intervention. Furthermore, family dynamics remain pivotal in

adolescent development, influencing their behaviours, attitudes, and relationships. While increased autonomy and independence are vital developmental milestones for adolescents, today's teenagers often maintain strong ties to their families for longer durations than previous generations and parents have a greater ability to monitor teens through social media. By considering developmental and family contexts throughout the developmental continuum, we can attain more profound insights into the determinants of PMU and devise interventions tailored to each stage of development and family circumstance.

Given that our aim was to investigate PMU across child and youth development, extending beyond the age range examined in the original PMUM study, we identified the need for validation and factor analytic work across a broader age spectrum. Therefore, based on this rationale, our aim was to replicate the factor structure and subsequently conduct a factor analysis across a wider age range.

Age and Sex Differences in Screen Media Use

The current literature on age and sex differences in screen media use among children and youth indicates several key findings. Prior research consistently shows that school-aged children spend more time on screen media compared to their preschool counterparts (Paudel et al., 2017), and adolescents engage in higher levels of screen media use than pre-teens (Jennings & Caplovitz, 2022). However, this distinctive age trend may be less clear post-pandemic and in the current screen media landscape, where apps and programs are increasingly targeting younger children (e.g., YouTube Kids). Indeed, recent studies suggest a significant rise in screen media use among elementary-aged children since the pandemic (Hedderson et al., 2023; Trott et al., 2022) which may influence the relationship previously noted between age and screen media use.

However, it is important to note that no prior research has examined the construct of PMU across childhood and adolescence. Although trajectories may differ, symptoms of psychopathology have been shown to be more stable in children who were older at initial assessment, suggesting that symptoms of psychopathology become more predictive of persistent psychopathology with age (Hofstra & Verhulst, 2000). In consideration of typical trajectories of developmental psychopathology, as well as the available evidence on age-related trends in screen use, we anticipate that older child age will be associated with higher levels of PMU in the present study.

Gender differences have also been found to play a role in screen media use patterns. While much of the literature does not differentiate between sex and gender, it is crucial to recognize these as related but distinct constructs. The way in which young people engage with screens is undoubtedly influenced by social factors that shape gender. To date, researchers have mostly dichotomized gender as “boys and girls” and do not report on sex assigned at birth. These studies indicate that boys generally spend more time on screens than girls, although there are differences in the types of screen-based activities preferred by each gender. For instance, boys are more likely to engage in video gaming, while girls tend to gravitate towards activities such as social media use (Rideout & Robb, 2019). However, it is important to recognize that there may be interaction effects between age and gender. In the adolescent literature, girls have been found to spend more time on smartphones and computers than adolescent males, with girls having higher rates of “smartphone addiction” (Cocoradă et al., 2018; Twenge & Martin, 2020). In addition to the amount of use, the impact of screen media use may also vary by gender. Some studies have found that adolescent girls showed stronger correlations between screen time and indicators of mental health concerns as compared to boys (Twenge & Farley, 2021; Twenge et

al., 2018). Therefore, a nuanced understanding of screen media use necessitates the consideration of both age and gender factors.

Sex assigned at birth (i.e., male, female, intersex) relates to biological characteristics such as hormonal influences, brain development, and physical differences, which may impact how young people interact with screen media. For instance, developmental outcomes such as neurodevelopmental disorders are more prevalent among males, suggesting a link between biological sex and susceptibility to certain screen-related behaviours. Drawing upon existing literature that underscores the complex interplay between these variables, we hypothesized that PMU would correlate with older age and male sex assigned at birth. Although we chose not to consider gender identity in the current study, these hypotheses acknowledge the multifaceted nature of screen media behaviours, encompassing both biological and developmental perspectives in understanding their manifestations.

Problematic Media Use in Children and Youth at Risk for Attention Difficulties: ADHD and Early Neurological Risk Samples

Researchers have also been interested in identifying children and youth who may be particularly vulnerable to PMU. The interactional theory of childhood problematic media use was posited by Domoff and colleagues (2020) emphasized interactions across person, context, and maintaining factors that may bring forth greater or reduced risk for problematic media use. Among important parent/family and social factors, the model also highlights proximal factors such as a child's challenging behaviours and emotion dysregulation. There is a growing body of research which supports the notion that children with attention difficulties appear to be

particularly prone to excessive, as well as problematic, screen media use (Barry et al., 2017; Settanni et al., 2018).

Attention-Deficit/Hyperactivity Disorder. One of the most commonly discussed groups at risk for attention difficulties is those with Attention-Deficit/Hyperactivity Disorder (ADHD). The core symptoms of ADHD, including impulsivity, inattention, and hyperactivity, are believed to contribute significantly to PMU, making it more difficult for individuals with ADHD to regulate their screen media use and maintain healthy screen habits (Barkley, 2015; Beyens et al., 2018). Furthermore, the unique characteristics of screen media, such as the instant gratification and sensory stimulation they provide, may particularly appeal to individuals with ADHD, leading to heightened susceptibility to problematic use (Beyens et al., 2018). Indeed, research has consistently demonstrated that children and adolescents with ADHD are at heightened risk of experiencing PMU, marked by excessive screen time, difficulties in self-regulation of screen use, and compulsive engagement with digital devices (Arness & Ollis, 2023; Dullur et al., 2021; Nikkelen et al., 2014).

Longitudinal studies have also illuminated bidirectional relationships between ADHD symptoms and PMU, suggesting that excessive screen time may exacerbate ADHD symptoms over time, while ADHD symptoms may increase the likelihood of engaging in problematic media use (Sibley & Coxe, 2018; Thorell et al., 2022). Nevertheless, several factors remain to be explored to confidently state that there is an empirical link between PMU and ADHD-related behaviours (Beyens et al., 2018), as well as the nature of this relationship. Notably, many studies of screen media in individuals with ADHD have used “screen media use” as their outcome variable, which captures only the quantity of use. However, assessing “problematic” use in this population may prove more informative. This prompted our specific interest in exploring PMU

within an ADHD sample and comparing it to both community samples and other theoretically vulnerable populations.

Early Neurological Risk. Children who have experienced early neurological injuries and conditions such as neonatal stroke, hypoxic-ischemic encephalopathy (HIE) and epilepsy, are at increased risk for developing attention difficulties later in life (Roberts et al., 2019; Williams et al., 2018). These neurological insults can disrupt the development and functioning of brain regions involved in attentional processes, leading to deficits in sustained attention, inhibitory control, and attentional shifting (Anderson et al., 2005; Cainelli et al., 2021; O’Keeffe et al., 2014). As a result, children with a history of early neurological injury may struggle with maintaining focus, regulating impulses, and effectively managing distractions, all of which are critical components of attentional functioning (Gioia & Isquith, 2004; Gioia et al., 2002). Moreover, research suggests that these attentional difficulties may persist into adolescence and adulthood, posing ongoing academic, social, and occupational challenges (Catroppa et al., 2011; Deotto, 2014; Halpin et al., 2022).

There is emerging evidence suggesting that children with early neurological injury may also be particularly vulnerable to developing maladaptive patterns of screen media consumption. While research examining this population's screen media use is limited, one study among children born premature demonstrated associations between increased screen time and negative cognitive and behaviour outcomes (Vohr et al., 2021). Given the attentional difficulties commonly observed in children with early neurological injury, these individuals may turn to screen media as a means of coping with attentional challenges or seeking stimulation, potentially exacerbating existing attentional deficits and contributing to problematic media use behaviours. However, it is currently unknown whether the vulnerability to PMU is related to the brain injury

itself, secondary attention problems, another variable or a combination of numerous factors. Further research is needed to elucidate the interplay between early neurological injury, attention difficulties, and screen media use in this population, as well as to inform targeted interventions to promote healthy screen habits and mitigate potential adverse outcomes. Given the insights from existing literature, we sought to investigate whether this group is similarly affected by PMU as individuals with ADHD, where this susceptibility has already been well-documented.

Having reviewed the current literature on PMU and explored the relationship between PMU and attention issues, our focus now shifts towards a deeper examination of parent perceptions within this context. To achieve this, we aim to extend the Problematic Media Use Measure (PMUM), enabling a thorough exploration of how parents perceive their child's screen media usage and their understanding of their child's viewpoint.

Parent Cognitions about Problematic Media Use

The recent publications on the theory and measurement of PMU have significantly advanced our understanding of this construct among young children (Abendroth et al., 2020; Domoff et al., 2020; Domoff et al., 2019). However, there is still a pressing need for a more nuanced understanding of the theoretical and etiological aspects of PMU. Currently, the way in which parents perceive their child's technology usage and their associated concerns are central to the concept of PMU. Instruments like the PMUM (Domoff et al., 2019) focus on behaviours that parents observe and perceive as problematic, underscoring the significance of the parental viewpoint. Yet, it raises the question: does the parent also consider their child's perspective?

In general, understanding a child's perspective is crucial for parents to foster empathy, strengthen parent-child relationships and promote healthy development. It allows parents to validate their child's emotions, needs, and experiences, leading to more effective communication,

support, and problem-solving. Moreover, recognizing their child's viewpoint helps parents make informed decisions and tailor their parenting approaches to better meet their child's unique needs. This is equally true in the context of screen media use. For instance, if a child demonstrates limited awareness of the negative consequences of excessive screen time, parents can be more proactive in setting limits and educating their child about healthy screen habits. Alternatively, if a child shows signs of heightened awareness of the adverse effects of media use but struggles to self-regulate, parents can work with them to develop coping strategies and problem-solving skills. Ultimately, by understanding their child's awareness or insight into screen-related problems, parents can play a crucial role in promoting healthy screen media habits and overall well-being.

The idea of discrepancy. Parental attunement refers to a parent's ability to be emotionally in sync with their child, understanding and responding to the child's needs, feelings, and cues in a sensitive and appropriate manner. This concept is rooted in the idea that a parent can "tune in" to their child's inner world, perceiving what the child might be experiencing emotionally and psychologically, even when it isn't explicitly expressed. Additionally, parents hold their own beliefs, attitudes and feelings. We consider the idea of a possible discrepancy between parent's own beliefs and their understanding of their child's beliefs when it comes to screen media use. A salient example of this in the context of PMU might be a parent who is constantly trying to manage their child's behavioural outbursts (e.g., crying, yelling, lashing out) when they transition off screens. This parent may hold different beliefs about their child's understanding of the problem: 1) my child sees things as I do (e.g., also acknowledging screens as problematic), or 2) my child does not see things as I do (e.g., fails to recognize screens as a problem). These contrasting beliefs may influence the parent's strategies for addressing and

mitigating their child's problematic screen media use. For instance, if parents believe that their child shares their perspective on screens being problematic, they are more likely to engage in collaborative problem-solving efforts, striving toward a shared goal of alleviating distress and mitigating the identified problem.

Conversely, if parents perceive their child as not acknowledging or being aware of the problem with screens, they may opt to impart additional information and scaffold their child's comprehension of the situation before embarking on problem-solving efforts. However, should the parent's assumption regarding their child's perception be erroneous, or they simply do not consider their child's viewpoint, the selected approach to problem-solving will be “mismatched” and may fail to yield the desired outcomes. As such, it is imperative that parental interventions align with the child's actual beliefs concerning screen media use to foster effective problem resolution and facilitate meaningful change, thereby underscoring the importance of understanding parental cognitions, including perceived discrepancies.

Factors contributing to differences in perspectives. As children grow, their ability to grasp and handle problems matures alongside their cognitive, emotional, and social development (Blakemore & Choudhury, 2006; Kilford et al., 2016). At younger ages, children often rely heavily on adults to navigate challenges, as their limited life experience and abstract thinking skills can hinder their understanding of issues like the impact of screen media use on their well-being (Diamond, 2002). Moreover, children and adolescents may view screen use through a narrow lens, prioritizing immediate gratification or social connection over long-term consequences. This reluctance to acknowledge the issue can impede efforts to address it effectively and contribute to its persistence. Influences like peer pressure and societal norms may further cloud their judgment, as they strive to fit in or adhere to cultural expectations. As a result,

young people may minimize the seriousness of their screen media use, attributing it to temporary factors or dismissing it as a normal part of development. Additionally, specific digital content and the persuasive features of many apps and games can exacerbate difficulties in self-regulating screen time. As children progress into adolescence, there's an expectation for increased self-awareness and problem-solving abilities. Adolescents, in particular, are often seen as capable of understanding and addressing issues independently. However, various factors, particularly concerning screen media use, may make this expectation of adolescents unfair.

Potential profiles of parent cognitions. To delve into parental perceptions of PMU, parents were tasked with completing two versions of the PMUM: one from their own perspective (original version) and another from their child's perspective (adapted version), aiming to elucidate potential discrepancies in their perceptions. Considering factors contributing to differences in perspectives, it is reasonable to anticipate that there may be no discrepancy, with parents reporting that they perceive the problem similarly to how they believe their child does, regardless of whether the problems are low or high. Alternatively, discrepancies may arise where parents acknowledge the problem but perceive that their child does not (parent more concerned group). Another potential discrepancy, although less common, is when parents believe their child is more concerned than they are themselves, thus presenting a diverse range of parental perspectives on the matter. As a result, the authors propose four potential groups across the community, ADHD, and early neurological risk samples. We anticipate that the majority of parents will not report discrepancies between their own viewpoint and their perception of their child's viewpoint, regardless of high or low PMU. Only a small subset of parents, primarily those of younger children, are expected to report a discrepancy where they perceive themselves to be

more concerned than their child. We do not expect to find parents reporting a discrepancy where they believe their child is more concerned than they are.

Parental cognitions in the context of attention difficulties. Several relevant factors come into play when extending the concept of parent discrepancy categories to populations vulnerable to problematic media use. Parents of children with ADHD may be more inclined to perceive a discrepancy between their own perspective on their child's screen media use and that of their child. This inclination could stem from several factors inherent to ADHD. Children with ADHD often exhibit behaviours that affect their attention, impulsivity, and executive functioning, which can impact their ability to self-regulate their screen time effectively (Settanni et al., 2018; Silverstein et al., 2020). As a result, parents of children with ADHD may observe patterns of screen media use that they perceive as problematic or excessive, leading them to believe that their child's view of their own media consumption differs from reality. Additionally, children with ADHD may have difficulty accurately assessing the impact of their screen media use on their behaviour and well-being due to their cognitive and attentional challenges.

Within the ADHD literature, positive illusory bias (PIB) has garnered significant attention (Owens et al., 2007). PIB refers to the tendency for individuals with ADHD to overestimate their abilities and positive attributes relative to objective evaluations. While extensive literature exists on PIB across various domains, its implications for specific behaviours, such as screen media use, remain relatively unexplored. However, research on PIB in ADHD suggests that individuals with ADHD may exhibit this bias in diverse contexts, including academic performance and social interactions (Emeh et al., 2018; McQuade et al., 2017). In children with ADHD, this bias may hinder accurate self-assessment of strengths, weaknesses, and behaviour. The presence of PIB among individuals with ADHD raises intriguing questions

regarding its potential influence on perceptions of screen media use in this population. Indeed, parents of children with ADHD may be more likely to recognize and acknowledge a discrepancy in perspectives regarding screen media use, as they may perceive their child's understanding of the issue to be influenced by their ADHD-related difficulties in self-awareness and self-regulation. As such, while it is still anticipated that the majority of parents will not report a discrepancy, a larger proportion of parents are expected to perceive themselves to be more concerned than their child.

The literature on early brain injury also suggests that children with such injuries may exhibit discrepancies in cognition, learning, attention and self-perception (Crowe et al., 2022; Rees et al., 2023), further complicating the understanding of problematic media use in vulnerable populations. Early acquired brain injury (e.g., perinatal stroke, hypoxic-ischemic encephalopathy [HIE], prematurity) can lead to various cognitive and behavioural challenges, including attention deficits and learning problems (Bolk et al., 2022; Williams et al., 2018). These deficits may impact how children perceive and evaluate their own screen media use, potentially leading to discrepancies between their self-assessment and parental observations. Therefore, when addressing problematic media use in vulnerable populations, it is essential to consider not only the perspectives of parents but also the unique cognitive and behavioural characteristics of the children themselves, as influenced by conditions such as ADHD and early brain injury.

Across community and clinical populations, parent-reported differences in their own and their child's perspectives may be an important factor for understanding problems resulting from screen media use. Parents who recognize that their child is unaware of their problems around screen media use may be more likely to intervene, mediate and provide scaffolding around appropriate use. On the other hand, parents who believe their child has good insight into these

difficulties may be less likely to mediate in this manner and may see continued challenges around devices. Understanding these profiles can help to elucidate patterns that will better inform the support provided to parents to facilitate healthy development around screen media use.

Summary of the Current Study

Two complementary studies were conducted to leverage parental cognitions, aiming to enhance our understanding of PMU. Chapter two presents a quantitative study characterizing PMU in children at risk of attention difficulties and exploring parent cognitions. Chapter three presents a qualitative study of how children and youth with ADHD engage with screen media from a parental perspective. Both chapters include brief discussions of their findings. Finally, Chapter 4 provides a comprehensive general discussion covering insights from both studies.

Chapter Two: Characterizing Problematic Media Use in Children At-Risk of Attention Difficulties: A Quantitative Study Using Parent Cognitions

The primary goals of this study were to characterize problematic media use in children and youth at risk of attention difficulties and explore how parents understand PMU when asked to consider their child's perspective. First, we aimed to replicate the Problematic Media Use Measure (PMUM) and validate its use across a wider age range (up to 18 years). This endeavour was important, as there is currently no measure of problems resulting from screen media use that can be used across development. Confirmatory factor analysis (CFA) was conducted with data from parents of children aged 6-11 to replicate original findings, as well as in the full sample to validate the structure in an older sample. For the purposes of replication of structure and validation of this scale, we purposely recruited parents of children without neurodevelopmental or neurological conditions to capture the general population. We then examined the associations of the PMUM with age and sex, to better understand developmental trends within problematic media use.

While children at risk of attention difficulties have been identified as particularly susceptible to difficulties with screen media use, it has not been systematically investigated across populations. To address this goal, we administered a survey to three groups of parents: (1) parents of children without attentional difficulties, (2) parents of children diagnosed with ADHD, and (3) parents of children with early neurological risk (e.g., stroke, epilepsy, cardiac conditions, traumatic brain injuries, etc.). In each of these groups, parents were administered questionnaires that assessed problematic media use, cognitions about screen media-related problems (what parents think and what they believe their child thinks) and a screen media use and impact

questionnaire. First, we compared scores on these questionnaires across the three groups of participants. Then, we examined the relationships between the PMUM and variables of interest within each group.

Last, to explore parent perception of child’s agreement on the degree of problems around screen media, parents reported on both their own observations as well as their perception of their child’s perspective on a subset of matched items, which allowed us to create an overall discrepancy score. Parents were categorized into groups based on high or low discrepancy, as well as degree of PMU. We then characterized these groups in the two clinical samples. Based on these study aims, the following hypotheses were generated:

Table 1. Hypotheses for Study 1a and Study 1b

Study 1a: Replication and validation of PMUM in age-extended sample

Hypothesis 1A	A one-factor structure of PMUM will be replicated in our sample of 6 to 11-year-olds.
Hypothesis 1B	A one-factor structure of PMUM will be replicated in the age-extended sample (6 to 18-year-olds).
Hypothesis 1C	Age is expected to be significantly related to PMUM scores, such that older children will have higher PMUM scores.
Hypothesis 1D	Sex is expected to be significantly related to PMUM scores, such that males will have higher PMUM scores.

Comparisons between samples

Hypothesis 2A	Parents of children in both the clinical groups will endorse greater problematic media use (i.e., higher PMUM scores) than parents of children in the community sample.
Hypothesis 2B	Parents of children in both clinical groups will report significantly more negative impacts of screen media use, less positive impacts of screen media use than parents of children in the community sample.

Hypothesis 2C Parents of children in both clinical groups will report significantly more child daily screen media use and more parental stress than parents of children in the community sample.

Correlations with the PMUM across samples

Hypotheses 3A-F In all three samples (i.e., community, ADHD and early neurological risk), problematic screen media use will be associated with:

- older child age
- increased child inattention on SNAP-IV (early neurological risk sample only) and greater externalizing behaviours on SDQ (ADHD & early neurological risk samples)
- more negative impact of screen media on the child,
- higher child screen media use
- greater parental stress about screen media and
- male sex.

Study 1b: Parental Perceptions of PMU Agreement with Child

(1) Investigate discrepancy between parental reports and their understanding of their child's beliefs regarding Problematic Media Usage (PMU) within a community sample, and

(2) explore how these groups correspond to child factors and technology use and impairment.

Translation of Discrepancy Groups to Clinical Samples

(1) Investigate if the discrepancy groups identified in the community sample remain consistent within samples of ADHD and early neurological risk, and

(2) explore how these groups are associated with child factors and technology use and impairment.

Method

Participants

In this study, three samples were recruited, including parents from a neurotypical sample of children and youth from the Qualtrics panel (N=386; mean age of child: 11.59; 174 (45%) male and 212 (55%) female), parents of children and youth previously diagnosed with ADHD (N=66; mean age of child: 12.03; 48 (73%) males and 18 (27%) females), and a sample of

parents of children and youth from neurological/medical clinics who are at risk of attention problems (N=65; mean age of child: 8.55; 42 [65%] males and 21 [32%] females). Across the three groups, parents were recruited if they had a child and youth between 6-18 years of age.

Parents in neurotypical/community sample. Participants who met the following criteria were included: (1) English language proficiency, and (2) currently living in North America (Canada or the United States of America). Participants were excluded from this sample if the parent reported that their child has a neurodevelopmental disorder (e.g., ADHD, ASD, ID) or significant medical history that would put them at risk for attention difficulties (e.g., stroke, cancer, epilepsy or other neurological condition, extreme prematurity). Participants who met the following criteria were also automatically excluded: (1) duplicate IP addresses, (2) response pattern indicating poor data (e.g., extremely low variability within answers, selecting same rating across items), (3) response time indicating poor data (i.e., completed the survey in less than 7 minutes), and/or (4) participant failed any of the attention check questions. Data from the community sample were further evaluated after data collection for exclusion if they reported significant attentional difficulties based on an ADHD screening tool. Specifically, participants were excluded who reported that their child: (1) had at least “moderate” severity of inattention problems on the SNAP-IV (described below; Swanson, 1995) or; (2) had reported impairment due to inattention as “a medium amount” or “a lot” in at least two domains (e.g., school, home, leisure) reported on the demographics form (Appendix A). Based on these criteria, 14 participants were removed for elevated SNAP-IV scores and/or parent-reported attention concerns, leaving a total of 386 participants included in the final sample.

Screening for Attention Difficulties. The Swanson, Nolan, and Pelham Rating Scale – Fourth Version (SNAP-IV) is a parent questionnaire used to assess inattention and hyperactivity/

impulsivity (Appendix B). Parents completed the 18 items from the inattention (9 items; e.g., “fails to give close attention to detail”) and hyperactivity/impulsivity (9 items; e.g., “often leaves seat”) subscales, which were rated from “*not at all*” to “*very much*” on a 4-point Likert scale. Subscale scores were created by calculating a total score for the items in the inattention and hyperactivity/impulsivity domains respectively, for a possible maximum score of 27 in each domain. Clinically significant symptoms were determined using the suggested cut-off score of 13/27 for each of the inattention and hyperactivity domains (Swanson et al., 2012). Per scoring guidelines, subscale scores greater than 17 are considered “moderate” and scores greater than 22 are considered “severe.”

Parents in ADHD sample. A sample of parents of children with a previous diagnosis of ADHD were recruited through the Centre for ADHD Awareness Canada (CADDAC). Participants who met the following criteria were included: (1) English language proficiency, (2) currently living in Canada, (3) child has been previously diagnosed with ADHD (see Appendix A for questions asked to establish prior diagnosis), (4) child had at least “moderate” severity (i.e., a score >17/27 on the SNAP-IV, described above) of inattention problems and; (5) child had impairment due to inattention (i.e., their parent reported “a medium amount” or “a lot” in at least two domains: school, home, leisure, on demographic questionnaire). As in the community sample, participants who met the following criteria were automatically excluded: (1) duplicate IP addresses, (2) response pattern indicating poor data (e.g., extremely low variability within answers, selecting same rating across items), (3) response time indicating poor data (i.e., completed the survey in less than 7 minutes), or (4) participant failed any of the attention check questions. A total of 21 participants were excluded after data collection due to “mild” (i.e., a score of 13-17 on the SNAP-IV) or not clinically significant (i.e., a score below 13 on the SNAP-

IV) inattention problems and/or lack of impairment due to attention problems when off medication (if applicable). An additional 4 participants were excluded due to missing data, leaving a total of 66 parent participants in this sample.

Parents in early neurological risk sample. A sample of 65 parents were recruited from clinics of children at-risk for attention difficulties secondary to neurological/medical risk (e.g., stroke, congenital heart disease, extreme prematurity, traumatic brain injury, etc.) through the Psychology department at the Hospital for Sick Children (SickKids). Participants who met the following criteria were included: (1) English language proficiency, (2) currently living in Canada, and (3) child has a significant medical history that would put them at risk for attention difficulties (e.g., stroke, cancer, epilepsy or other neurological condition, extreme prematurity). As in the other samples, participants who met the following criteria were automatically excluded: (1) duplicate IP addresses, (2) response pattern indicating poor data (e.g., extremely low variability within answers, selecting same rating across items), (3) response time indicating poor data (i.e., completed the survey in less than 7 minutes), and (4) participant failed any of the attention check questions. A total of 85 participants consented to participate and completed at least one measure. Although no data were lost following quality checks, only participants with complete data were included for analysis, leaving 65 participants in this sample.

As the SNAP-IV was used for screening in the community and ADHD samples, it was not included as a variable of interest except in analyses specific to the early neurological risk sample. The SNAP-IV inattention and hyperactivity/impulsivity scores were not used for inclusion/exclusion in the early neurological risk sample and are therefore included in some analyses to better understand heterogeneity in this at-risk population and the relationship between PMU and inattention.

Participant Demographics

All parent participants were asked to complete a brief demographics form (Appendix A). Race, ethnicity and cultural identity of the child were asked in an open-ended format and coded based on questions from Statistics Canada’s ethnic origin of person (Government of Canada, 2021). Key participant demographics for the three samples are presented in Table 2. Children in the early neurological risk sample were younger than the ADHD and community samples. The early neurological risk and ADHD samples were predominantly male (65% and 73%, respectively), whereas the community sample had a slightly higher proportion of females (55%) than males. The majority of parents who participated in completing the questionnaires across all three samples identified themselves as the child's mother and their child as white/Caucasian. Notably, a higher proportion of parents reported having obtained a university/college degree in the ADHD sample (59%) and the early neurological risk sample (63%) compared to the community sample (29%).

Table 2. Participant demographics across samples: Means (SD) and Frequencies (%)

Variable	Sample		
	Community sample (n=386)	ADHD (n=66)	Early neurological risk (n=65)
Mean Age of child (years)	11.59 ± 3.5	12.03 ± 2.98	8.55 ± 2.36
Observed Range	6-18	6-17	6-16
Sex of child: Frequency			
Female	212 (55%)	18 (27%)	21 (32.3%)
Male	174 (45%)	48 (73%)	42 (64.6%)
Child race/ethnicity/cultural identity: Frequency			
White/Caucasian	283 (73.3%)	46 (69.7%)	45 (69.2%)
Black/African American	43 (11.1%)	3 (4.5%)	3 (4.6%)
Indigenous	6 (1.6%)	6 (9.1%)	-

American	20 (5.2%)	-	-
Canadian	-	16 (24.2%)	14 (21.5%)
French Canadian	-	4 (6.1%)	-
Asian	5 (1.3%)	4 (6.1%)	10 (15.4%)
Hispanic/Latino	46 (11.9%)	3 (4.5%)	1 (1.5%)
Middle Eastern	1 (0.3%)	1 (1.5%)	1 (1.5%)
South Asian	-	-	4 (6.2%)
European	22 (5.7%)	21 (31.8%)	13 (20%)
Jewish	-	2 (3%)	-
Hawaiian	2 (0.5%)	-	-
Biracial	19 (4.9%)	5 (7.6%)	4 (6.2%)
Multiracial	3 (0.8%)	3 (4.5%)	-
Prefer not to say	1 (0.3%)	2 (3%)	1 (1.5%)
Caregiver completing questionnaire			
Mother	292 (76%)	59 (89.4%)	58 (89.2%)
Father	50 (13%)	-	4 (6.2%)
Grandparent	18 (5%)	1 (1.5%)	-
Step-parent	12 (3.2%)	1 (1.5%)	-
Legal guardian	-	1 (1.5%)	-
Other	13 (3%)	3 (4.5%)	1 (1.5%)
Mean Age of caregiver (years)	40.59 ± 9.78	46.89 ± 5.83	40.43 ± 5.95
Observed Range	24-72	32-64	29-56
Caregiver level of education completed: Frequencies			
Did not complete high school	17 (4.4%)	-	-
High school graduate	107 (27.7%)	-	6 (9.2%)
Partial college/university (at least one year)	100 (25.9%)	4 (6.1%)	3 (4.6%)
College/university degree	112 (29%)	39 (59.1%)	41 (63.1%)
Graduate/professional degree	49 (12.7%)	23 (34.8%)	14 (21.5%)
Would rather not say	1 (0.3%)	-	1 (1.5%)

Participants in the two clinical samples provided additional information about their child's psychological and medical diagnoses (Appendix C). All participants in the ADHD sample endorsed their child having been diagnosed previously with ADHD. There was also a high proportion of parents in this group who endorsed that their child had a learning disability (33.3%) or an anxiety disorder (33.8%). Most of the participants in the ADHD group reported that their child did not have any significant medical diagnoses or events, with the exception of some endorsing premature birth (9.1%). In the early neurological risk group, all participants endorsed that their child had at least one major medical diagnosis or event, with the most common being congenital heart disease (20.0%), stroke (16.9%), traumatic brain injury (16.9%) and premature birth (13.8%). Consistent with the literature on children with early neurological risk, many of the parents in this sample also endorsed that their child had a prior psychological diagnosis. The most common psychological diagnoses endorsed included ADHD (35.4%), learning disability (24.6%), autism spectrum disorder (24.6%), intellectual disability (21.5%) and anxiety disorder(s) (18.5%).

Measures

Screen Media Use: Parent Rating and Parent-Rated Child Perspective

Problematic screen media use (PMUM): Parent rating. The 27-item Problematic Media Use Measure (PMUM; Domoff et al., 2019) was used to capture screen media use that is disruptive to family functioning or obsessive in nature. Sample items include: "My child's screen media use interferes with family activities" and "Screen media are all that my child seems to think about." This measure demonstrated convergent validity by showing a significant positive correlation with total daily screen time and parent-rated concern about the child's media use and showed incremental validity for predicting the child's overall functioning above total daily

screen time in children aged 4 to 11 years (Domoff et al., 2019). The full 27-item scale (Appendix D) was selected given our intention to use it in an older sample. Parents rated how true statements were for their child on a 5-point Likert scale: 1 (“never”), 2 (“rarely”), 3 (“sometimes”), 4 (“very often”) and 5 (“always”). Previous studies suggest a one-factor solution using EFA (i.e., use of a total score). The Total Score was used as the dependent measure for analyses. Internal consistency across samples was excellent: $\alpha = .98$ (community), $\alpha = .95$ (ADHD) and $\alpha = .98$ (early neurological risk).

PMUM Parent-rated child perspective. Parents were asked to rate PMUM items again, but this time based on their child’s perspective on these difficulties. A total of 19 items were chosen from the PMUM Adolescent Self-Report (11 items; Domoff et al., unpublished) and the original PMUM 27-item scale to capture what parents believe about their child’s perceptions of their screen media use (Appendix E). Parents rated how true **their child** would believe these statements were on a 5-point Likert scale from “1 = Never” to “5 = Always.” For example: “My screen media use interferes with family activities.” Scores on *PMUM Parent-Rated Child Perspective* items were used to generate discrepancy scores. This process is detailed in the Data Analysis section. Internal consistency across samples was excellent: $\alpha = .96$ (community), $\alpha = .91$ (ADHD) and $\alpha = .96$ (early neurological risk).

Outcome Measures and Correlates of Screen Media Use

Screen Media Use and Impact Questionnaire. This questionnaire, also completed by the parent participants, assessed screen media use by children and parents and its impacts on them across several domains. All items are found in Appendix F. This questionnaire has the following four domains:

Child screen media use. Parents reported on which types of screen media their child has regular access to, including smartphone, laptop computer, desktop computer, iPad/tablet (or similar device), handheld video game player (e.g., Gameboy, PSP, Nintendo Switch), video game console, television and “other.” Parents were also asked to estimate their child’s average daily screen time on weekdays and weekends, and how much their child uses screen media for school/homework. The dependent variable used in analyses was the child's average daily screen time in hours.

Parent screen media use. Parents then reported which screen media devices they use. They were also asked to estimate their own average daily screen time on weekdays and weekends, and how much they screen media for work. Parents’ comfort with technology was assessed by rating their comfort level in using screen media (e.g., searching for information online, downloading, using email, using social media, learning how to use new programs/apps). Response options ranged from *Very Uncomfortable (1)* to *Very Comfortable (10)*. In the current study, the dependent variable used in analyses was parent comfort with technology (i.e., rating of their own comfort with technology from 1-10).

Impact of screen media use on child. Parents were asked to rate the degree of impact screen media has on their child across various child life domains, including schoolwork, family, mental health, physical health and exercise, sleep, peers/social life, and recreation and hobbies. Parents rated both the negative impact and positive impact separately on a 5-point Likert scale from “1 = None” to “5 = A lot.” A total score for negative impact and a total score for positive impact were calculated by summing scores across all domains of functioning, each with a minimum score of 7 and maximum score of 35. Total negative impact and total positive impact were used as dependent variables in analyses.

Parental stress about child screen media use. The impact of child screen media use on parent stress and sense of competency was assessed using a 12-item questionnaire. Items assessed parent stress and anxiety related to their child's screen media use (e.g., trying to manage my child's screen media use causes me stress), wanting the amount or manner of screen media use to be different (e.g., I wish I could reduce the amount of time my child uses screen media devices), sense of competency parenting around screen media use (e.g., other parents are better able to manage their children's screen media use), and parent-child relationship (e.g., my child's screen media use negatively effects of relationship). Parents were asked to rate how much they agree with each item on a 6-point Likert-type scale from "1= Strongly Disagree" to "6 = Strongly Agree." A total score was calculated by summing all items, with a minimum 12 and maximum of 72, where a higher score indicated greater parental stress. Total score was used as the dependent measure in analyses. Internal consistency across samples ranged from good to excellent: $\alpha = .91$ (community), $\alpha = .89$ (ADHD) and $\alpha = .94$ (early neurological risk).

Emotional and behavioural challenges. The Strengths and Difficulties Questionnaire – Parent Version (SDQ; Goodman, 1997) is a parent questionnaire used to assess emotional and behavioural difficulties in children and adolescents. As such, it contains questions pertaining to conduct problems, emotional problems, hyperactivity, peer problems, and prosocial behaviour. Parents in the two clinical samples were provided with the appropriate version of the questionnaire according to their child's age (i.e., ages 4-10 or ages 11-17). This scale contains 25 items, which are rated as 1=Not True, 2=Sometimes True, and 3=Certainly True. The dependent variables included in analyses were *externalizing behaviour* (sum of hyperactivity and conduct problem scales) and *internalizing behaviour* (sum of peer problems and emotional problems scales). The internal consistency for the externalizing behaviour subscale across samples was

acceptable to good: $\alpha=.67$ (ADHD) and $\alpha=.82$ (early neurological risk). Internal consistency for the internalizing behaviour subscale across samples was good: $\alpha=.80$ (ADHD) and $\alpha=.82$ (early neurological risk).

Procedure

Eligible participants were invited to complete an online survey about their children's screen media use and their parenting around screen media use. For the Qualtrics community sample, eligible parents were recruited by the Qualtrics panel via email to complete the survey via Qualtrics. For the ADHD sample, parents were emailed through the CADDAC listserv and invited to complete the survey via Qualtrics. For the early neurological risk sample, parents who had previously participated in neuropsychological research at the Hospital for Sick Children (SickKids) were invited via email to complete the survey via REDCap. All participants completed the tasks in the following order: informed consent, PMUM (parent perspective), PMUM (parent-rated child perspective), screen media outcome questionnaire, strengths and difficulties questionnaire and the demographics form. Participants in the community sample were compensated for their time through the Qualtrics panel program. Participants in the ADHD and early neurological risk samples were entered in a draw for the chance to win one of four \$50 Amazon gift cards (for each sample). This study obtained institutional ethics approval prior to commencing data collection.

Data Analysis

Factor analysis of the PMUM: Parent report. The Problematic Media Use Measure (PMUM) was developed and preliminary validated in a sample of 291 mothers of children 4 through 11 years of age in the United States (Domoff et al., 2019). The sample was

predominantly white (76.7%) and was not screened for any child developmental or physical health conditions. A total of 60 items were generated based on the proposed criteria for Internet Gaming Disorder in the DSM-5. EFA indicated a unidimensional construct of screen media addiction, and the final version of the PMUM (27 items) evidenced high internal consistency (Cronbach $\alpha = .97$; Domoff et al., 2019).

To investigate the structure of the PMUM and confirm its use in our extended age sample, confirmatory factor analyses (CFA) were conducted using a single-factor model of problematic media use. This was first completed in a subsample of children aged 6-11 to replicate previous findings and then in the full sample (6-18 years) to see if the model extends across this age range. Items on the PMUM produced responses with an ordered, categorical scale that ranged from 1 to 5. Maximum Likelihood (ML) estimation was chosen based on research supporting the use of linear approaches, such as ML, with ordinal variables when there are 5 or more categories, sample size is small, and category thresholds are approximately symmetric (Rhemtulla et al., 2012).

Given the wider age range included in this sample, two additional factor structures consistent with the original item development were examined using CFA. Specifically, in the original development of the 27-item PMUM, items were generated to assess the following eight domains of screen media use based on IGD symptoms (APA, 2013): (1) “preoccupation,” (2) “withdrawal,” (3) “tolerance,” (4) “unsuccessful attempts by parent to control use,” (5) “loss of interest in previous hobbies and entertainment,” (6) “deceived others about use,” (7) “use to escape or relieve a negative mood” and the final six items reflected (8) “psychosocial problems”, such as “jeopardizing/losing a relationship or compromised functioning in school due to use” and “continued use despite psychosocial problems.” As such, two additional models were considered

based on these eight factors: a) a non-hierarchical eight-factor model and b) a higher order eight-factor model of a general problematic media use factor, plus the eight specific factors. Models a and b differ, such that the hierarchical model (model b) assumes that the correlations among the eight specific (first-order) factors can be explained by a single higher-order factor, that is, the general construct of problematic media use.

The CFA models were fitted to polychoric correlations among the PMUM items using maximum likelihood (ML) estimation in R. Model fit was evaluated using the standardized root mean square residual (SRMR), the root mean square error of approximation (RMSEA), and the Tucker-Lewis index (TLI). Hu and Bentler (1998) suggest that SRMR values less than .08 indicate good fit, RMSEA values less than .08 indicate reasonable fit, and TLI values greater than .90 indicate good fit.

Group comparisons on PMUM parent report: Matched groups. Analyses were conducted using SPSS software. Item-level descriptive statistics were calculated for all of the variables in the dataset. To examine each item's distribution and determine appropriateness for subsequent parametric analyses, visual inspection of the distributions of each measure, as well as indices of skewness and kurtosis, were calculated for each item. To compare scores across the three samples, the samples were matched on age (within 2 years of each other) and sex (same sex). With these matching criteria, 36 participants from each group were identified and matched. Demographic and psychological/medical diagnostic information of this matched sample can be found in Appendix G. Comparative analyses with post-hoc analyses were then conducted on the PMUM Parent Report and the screen media use and impact questionnaire. Correlations were then calculated within each of the three samples independently. Specifically, the relationships between the PMUM and parental stress, child daily use, negative impact of screen media on the child,

ratings of child externalizing behaviour, and child age and sex were assessed. Correlations were calculated within the full community, ADHD and early neurological risk samples.

PMUM comparison of discrepancies between parent rating and parent-rated child perspective. The process of discrepancy score calculation and group determination in the community sample (N=386) is detailed in Table 3. Briefly, discrepancy scores were calculated by subtracting scores for each PMUM Parent-Rated Child Perspective item from the corresponding items on the PMUM (parent's own perception). Items 7 and 17 were excluded because they did not have analogous items on the PMUM (parent's own perception) or there were missing data. In total, 17 items were included for analysis. Positive discrepancy scores indicate parents were reporting more problems when rating their own perception than they did when rating their child's perspective on a given item. Negative discrepancy scores represent that parents provided a greater endorsement of problems when rating their child's perspective than their own. Discrepancy scores equivalent to 0 or an absolute value of 1 would likely not represent a meaningful difference in ratings given the Likert-scale anchors.

An overall total discrepancy score was calculated by adding item discrepancy scores and was then used to create three groups: "no discrepancy," "discrepancy – parent more concerned than they believe their child is," and "discrepancy – parent less concerned than they believe their child is." Total scores between 9 and -9 were considered non-discrepant, as the average discrepancy score would be less than 1. Scores greater than or equal to 10 (i.e., more than half the items have at least a 1-point discrepancy in the same direction) were categorized as "Discrepancy – More Concerned." Similarly, overall scores less than or equal to -10 were categorized as "Discrepancy – Less Concerned." Of the sample of 386 participants in the

community sample, 325 fell into the “No Discrepancy” category, 32 into “Discrepancy – More Concerned,” and 29 into “Discrepancy – Less Concerned.”

As the degree of parent-reported PMU was expected to influence group membership among Discrepancy – More Concerned and Discrepancy – Less Concerned groups, the “No Discrepancy” group was further subdivided by parent-reported screen related impairment (i.e., high PMUM ratings vs. low PMUM ratings). A median split approach was used to divide the entire sample (N=386) into high (PMUM total score ≥ 63) and low (PMUM total score ≤ 62) problems with screen media, given that scores of 4 (“very often”) or 5 (“always”) on a PMUM item reasonably represent a high problem frequency, whereas scores of 1 (“never”) and 2 (“rarely”) are anchored in a way that suggests the parent does not see this behaviour as a problem. A total of 165 participants in the community sample fell in the “No Discrepancy – Low Problems” group, 160 participants in the “No Discrepancy – High Problems” group, 32 in the “Discrepancy – More Concerned” group, and 29 in the “Discrepancy – Less Concerned” group.

Table 3. *Process of determining discrepancy group membership in community sample*

Step 1: Discrepancy score calculated per item and total score used to create three groups

PMUM Item –	PMUM Parent-Rated Child Perspective Item =	Discrepancy Score (range)
My child loses sleep due to screen media use.	I lose sleep due to my screen media use.	-4 to 4
My child sneaks using screen media.	I hide my screen media use from my parents.	-4 to 4
Screen media is all that my child seems to think about.	Screen media is all that I seem to think about.	-3 to 3

My child's screen media use negatively affects their friendships.	My screen media use hurts my friendships.	-2 to 4
It is really difficult to get my child to stop using screen media.	It is hard for me to stop using screen media.	-4 to 3
When my child has had a bad day, screen media seems to be the only thing that helps them feel better.	When I have a bad day, screen media seems to be the only thing that helps me feel better.	-3 to 2
The amount of time my child wants to use screen media keeps increasing.	The amount of time I want to use screen media keeps increasing.	-2 to 4
Screen media is the only thing that seems to motivate my child.	Screen media is the only thing that motivates me.	-3 to 3
My child becomes frustrated when he/she cannot use screen media.	I become frustrated when I cannot use screen media.	-4 to 4
My child's screen media use interferes with family activities.	My screen media use gets in the way of family activities.	-3 to 3
My child lies in order to use screen media.	I lie to my parents so that I can use screen media.	-3 to 3
My child uses screen media to feel better.	I use screen media to feel better when I am feeling bad.	-3 to 3
My child attempts to use screen media for increasing amounts of time	I try to use screen media for more and more time.	-3 to 4
There is nothing my child enjoys as much as screen media.	There is nothing I enjoy as much as screen media.	-2 to 4
My child's screen media use causes problems for the family.	My screen media use causes problems for my family.	-2 to 4

My child becomes frustrated when he/she cannot use screen media.	I get upset when I can't use screen media	-3 to 4
It is really difficult to get my child to stop using screen media.	It is hard to get me to stop using screen media	-3 to 3
Total (sum) =		-25 to 47

No Discrepancy Group (n= 325)	Parent Report: Discrepancy Groups	
Total scores between 9 and -9 (i.e., on average there was 0 or 1 difference for a given item)	“Parent More Concerned”	“Parent Less Concerned”
	Total score greater than 10 (i.e., more than half the items have at least a 1 point discrepancy in the same direction)	Total score less than -10 (i.e., more than half the items have at least a 1 point discrepancy in the same direction)

Step 2: No Discrepancy group further split to layer on PMU

Median PMUM total score = 63

Average item rating of 2.33/5

anchors: 1 (“never”), 2 (“rarely”), 3 (“sometimes”), 4 (“very often”) and 5 (“always”)

No Discrepancy Groups			
“Low Problems”	“High Problems”	--	--
PMUM total score < 63	PMUM total score > 62		

Step 3: Final groups reflecting both dimensions of parent cognition and level of PMU in the community sample

No Discrepancy		Discrepancy	
No Discrepancy – Low Problems	No Discrepancy – High Problems	Discrepancy – More Concerned	Discrepancy – Less Concerned

(n=165)

(n=160)

(n= 32)

(n=29)

The same process for discrepancy group determination was used to categorize participants in the full ADHD (n= 66) and early neurological risk (n= 65) samples. The median of the community sample was used for the respective samples to further divide the No Discrepancy groups to be consistent in what constituted a discrepancy in reporting across groups.

Results

Screen Media Devices Used: Descriptives

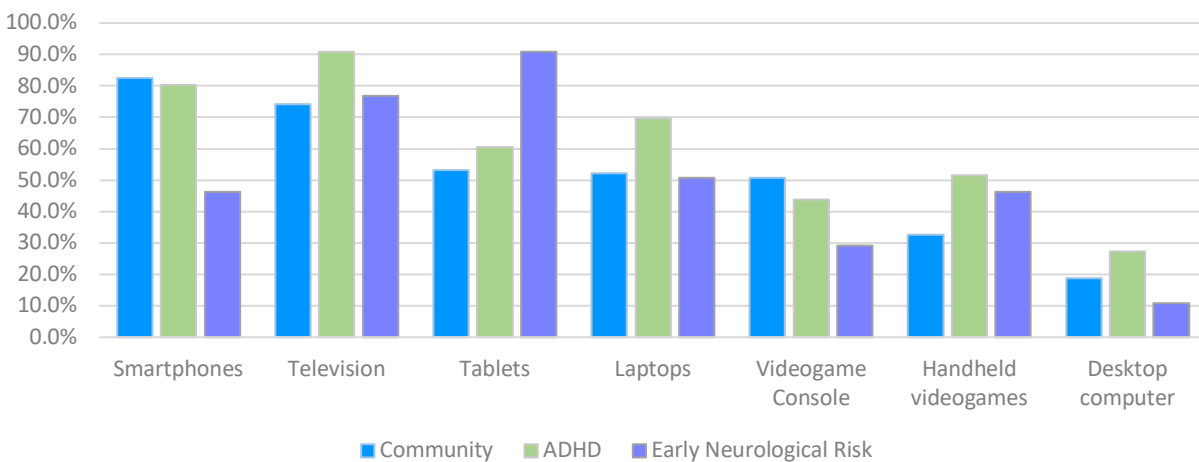
To gain deeper insights into patterns of screen media usage across the three samples, we examined the range of devices used by children and the accessibility of these devices. Frequencies are presented by group in Figure 1. In the community sample, the predominant device reported was smartphones, with 82.6% of parents indicating their child's use. Following this, 74.1% reported television use. About half of the sample reported the use of tablets, laptops, and videogame consoles (e.g., Xbox or PlayStation). A smaller proportion endorsed their child's use of 32.6% handheld videogames (e.g., Gameboy, PSP, or Nintendo Switch) and 18.7% desktop computers. Most parents (76.2%) reported that their child engages with three or more devices. Additionally, a noteworthy proportion (19.7%) reported that their child had access to these devices in their bedroom during the day, with 31.9% allowing access at night.

In the ADHD sample, television emerged as the most commonly used device, with 90.9% of parents reporting child use. This was followed closely by smartphones (80.3%). The use of laptops (69.7%), tablets (60.6%), handheld video games (51.5%), and videogame consoles

(43.9%) were also common. As in the community sample, fewer parents reported their child's use of desktop computers (27.3%). An overwhelming majority (97%) of children frequently used three or more devices. Moreover, a significant portion (71.2%) had access to screens in their bedroom during the day, with 33.3% having access at night.

In the early neurological risk sample, tablet use was predominant at 90.8%, followed by television at 76.9%. A large portion also reported laptop (50.8%), smartphones (46.2%) and handheld video games (46.2%) usage. The utilization of video game consoles was reported by 29.2% followed by desktop computers at 10.8%. A substantial proportion of parents (76.9%) indicated that their child used three or more devices. Furthermore, 36.9% had screen access in their bedroom during the day, and 18.5% had access at night.

Figure 1. Frequency of Device Use Across Samples



Replication and Validation of Larger Age Range in PMUM

Assumptions verification for CFA. Means, standard deviations, and indices of skewness and kurtosis were calculated for all variables and the results from these analyses are summarized in Appendix H. All the items demonstrated acceptable skewness and kurtosis indices (Hair et al., 2022), therefore meeting the assumption of multivariate normality.

Replication of PMUM: Parent Report factor structure

Model selection in 6-11 year old subsample. Fit indices for each CFA model tested with the PMUM data among children aged 6-11 years appear in Table 4. The one-factor model did not account for the relationships among PMUM items well. By contrast, all of fit statistics indicated that the eight-factor model had adequate fit to the PMUM items (RMSEA= 0.08, SRMR= 0.05, CFI= 0.93, and TLI= 0.92). The hierarchical eight-factor also fit well and fit indices were highly comparable to the correlated eight-factor model (RMSEA=0.08, SRMR= 0.06, CFI=0.92, and TLI=0.91). In light of these results, the two nested models were compared using the chi-square difference test, which evaluates the null hypothesis that the models are equivalent. The χ^2 difference test (which uses the standard test statistics) was significant, $\chi^2 (2) = 72.70, p < .001$, indicating that the more restricted higher-order model fits the data significantly better than the simpler model with eight correlated factors. These results did not confirm the one-factor model predicted in hypothesis 1A.

Table 4. *Fit of CFA Models for the Problematic Screen Media Use Scale (ages 6-11; n=198)*

Model	df	χ^2	CFI	TLI	RMSEA	SRMR
One factor	324	1008.61	0.845	0.832	0.110	0.062
Correlated 8-factor	296	593.16	0.934	0.922	0.075	0.050
Higher Order 8-factor	316	669.09	0.921	0.913	0.079	0.056

Note. *df* degrees of freedom; χ^2 chi-square fit statistic; *CFI* Comparative Fix Index; *TLI* Tucker-Lewis Index; *RMSEA* Root Mean Square Error of Approximation; *SRMR* Square Root Mean Residual

Extension of PMUM Age Range

Model selection in full sample. Fit indices for each CFA model in the full sample appear in Table 5. Similarly, fit statistics indicated that the correlated eight-factor model (RMSEA=0.07, SRMR= 0.04, CFI=0.94, and TLI=0.93) fit the PMUM items well in the full age sample (ranging from 6 to 18 years). The hierarchical eight-factor model demonstrated adequate fit (RMSEA=0.08, SRMR= 0.05, CFI=0.93, and TLI=0.92) and the one-factor model, poor fit (RMSEA = 0.11, SRMR = 0.06, CFI = 0.84, and TLI = 0.83). As in the younger subsample, the chi-square difference test on the standard test statistics is significant, $\chi^2 (2) = 153.06, p < .001$, indicating that the more restricted higher-order model fits the data significantly better than the simpler model with eight correlated factors. These results supported the prediction that the same factor model as the 6 to 11-year-old sample would hold in the extended age sample (hypothesis 1B).

Table 5. *Fit of CFA Models for the Problematic Screen Media Use Scale (ages 6-18) n=387*

Model	df	χ^2	CFI	TLI	RMSEA	SRMR
One factor	351	8687.48	0.843	0.830	0.113	0.057
Correlated 8-factor	296	800.37	0.942	0.931	0.072	0.040
Higher Order 8-factor	316	956.33	0.926	0.918	0.079	0.048

Note. *df* degrees of freedom; χ^2 chi-square fit statistic; *CFI* Comparative Fix Index; *TLI* Tucker-Lewis Index; *RMSEA* Root Mean Square Error of Approximation; *SRMR* Square Root Mean Residual

Summary of PMUM: Parent Report analyses. Given the comparable pattern of findings, including similar fit statistics in the subsample (6 to 11-year-olds) and extended sample (6 to 18-year-olds), the higher order eight-factor model factor structure of the PMUM fits best in our community sample. Factor results of this model in the full sample are summarized in Appendix I. All items are statistically significant indicators of the latent variable constructs, with strong magnitude (i.e., standardized loadings >0.60, range 0.66 to 0.97). Standardized error

variances (i.e., uniqueness estimates) range from .05 to .57. Most of these uniqueness values are small, indicating a sizeable amount of variance in item scores is explained by their respective factors in this model. Overall, all the items loaded well onto their respective factors, and the interpretation of the model was consistent with the scale's theoretical development. A significant portion of the variance in each of the eight PMUM factors (74-97%) is explained by the higher-order general factor (problematic screen media use). As such, this study will use a total PMUM score as the key dependent variable.

Relationship with Child Age and Sex

Child age was not significantly related to total parent-reported PMUM score, suggesting that parents endorsed a similar degree of overall problems with screen media across the developmental period. The findings diverged from the anticipated age in hypothesis 1C. Conversely, males (*Mean Rank* = 205.89, *n* = 174) were reported to have higher levels of PMU than females (*Mean Rank* = 183.33, *n* = 212), $U = 518.0, p = .048$. This finding supported hypothesis 1D.

Comparative analyses across samples using matched groups on the PMUM parent report

Assumption verification for group comparisons. Given differences in sample size, age and proportion of sex assigned at birth across samples, group comparisons were conducted in a subsample matched by age and sex. An examination of the variables used in the group comparative analyses was conducted to ensure that assumptions were met before proceeding with further analyses. First, the parametric nature of each variable for each group within the matched sample was examined to ensure normal distribution to proceed with further analyses. Histograms and Q-Q plots for all variables were visually inspected. Means, standard deviations,

indices of skewness and kurtosis were calculated for all variables by group within the matched sample. Shapiro-Wilks tests of normality were also conducted to assess the normality of the distribution of all variables by group. Levene's test was also conducted for each variable to assess the homogeneity of variance of all variables. Results from these analyses are summarized in Appendix J. These analyses revealed that for all the variables in this study, at least one of the groups did not meet the assumption of normality. As such, non-parametric analyses were used for the subsequent group comparisons (i.e., Kruskal-Wallis tests). Dunn's pairwise tests were performed post-hoc using Bonferroni correction on significance values for multiple tests.

As males were reported to have greater PMU in the community group, sensitivity analyses examining group differences within each sex individually (i.e., males and females) were conducted, however, results did not differ. As such, analyses are reported for matched groups.

Problematic screen media use on the PMUM parent report. First, total PMUM Parent Report score was compared by group. A Kruskal-Willis H test revealed significant group differences in PMUM total score $H(2) = 21.74, p < .001$. Post-hoc analyses identified that parents in the ADHD group ($M_{rank} = 74.35$) reported significantly more overall PMU than parents in the early neurological risk group ($M_{rank} = 45.36, p < .001$) and the community group ($M_{rank} = 43.79, p < .001$). The early neurological risk group and community group were not significantly different. These results supported the hypothesis that the ADHD group would have more PMU than the community group. Conversely, contrary to what was hypothesized, no significant difference between the early neurological risk and community groups was observed (Hypothesis 2A).

Child life domains of impact. Next, parent-reported impact of screen media use on their child's life was compared by group. Significant group differences were detected for both total positive, $H(2) = 7.27, p = .03$, and negative impact, $H(2) = 8.95, p = .01$, total scores. Post-hoc

analyses identified that parents in the ADHD group ($M_{rank}= 67.06$) reported significantly more negative impact of screen media use than parents in the community group ($M_{rank}= 46.40$, $p<.001$). Parents in the ADHD group also reported less positive impact ($M_{rank}= 45.26$) of screen media as compared to the community group ($M_{rank}= 65.00$, $p<.001$). The early neurological risk group did not significantly differ in ratings of positive and negative impact from either the ADHD group or the community group. In particular, parents in the ADHD group endorsed a high degree of negative impact on domains of Family Life, Mental Health and Sleep. These results supported the hypothesis that the ADHD group would have greater negative impact and less positive impact than the community group. Conversely, contrary to what was hypothesized, no significant difference between the early neurological risk and community groups was observed in negative or positive impact of screen use on child (Hypothesis 2B).

Child screen media use and parental stress. Children's average daily use of screen media was not significantly related to group. In contrast, there was a statistically significant difference in parental stress between groups, $H(2)=22.13$, $p<.001$. Post-hoc analyses identified that parents in the ADHD group ($M_{rank}=73.32$) reported significantly more parental stress than the community sample ($M_{rank}=40.43$, $p<.001$) and the early neurological risk sample ($M_{rank}=48.09$, $p=.002$), though the community group and the early neurological risk group were not significantly different from one another. These results supported the hypothesis that the ADHD group would have greater negative impact and less positive impact than the community group. Conversely, contrary to what was hypothesized, no significant difference between the early neurological risk and community groups was observed in negative or positive impact of screen use on child (Hypothesis 2C).

Summary of comparative analyses on matched groups. Participants in the three groups (i.e., community, ADHD and early neurological risk) were compared on several outcome measures. Parents in the ADHD group reported higher PMUM Parent Report scores as well as more stress related to screen media use when compared to both the early neurological risk and Community groups. Parents in the ADHD group also reported significantly more negative and less positive impacts of screen media on their children as compared to the community group. Group differences in negative impact were seen in the ADHD group in the domains of family life, mental health and sleep.

Correlations with the PMUM across samples

Correlates of the PMUM parent report. Correlations among all variables were assessed within the community sample, ADHD sample, and the early neurological risk sample individually (Appendix K).

Contrary to what was hypothesized (Hypothesis 3A), total PMUM score was not significantly related to child's age in either the community or ADHD groups. However, age was positively associated in the early neurological risk group ($r_s = .26, p = .04$), such that older children were rated as having greater PMU.

As predicted, a greater total PMUM score was significantly related to higher externalizing behaviour in both clinical samples. Associations ranged from strong (early neurological risk sample, $r_s = .56, p < .001$) to moderate (ADHD sample, $r_s = .29, p = .02$). Higher parent-rated inattention was significantly related to greater PMUM scores in the early neurological risk ($r_s = .46, p < .001$) group. These results support the hypothesis 3B.

Similarly, as expected (Hypothesis 3C), higher total PMUM score was found to be strongly related to greater negative impact of screens on the child in all samples: community ($r_s=.59, p<.001$), ADHD ($r_s=.65, p<.001$), and early neurological risk ($r_s=.86, p<.001$).

Total PMUM score was significantly related to higher child daily screen media use in the community sample ($r_s = .25, p<.001$) and the early neurological risk group ($r_s = .52, p<.001$), but not in the ADHD sample ($r = .06, ns$). These results were partly inconsistent with Hypothesis 3D, which predicted higher screen use would be related to the PMUM across all groups.

As predicted, greater problematic screen media use was significantly related to parental stress in all groups (Hypothesis 3E), such that all parents reported greater stress with higher PMUM scores (r_s from .36 to .88).

Sex assigned at birth. In the community sample, males (*Mean Rank* = 205.89, $n = 174$) were reported to have higher levels of PMU than females (*Mean Rank* = 183.33, $n = 212$), $U = 518.0, p = .048$. In the early neurological risk, males also had significantly higher PMUM scores (*Mean rank* = 35.67, $n=42$) than females (*Mean rank* = 24.67, $n=21$) sample, $U = 287.00, p = .025$. However, there was no significant difference between males and females in the ADHD sample. These results were partly inconsistent with Hypothesis 3F which predicted higher PMUM scores among males across groups.

Study 1b: Parent Cognitions of PMU in a Community Sample

Key variables such as age, sex, inattention and hyperactivity, and technology use and impact questionnaire are presented by discrepancy group in the community sample presented in Table 6. As at least one variable in the community sample did not meet the assumption of

normality, Kruskal-Wallis tests and Dunn’s pairwise tests (post-hoc), were used for subsequent group comparisons.

Table 6. Means, Standard Deviation by Discrepancy Group in Community Sample (N=386)

Variable	No Discrepancy		Discrepancy	
	Low Problems	High Problems	More Concerned	Less Concerned
N (%)	165 (42.7%)	160 (41.5%)	32 (8.3%)	29 (7.5%)
Age (years)	11.62 ± 3.6	11.35 ± 3.4	11.81 ± 3.5	12.55 ± 3.5
<i>Youngest (6-10yrs), n (%)</i>	<i>73 (44.2%)</i>	<i>73 (45.6%)</i>	<i>13 (40.6%)</i>	<i>9 (31.0%)</i>
<i>Middle (11-14yrs), n (%)</i>	<i>45 (27.2%)</i>	<i>51 (31.9%)</i>	<i>11 (34.4%)</i>	<i>10 (34.5%)</i>
<i>Oldest (15-18yrs), n (%)</i>	<i>47 (28.5%)</i>	<i>36 (22.5%)</i>	<i>8 (25.%)</i>	<i>10 (34.5%)</i>
Sex – Males (%)	67 (40.6%)	77 (48.1%)	17 (53.1%)	13 (44.8%)
Psychological diagnosis – n (%)				
Anxiety disorder	10 (6.0%)	9 (5.6%)	3 (9.4%)	4 (13.8%)
OCD	1 (0.6%)	3 (1.9%)	0 (0%)	0 (0%)
Depression	4 (2.4%)	7 (4.4%)	2 (6.3%)	5 (17.2%)
PMU Discrepancy Score	-1.32 ± 4.2	-0.07 ± 4.2	15.88 ± 8.3	-12.55 ± 3.2
Screen Media Use and Impact Questionnaire				
Hours of Use (Child)	4.83 ± 3.5	5.29 ± 2.9	5.28 ± 2.8	5.24 ± 3.3
Parental Comfort	8.87 ± 1.5	8.28 ± 1.9	8.72 ± 1.8	7.97 ± 2.1
Impact of Screen Media on Child Life Domains				
Total Positive Impact	17.78 ± 7.2	19.16 ± 5.7	18.19 ± 6.7	19.14 ± 6.3
Total Negative Impact	11.94 ± 5.0	17.56 ± 5.7	18.63 ± 8.4	15.00 ± 4.9
Parental Stress	2.05 ± 0.8	3.42 ± 0.9	2.96 ± 1.2	2.86 ± 1.0

Note. Presented as Mean ± SD where relevant

The Kruskal-Wallis H test was used to compare groups on continuous variables, and the Chi-square difference test was used for categorical variables. Dunn’s pairwise tests were performed following Kruskal-Wallis H tests using Bonferroni correction on significance values for multiple tests.

Child Factors. Discrepancy group did not have a significant interaction with child age (continuous variable) or age band (i.e., 6-11y.o., 12-14 y.o., 15-18 y.o.). Similarly, no significant association was found between discrepancy group and sex, nor psychological diagnoses of anxiety or OCD. However, discrepancy group was associated with depression, $\chi^2(3) = 12.39, p = .01$, such that parents with children who have a diagnosis of depression were more likely to be in the Discrepancy – Less Concerned group ($z = 3.34, p = .001$). A Bonferroni correction was applied to adjust for the increased risk of Type I errors. The adjusted significance level was set at $\alpha = 0.05/8 = 0.01$.

Screen Media Use and Impact. First, ratings of parental stress about their child's screen media were compared by group. A Kruskal-Willis H test revealed that there was a statistically significant difference in parental stress between groups, $H(3) = 133.15, p < .001$. Post-hoc analyses identified that parents in the No Discrepancy – Low Problems group ($M_{rank} = 120.63$) reported significantly less parental stress than the Discrepancy – More Concerned group ($M_{rank} = 212.09, p < .001$), the Discrepancy – Less Concerned group ($M_{rank} = 206.28, p = .001$) and the No Discrepancy – High Problems group ($M_{rank} = 262.61, p < .001$). The other three groups were not significantly different from one another.

Second, ratings of the impact of screen media use on the participants' child were compared by group. A statistically significant difference was seen in the negative impact of screen media use between groups, $H(3) = 82.76, p < .001$, but not on the positive impact of screen media. The No Discrepancy – Low Problems group differed from the Discrepancy – More Concerned and No Discrepancy – High Problems groups on mean ranks of negative impact across all child life domains, suggesting greater negative impact among these two groups as compared to the No Discrepancy – Low Problems group.

Third, parental comfort with technology was compared by discrepancy group. A Kruskal-Willis H test revealed that there was a statistically significant difference in parental comfort between groups, $H(3)= 11.37, p = .01$. Post-hoc analyses identified that parents in the No Discrepancy – Low Problems group ($M_{rank}= 210.97$) reported significantly more comfort than the No Discrepancy – High Problems group ($M_{rank}= 178.19, p=.033$),

Last, the amount child screen use was compared across discrepancy groups. There was no statistically significant difference in amount of child daily screen use between groups.

Parent Cognitions of PMU in Clinical Samples

Key variables such as age, sex, internalizing and externalizing behaviour, and technology use and impact are presented by discrepancy group in Table 7 (ADHD) and Table 8 (early neurological risk) by group. As at least one variable in both the ADHD and early neurological risk samples did not meet the assumption of normality, non-parametric tests were used for any subsequent group comparisons.

ADHD Sample. A total of 3 (4.5%) participants fell in the No Discrepancy – Low Problems group, 45 (68.2%) in the No Discrepancy – High Problems group, 17 (25.8%) in the Discrepancy – More Concerned group, and 1 (1.5%) in the Discrepancy – Less Concerned group.

Table 7. Means, Standard Deviation by Discrepancy Group in the ADHD sample (N=66)

Variable	No Discrepancy		Discrepancy	
	Low Problems	High Problems	More Concerned	Less Concerned
N (%)	3 (4.5%)	45 (68.2%)	17 (25.8%)	1 (1.5%)
Age (Years)	12.33 ± 4.6	11.91 ± 2.9	11.41 ± 4.3	-

<i>Youngest (6-10yrs)</i>	<i>1 (33.3%)</i>	<i>13 (28.9%)</i>	<i>6 (35.3%)</i>	-
<i>Middle (11-14yrs)</i>	-	<i>23 (51.1%)</i>	<i>5 (29.4%)</i>	<i>1 (100%)</i>
<i>Oldest (15-16yrs)</i>	<i>2 (66.7%)</i>	<i>9 (20.0%)</i>	<i>5 (29.4%)</i>	-
Sex – Males (%)	3 (100%)	31 (68.9%)	13 (76.5%)	1 (100%)
Psychological diagnosis – n (%)				
ADHD	3 (100%)	44 (100%)	17 (100%)	1 (100%)
Learning Disability	2 (66.7%)	14 (31.1%)	6 (35.3%)	-
Intellectual Disability	-	2 (4.4%)	1 (5.9%)	-
Autism Spectrum Disorder	-	5 (11.1%)	1 (5.9%)	-
Tourette Syndrome/Tic Disorder	1 (33.3%)	-	-	-
Fetal Alcohol Spectrum Disorder	-	1 (2.2%)	1 (5.9%)	-
Anxiety disorder	3 (100%)	18 (40.0%)	3 (17.6%)	1 (100%)
OCD	-	4 (8.9%)	-	-
Depression	-	2 (4.5%)	3 (17.6%)	-
Substance use disorder	-	-	-	-
Psychosis	-	-	-	-
ODD/Conduct disorder	-	1 (2.2%)	-	-
Eating disorder	-	1 (2.2%)	-	-
PTSD	-	-	1 (5.9%)	-
Developmental coordination disorder	-	3 (6.7%)	-	-
Sensory processing disorder	-	1 (2.2%)	-	-
Medical diagnosis – n (%)				
Premature birth	-	2 (4.5%)	3 (17.6%)	-
Cerebral palsy	-	1 (2.3%)	-	-
SDQ				
Externalizing Problems	9.67 ± 7.2	10.49 ± 3.0	11.29 ± 2.2	-
Internalizing Problems	2.00 ± 2.0	7.96 ± 4.3	8.71 ± 4.7	-
PMU Discrepancy Score	-1.00 ± 4.4	1.36 ± 4.6	14.35 ± 4.4	-
Screen Media Use and Impact Questionnaire				
Hours of Use (Child)	4.86 ± 2.1	4.79 ± 2.8	4.31 ± 2.3	-
Parental Comfort	10.00 ± 0.0	8.24 ± 1.8	8.41 ± 1.7	-
Impact of Screen Media Use on Child Life Domains				
Total Positive Impact	17.33 ± 7.2	16.98 ± 4.2	15.76 ± 3.3	-
Total Negative Impact	10.33 ± 2.9	21.71 ± 5.0	22.12 ± 5.4	-
Parental Stress about Screen Media Use	2.86 ± 1.2	4.50 ± 0.8	4.59 ± 0.7	-

Note. Presented as Mean \pm SD where relevant

Group Comparisons. Variables of interest were compared across two groups (No Discrepancy – High Problems and Discrepancy – More Concerned) using the Mann-Whitney U-test, as the No Discrepancy – Low Problems and Discrepancy – Less Concerned groups had too small a sample size. These two groups did not significantly differ on any of the variables of interest, including child age, sex, externalizing or internalizing problems or any metric on the screen media use and impact questionnaire.

Early Neurological Risk Sample. A total of 28 (43.1%) participants fell in the No Discrepancy – Low Problems group, 25 (38.5%) in the No Discrepancy – High Problems group, 5 (7.7%) in the Discrepancy – More Concerned group, and 7 (10.8%) in the Discrepancy – Less Concerned group.

Table 8. Means, Standard Deviation by Discrepancy Group in the early neurological risk sample ($N=65$)

Variable	No Discrepancy		Discrepancy	
	Low Problems	High Problems	More Concerned	Less Concerned
N (%)	28 (43.1%)	25 (38.5%)	5 (7.7%)	7 (10.8%)
Age (Years)	7.75 \pm 2.1	9.46 \pm 2.5	9.2 \pm 1.1	8.57 \pm 2.6
<i>Youngest (6-10yrs)</i>	23 (82.1%)	17 (68.0%)	4 (80.0%)	5 (71.4%)
<i>Middle (11-14yrs)</i>	5 (17.9%)	7 (28.0%)	1 (20.0%)	2 (28.6%)
<i>Oldest (15-18yrs)</i>	-	1 (4.0%)	-	-
Sex – Males (%)	15 (53.6%)	18 (72.0%)	3 (60.0%)	6 (85.7%)
Psychological diagnosis – n (%)				
ADHD	8 (28.6%)	10 (40.0%)	3 (60.0%)	2 (28.6%)

Learning Disability	7 (25.0%)	6 (24.0%)	2 (40.0%)	1 (14.3%)
Intellectual Disability	5 (17.9%)	8 (32.0%)	1 (20.0%)	-
Autism Spectrum Disorder	3 (10.7%)	8 (32.0%)	2 (40.0%)	3 (42.9%)
Tourette Syndrome/Tic Disorder	-	-	-	-
Fetal Alcohol Spectrum Disorder	-	-	-	-
Anxiety disorder	2 (7.1%)	7 (28.0%)	-	3 (42.9%)
OCD	-	3 (12.0%)	-	-
Depression	1 (3.6%)	-	-	-
Substance use disorder	-	-	-	-
Psychosis	-	-	-	-
ODD/Conduct disorder	-	1 (4.0%)	-	-
Eating disorder	-	-	-	-
PTSD	-	-	-	-
Developmental coordination disorder	-	-	-	-
Sensory processing disorder	-	-	-	-
Medical diagnosis – n (%)				
Stroke	6 (21.4%)	3 (12.0%)	-	2 (28.6%)
Epilepsy	3 (10.7%)	1 (4.0%)	1 (20.0%)	-
Congenital Heart Disease	8 (28.6%)	4 (16.0%)	1 (20.0%)	-
Hypoxic Ischemic Encephalopathy	1 (3.6%)	-	-	-
Thyroid disease	-	1 (4.0%)	-	-
Cancer	-	1 (4.0%)	-	-
Premature birth	3 (10.7%)	5 (20.0%)	-	1 (14.3%)
Traumatic brain injury	7 (25.0%)	3 (12.0%)	-	1 (14.3%)
Cerebral palsy	2 (7.1%)	-	-	-
Hydrocephalus	-	1 (4.0%)	-	-
Moyamoya disease	-	1 (4.0%)	-	-
Loeys-Dietz syndrome	-	1 (4.0%)	-	-
Kidney disease	1 (3.6%)	-	-	-
SDQ (N=64)				
Externalizing	5.68 ± 4.4	9.29 ± 3.4	10.00 ± 3.0	6.29 ± 3.3
Internalizing	4.96 ± 4.1	7.75 ± 4.6	8.40 ± 4.4	5.57 ± 4.5
PMU Discrepancy Score	-1.22 ± 4.5	1.56 ± 4.5	17.00 ± 8.5	-11.71 ± 2.3
Screen Media Use and Impact Questionnaire				
Hours of Use (Child)	2.37 ± 1.3	4.26 ± 2.1	3.43 ± 1.2	2.86 ± 1.6

Parental Comfort	9.44 ± 1.1	8.20 ± 2.3	8.25 ± 2.4	8.29 ± 1.6
Impact of Screen Media Use on Child Life Domains				
Total Positive Impact	14.07 ± 5.8	18.96 ± 5.4	21.35 ± 3.0	17.29 ± 6.4
Total Negative Impact	11.40 ± 3.6	20.16 ± 6.5	26.50 ± 3.7	15.29 ± 4.6
Parental Stress about Screen Media Use	2.31 ± 0.9	3.79 ± 1.0	5.00 ± 0.8	2.64 ± 0.9

Note. Presented as Mean ± SD where relevant

Group Comparisons

Variables of interest were compared across two groups (No Discrepancy – High Problems and No Discrepancy – Low Problems) using Mann Whitney U-tests, as the group size of the Discrepancy – More Concerned and Discrepancy – Less Concerned groups were too small for statistical comparison.

Child Factors. First, parent ratings of child internalizing and externalizing behaviours were compared between the two groups. The Mann-Whitney U test revealed a significant difference in internalizing ratings between the No Discrepancy – Low Problem group ($Mdn = 22.14$, $n = 28$) and the No Discrepancy – High Problems group ($Mdn = 31.58$, $n = 24$), $U = 458.0$, $p = .025$. Similarly, parents in the No Discrepancy – Low Problems group ($Mdn = 20.00$, $n = 28$) also reported significantly less externalizing behaviours than the No Discrepancy – High Problems group ($Mdn = 34.08$, $n = 24$), $U = 518.0$, $p < .001$. The Low Problems group ($Mdn = 22.14$, $n = 28$) was significantly younger than the High Problems group ($Mdn = 32.44$, $n = 25$), $U = 486.0$, $p = .014$. Last, there were no significant group differences related to child sex.

Screen Media Use and Impact. Ratings of parental stress about their child’s screen media were compared between the two groups. The Mann-Whitney U-test identified that parents in the No Discrepancy – Low Problems group ($Mdn = 17.96$, $n = 28$) reported significantly less

parental stress than the No Discrepancy – High Problems group ($Mdn = 37.12$, $n = 25$), $U = 603.0$, $p < .001$.

Second, ratings of the impact of screen media use on the participants' children were compared between the two groups. Parents in the No Discrepancy – Low Problems group ($Mdn = 17.32$, $n = 28$) reported significantly less negative impact than the No Discrepancy – High Problems group ($Mdn = 37.84$, $n=25$), $U = 621.0$, $p < .001$. Conversely, the Low Problems group ($Mdn = 20.11$, $n = 27$) reported a greater positive impact of screen media use than the High Problems group ($Mdn = 33.4$, $n=25$), $U = 510.0$, $p = .002$.

Third, the average child's daily screen time was compared between the two groups. Parents in the No Discrepancy – Low Problems group ($Mdn = 19.39$, $n = 28$) reported that their child spends significantly less time on screens than parents in the No Discrepancy – High Problems group ($Mdn = 35.52$, $n=25$), $U = 563.0$, $p < .001$.

Last, the two groups were compared in terms of parent comfort using screen media. Parents in the No Discrepancy – Low Problems group ($Mdn = 31.13$, $n = 28$) reported significantly greater comfort with screen media than the No Discrepancy – High Problems group ($Mdn = 22.38$, $n=25$), $U = 234.5$, $p = .02$.

Summary. A total of four discrepancy groups were created to capture 1) parent cognitions about their own and their child's beliefs about PMU and 2) the degree of parent-rated PMU in Aim 3. To explore whether these groups hold in clinical samples, parents were placed into groups and exploratory group comparisons were conducted on variables of interest, including child age, behaviour and several parent and child factors related to screen media use. Parents in the ADHD sample largely fell into the No Discrepancy – High Problems group (66.7%), followed by the Discrepancy – More Concerned group (25.8%). Only one participant

was in the Discrepancy – Less Concerned group and three were in the No Discrepancy – Low Problems group, which were therefore excluded from analyses. The two groups did not differ on any variables of interest.

In contrast, parents in the early neurological risk sample largely fell into either the No Discrepancy – Low Problems group (43.1%) or the No Discrepancy – High Problems group (38.5%). The Discrepancy – More Concerned and Discrepancy – Less Concerned groups were small, and excluded from group comparisons. Parents in the Low Problems group reported less inattention and hyperactivity/impulsivity, less negative and positive impact of screen media, greater parental comfort with technology, less parental stress about screen use and fewer hours of child screen use than the High Problems group. Their children were also significantly younger.

Discussion

The initial aim of the study was to replicate the factor structure of Problematic Media Use Measure (PMUM) using confirmatory factor analysis (CFA) and to assess factor structure in an extended age sample. The results differed from previous research, which favored a one-factor solution in exploratory factor analysis (Domoff et al., 2019). Contrary to expectations, the one-factor solution did not have adequate fit in the replication sample. However, the higher-order eight-factor structure, aligning with the original item development and theoretical underpinnings of the construct of PMU, was retained. The stability of the factor structure across different developmental stages, as evidenced by consistent results in the full sample with incorporating older children and adolescents, suggests the validity of PMUM across developmental age groups. This finding aligns with developmental perspectives on psychopathology that suggest

differentiation with age (e.g., Caspi et al., 2014; Lahey et al., 2017) and is discussed in detail in the general discussion.

In study 1a, we also explored PMU in three different samples: a community sample, an ADHD sample, and an early neurological risk sample. We created a sample matched on age and sex to calculate group comparisons and then examined the relationships between screen media variables within each group. As expected, parents of children in the ADHD group did report significantly higher levels of PMU, as well as significantly less positive impact and significantly more negative impact of screen media on their child. However, contrary to our hypothesis, parents of children in the early neurological risk sample did not report significantly more parental stress or impacts of screen media on their child than the community sample. This finding suggests that while parents in both of these clinical groups have children with unique neurodevelopmental needs, children with ADHD may have specific neurodevelopmental or behavioural needs that uniquely predispose them higher risk of negative outcomes related to screen media use.

Finally, Study 1a revealed fairly consistent relationships between the PMUM and previously identified correlates across samples. Of note, we predicted that older children would have higher PMUM scores which was only found in the early neurological risk sample. The negligible association between child age and PMU further supports the notion of a stable construct across development. Consistent with prior research, PMU was significantly related to higher externalizing behaviour in both clinical samples (Rega et al., 2023), and strongly related to greater negative impact of screens on the child and parental stress in all samples. Child daily screen media use was also related to PMU in the community and early neurological risk samples. This association was not found in the ADHD sample, perhaps further highlighting the

vulnerability to PMU in this population. Likewise, male sex was associated with higher PMUM scores in the community and early neurological risk samples, but not the ADHD sample, adding to the premise of a unique susceptibility among young people with ADHD.

The second aim of this study was to explore the parental perceptions about PMU from their own and their child's viewpoints. Study 1b findings revealed that while most parents believed their child would endorse similar levels of PMU (84.2%), a small proportion reported problems differently from their child's perspective. As proposed, four distinct groups were identified based on parental beliefs about discrepant views and parent-reported PMU levels. These groups exhibited varying clinical characteristics, suggesting nuanced profiles within the sample. Notably, discrepancy group was not associated with the child's age or sex, indicating that perception gaps transcend developmental stages. To our knowledge, this study constitutes the first to explore parental cognitions in this manner.

Similar patterns were observed in the early neurological risk group, whereas the relative proportion of parents in each group differed in the ADHD sample. These results suggest that the parental belief about whether they see the problem similarly to their child adds important information to our understanding of the negative impact of screen media use and may be influenced by specific child factors, such as ADHD. Identifying distinct groups based on parent-reported perception discrepancies serves as a proof of concept for its utility in understanding child factors and guiding intervention strategies related to PMU. It will be important for future research to further explore the intricate interplay between parental perceptions, child behaviours, and the familial context in shaping the assessment and management of PMU. Implications are discussed further in the general discussion.

Chapter Three: Using Parent Perspective to Better Understand how Children and Youth with ADHD Engage with Screen Media: A Qualitative Exploratory Case Study

Much of the literature examining PMU is quantitative (as previously discussed) or focused on parents' perceptions and experiences managing screen use (Findley et al., 2022; Mallawaarachchi et al., 2022; Marsh et al., 2024). However, an in-depth understanding of child behaviours and attitudes around screen use is needed to provide “context and a human voice” to ongoing debates about the impact of screen media (Mallawaarachchi et al., 2022), especially in at-risk populations like young people with ADHD. Qualitative methodologies offer several distinct advantages that can contribute to a more nuanced understanding of PMU. The format of qualitative research allows for a deeper exploration of real-life phenomena by capturing individuals' experiences and viewpoints through open-ended inquiries (Moser & Korstjens, 2017). Specifically, qualitative interviews offer an opportunity to explore with parents to understand their children's media practices and what they seek from their digital experiences. This approach is especially pertinent for investigating complex phenomena that may not be fully captured through numerical data alone. As a result, qualitative research has gained traction in the field of psychology for its ability to provide rich insights into human behaviour (Rennie et al., 2002).

Qualitative Approaches to Understanding Problematic Media Use

Within the discourse on screen media use, several qualitative studies explore the perspectives of adolescents and pre-adolescents, offering insights into the nuanced interplay of benefits and challenges associated with screen usage. In one qualitative study examining adolescents' interactions with contemporary screen devices before the onset of COVID-19

lockdowns in 2018, a cohort of Australian adolescents ($n = 16$, mean age 15.6 ± 2.4 years) acknowledged the intricate impact of screen usage on their lives (Thomas et al., 2021). They recognized the potential benefits, such as increased social interaction and the calming effect of screen time, as well as the negative consequences, including feelings of isolation and stress (Thomas et al., 2021). Further insights into this complexity emerge from examining how Canadian mothers and pre-adolescents view the dynamics surrounding screen usage ($n = 91$; pre-adolescents aged 10–13 years) (Francis et al., 2021). Mothers identified both positive and negative socio-emotional effects of screen use for their children, while the pre-adolescents emphasized only the positive socio-emotional impacts (Francis et al., 2021). Notably, both mothers and pre-adolescents expressed frustration regarding screen time regulations, albeit from differing viewpoints. In contrast to previous studies that mainly focused on parental perceptions, Francis and colleagues (2021) shed light on pre-adolescent perceptions of screen use and the difference in opinions with their parents.

Qualitative investigations conducted amidst the COVID-19 pandemic have offered valuable insights into the advantages and drawbacks of screen media use. Many of these findings echoed concerns expressed by parents over the past decade, such as the emergence of addiction-like behaviours, exposure to potentially harmful content, social withdrawal, heightened family conflict, and adverse effects on physical, mental, and cognitive well-being (Arundell et al., 2022; Marsh et al., 2024). Nonetheless, delving into the context and experiences of families regarding screen use during lockdowns has also revealed certain benefits, such as facilitating the maintenance of social connections, accessibility of programming and fostering increased competence and proficiency with technology (Arundell et al., 2022).

In the broader literature, parents and, to a lesser extent, young people have described both positive and negative aspects of screen media use. However, qualitative research examining these experiences specifically within the context of ADHD among parents is lacking. While it stands to reason that themes may be similar, the quantitative literature suggests that children with ADHD experience more challenges related to screen media use, potentially leading to the emergence of different themes or fewer described positive aspects. Furthermore, the extent to which parents actively reflect on and consider the potential disparities between their own views and those of their child remains unknown.

While quantitative investigations provide valuable insights, delving into parental cognitions and experiences through qualitative inquiry offers added depth to our understanding of complex phenomena, such as problematic media use among vulnerable young people. However, qualitative studies on problematic media use in the context of ADHD remain scarce, leaving a gap in our understanding of the way in which ADHD interacts with children's screen media habits. To address this gap, this study adopts an exploratory, qualitative approach, engaging in semi-structured interviews with six parents of children with ADHD, spanning various age and gender demographics. Through inductive content analysis, we aimed to illuminate the nuances related to parental cognitions and uncover emergent themes surrounding screen media use among children and youth with ADHD.

Qualitative Approaches to Understanding Experiences and Behaviour in ADHD

Despite well-documented vulnerabilities to excessive and problematic media use (Beyens et al., 2018; Dekkers & van Hoorn, 2022; Dullur et al., 2021), no qualitative studies have explicitly investigated PMU in children or adolescents with ADHD. Among emerging adults, some preliminary work has been done in the area of social media use. In a recent mixed methods

study of first-year university students (ages 18 to 31), researchers interviewed students with significant attention concerns (a score of 5 or greater on the Adult ADHD Self-Report Scale) with both high and low scores of problematic social media use (score within the highest or lowest quartile on the Bergen Social Media Addiction Scale [BSMAS]) (Arness & Ollis, 2023). The thematic analysis found that most individuals with attention dysregulation, regardless of their BSMAS category, perceived self-regulation of social media use as highly challenging and effortful, describing the broadly problematic relationship with social media (Arness & Ollis, 2023). Regulating one's social media usage requires effortful self-control that many describe as not believing they possess. While some participants expressed being aware of their overuse while using social media, others articulated that they "get lost" in their social media usage. Importantly, this qualitative analysis found that awareness of problematic use and intentions to reduce or halt social media use is not sufficient to lead to self-regulation – and that self-regulation of social media use was unsurprisingly perceived as effortful and challenging for individuals with significant attention concerns (Arness & Ollis, 2023).

The aim of Study 2 was to deepen our understanding of parent cognitions about problematic screen media use in the context of children with ADHD through a qualitative approach, specifically focusing on parental awareness of their child's insight into their problems resulting from screen media use. To achieve this objective, we engaged in semi-structured interviews with parents of children with ADHD across various ages and sexes. These interviews sought to delve into various aspects of problematic screen media use, including parental cognitions (i.e., their own perceptions of challenges, their understanding of their child's perspective), and to explore how developmental stages and ADHD-related difficulties influence

their child's interactions with screens. Given that this study represents the first qualitative exploration of this subject matter, we adopted a qualitative exploratory case study design.

Method

Study Design

The present study was a qualitative exploratory case study design, following guidelines from Baskarada (2014). An exploratory case study design was deemed appropriate for the present study as, to our knowledge, there have not been any previous studies to date that have investigated problematic screen media use in children/youth with ADHD from a qualitative approach. Based on the current literature's findings that child age and sex may impact screen media use, we aimed to purposefully sample based on different child age groups and child sex, to obtain case studies from these different groups.

Participants

Parents of children who participated in Study 1 from the ADHD sample (i.e., recruited via CADDAC) were recontacted to participate in the present study. The same inclusion criteria as Study 1 were retained in the present study. Stratified sampling was used to ensure that parents of children from different age groups (i.e., 6 to 10-year-olds, 11 to 14-year-olds, and 15 to 18-year-olds) and sex groups (i.e., male and female) were recruited. As we aimed to recruit 6 participants (one male and one female within each age band), we contacted interested families until saturation was reached. Key participant demographics are summarized in Table 9 for each participant.

Table 9. *Study 2 participant demographic information (N=6)*

	Youngest age (6-10)		Middle age (11-14)		Oldest age (15-18)	
	Parent 1	Parent 2	Parent 3	Parent 4	Parent 5	Parent 6
Child demographics						
Age	6	10	13	12	16	15
Sex	Female	Male	Female	Male	Female	Male
Medication (Y/N)	Y	N	Y	Y	Y	Y
Parent demographics						
Age	41	41	43	47	47	57
Caregiver status	Mother	Mother	Mother	Mother	Mother	Mother
Level of Education	College/ University Degree	Graduate/ Professional Degree	College/ University Degree	College/ University Degree	Graduate/ Professional Degree	Graduate/ Professional Degree

Procedure

Parents of children from the ADHD sample in Study 1 (i.e., sample 2, CADDAC) who consented to be recontacted for future research with our team were invited via email to participate in the present study. Participants who expressed interest were then provided information about the study and completed an informed consent form in advance of their scheduled interview. Recruitment continued until all six intended participants were recruited according to the stratified sampling approach described above. Participants then completed a 30 to 60-minute semi-structured, virtual interview with one of the study coordinators via Zoom. Participants were oriented to the present study and were asked a series of semi-structured questions regarding their child’s screen media use and their experience managing this as a parent of a child with ADHD (semi-structured interview script in Appendix L). Structured prompts were used to encourage parents to reflect on their child's thoughts and insights regarding their screen

media usage if it was not raised organically. Following the interview, participants were compensated with a \$20 Amazon gift card. This study received appropriate institutional ethics approval prior to commencing data collection.

Data analysis

The semi-structured interviews were audio-recorded and transcribed verbatim by a research assistant on the study team. All transcripts were verified against recordings and imported into NVivo10 for analysis. Subsequently, we conducted a qualitative analysis of the interview transcripts utilizing inductive content analysis (ICA)(Bergmann et al., 2022). Vears and Gillam (2022)'s guidelines for ICA were used to guide the iterative coding process, which involved 3 phases of coding. The first phase of coding aimed to identify broad classes of content to be further analysed. The second phase of coding involved developing subcategories within each content class identified in phase 1. The third phase of coding involved reviewing all transcripts with the finalized coding scheme to identify whether any codes had been missed and code them accordingly. Based on this, the refined coding scheme (Table 10) was finalized, and the data was interpreted. Last, qualitative responses from parents were systematically mapped onto suggested criteria for problematic media use.

Results

Following the coding process for all parent interviews (N=6), three broad classes of content were identified: (1) impacts of their child's screen media use, (2) parental perceptions about their child's perspective on their screen media use, and (3) impact of ADHD on their child's relationship with screen media. These broad content classes were then further analysed and several sub-themes emerged, including the influence of child's developmental stage and age.

Table 10. *Content classes and sub-themes from the qualitative content analysis*

a. Perceived impacts on child of screen media use
i. Addictive nature of screens
ii. Risks around safety
iii. Low mood and anxiety symptoms
iv. Social skills development
v. Emotion Regulation
vi. Opportunities for learning and fostering interests
b. Parental perceptions of their child’s perspective on their screen media use problems
i. Discrepant views due to normalization of use
ii. Discrepant views due to child only sees benefits
iii. Impact of child’s development and capacity for self-reflection on insight
iv. Agreement resulting from explicit discussions with parents
c. Parent observed influences of ADHD on PMU
i. Satisfies need for sensory stimulation
ii. Affinity for instant gratification and automatic feedback
iii. Greater need for coping strategies
iv. More difficult to monitor and control use themselves
v. Influence of environment and medication

Perceived impacts of child’s screen media use

Parents were asked about their child’s relationship with screen media overall, as well as any specific concerns or benefits they have seen with respect to their child’s screen media use. All the parents in this sample endorsed having concerns about their child’s screen media use. All but one parent described concerns about the “dependence” or addictive nature of screen media: “I would say that she's dependent on it. [...] I don't know that she would know how to exist without it at this point in time” (Parent 5, 16-year-old female). In particular, parents highlighted the impact this dependence has on their child’s functioning: “Very addicting. It's the first thing she wants to do in the morning and it's the reason why things don't get done” (Parent 3, 13-year-old female). Similarly, another parent described : “She’s dependent on it. [...] If I were to ask her

to get ready for school, I would have to get her up in enough time so that she has at least 15 minutes to watch the television before she would be willing to do that” (Parent 1, 6-year-old female). Another parent raised an important idea of routine and expectation possibly contributing to dependence: “My kids are fixated on the fact that they should get two hours of screen time every day. [...] Nowhere in my son's repertoire of thinking would he consider doing homework first and then doing a screen because he's so concerned about not getting his fair share of screen time” (Parent 4, 12-year-old male).

Most parents also described having concerns about online safety. A parent of one of the middle-school-aged children described her concerns about her child being taken advantage of: “Being so young, they are inexperienced. People don't always claim to be who they are. [...] She's not very savvy, so I hope nobody ever pretends to be somebody else to get her to do something or give information” (Parent 3, 13-year-old female). The other facet of safety that was raised by several parents was around content. Despite parents’ best efforts, inappropriate content often does not need to be sought out and is actually suggested to the user. One parent described how this has been the case for her child: “The content that he's being exposed to when he chooses something funny on YouTube shorts or TikTok that [...] feeds onto YouTube [is] really inappropriate; not 10-year-old language, sometimes hyper-sexualized or racist” (Parent 2, 10-year-old male). As children get older and have more say in the types of things they are viewing, particularly in adolescence. Another parent articulated concerns regarding the influence of content young people have access to online and their ability to make sense of complex information:

The things that he's interested in are clean [...] but he likes to watch a lot of YouTubers and sometimes the news. How do you know that it is accurate and not fake news? [...]

there is content [online] that looks real but isn't. It's really hard for any of us to discern what's happening when we're watching it. [...] I don't know if he could, at some point, be influenced by particular ideas (Parent 6, 15-year-old male).

Safety concerns spanned all age groups and sexes, and ranged from physical safety, to exposure to inappropriate content, to vulnerability of being influenced by ideas and concepts.

Among parents of older children, they expressed concern about the negative emotional impacts of their child's relationship to screens. One parent discussed worries around social withdrawal and low mood: "I think you could see that [his screen use] was affecting him. He was getting blue. His mood was changing because it was too isolating" (Parent 6, 15-year-old male). Another parent highlighted the anxiety their child feels related to maintaining access to her phone: "If we're going somewhere [...] she's thinking about if the battery's going to run out, does she have a charger close by, etc. Very much of her day and priorities are centered around her having a charged phone with her always" (Parent 5, 16-year-old female).

Despite all parents having concerns, many also described positive aspects to their child's screen media use. Numerous parents spoke about the social benefits of various types of screen media. For children who have more difficulty with social skills, connecting online may be easier and more successful: "I see some social benefits from it because he was a very isolated kid, and he's developed friendships and he's often socializing with other kids" (Parent 6, 15-year-old male). Similarly, another parent spoke about how the online environment can make social relationships more accessible for her child who has challenges with friendships: "Social relationships are hard for him. He doesn't really have a lot of friends [or] makes friends very easily. [...] He made a couple of connections earlier in the year [on Fortnite]" (Parent 4, 12-year-old male). One parent spoke about the social skills her child learned through YouTube:

One day we were driving in the car, and he's like, "Oh, I'm going to send them a video to thank them for my birthday present", [...] But he said "I won't send that today because that'd be like hogging the attention on his special day. I'll send it later." I thought that was very reflective. I asked him if it was a rule he learned or if I taught him that. He told me "No, there's a YouTube channel called, "Am I The Jerk?" where they go through various scenarios [...] embedding social skills [...]that wouldn't necessarily happen on a daily basis (Parent 2, 10-year-old male).

Even among children who have strong social relationships, one parent also acknowledged how social media and texting play a crucial role in their child's social life: "I would think that the social connection is enormous, and I wouldn't want to minimize it. Realistically, socially it's very important. Her having a connection to positive people can be really good for her" (Parent 5, 16-year-old female).

Although parents identified that it is often emotionally dysregulating for their child to transition off of screens, among the youngest children, emotion regulation via screens was also raised as a benefit of screen media. For example, one parent described both upregulating and downregulating benefits:

I think he finds it to be extremely rewarding and regulating. When he's low energy, it gets him excited when he's playing a video game, and downregulating when he's had a stressful day. In any context where he's gotten stressed out over the course of the day and had enough of people, it's a nice distraction that helps him down regulate (Parent 2, 10-year-old male).

Similarly, another parent described challenges with emotion regulation and how screens allow her child to regulate more independently: "She has difficulty with emotional and behavioral

regulation. She goes to that screen, and it does help to do that easily on her own” (Parent 1, 6-year-old female). Parents of older children did not identify this benefit.

Finally, a couple of parents expressed observed advantages to learning and fostering interests. For example, one parent raised that she feels that screens allow her child to access information in a captivating way that he otherwise would not engage with: “It has allowed him to explore passions, that would otherwise not have the same depth of knowledge and engagement. [...] He can consume for longer lengths of time than if he's reading a book about something” (Parent 2, 10-year-old male). Another parent also felt that screen media enables unique opportunities to engage with family culture and learn new things: “On her own, she decided to learn Polish on Duolingo. [...] I think she's very proud of herself when she could share that she's accomplished something like learning Polish online” (Parent 3, 13-year-old female).

Parental perceptions about their child’s awareness of their screen media use

Notably, none of the parents in this study raised their child’s understanding or insight about screen media use organically. Thus, parents were explicitly asked if they believed their child would agree or disagree with their concerns related to their screen media use. Half of the parents in the sample described largely discrepant views. Specifically, that their child would probably disagree with their perspective. One parent commented on the normalization of certain screen-media related behaviours:

I don't know that he would agree that it's impacting him negatively, like school wise. I think if you mentioned friends or kids at school, he'd be like “they all have phones too and they are all on their phones too, I'm just like everybody else”. School, he'll be like “It's fine, I'm keeping up” (Parent 4, 12-year-old male).

Another parent described that her child would probably focus on the benefits, rather than acknowledge the problems: “I don't think he would see it as a problem. I think he would argue that there are benefits to it. He would say that he’s socializing; “I'm on with a friend, you always say I should be hanging out with friends” (Parent 6, 15-year-old male). Discrepancies were also attributed to developmental concepts such as understanding of time and abstract comprehension: “She has this time blindness. I don't think she realizes the amount of time that she spends in front of the screen. While she's starting to realize how that interferes with her day, [because I tell her she has to do things], she's six, so she doesn't really understand the interference” (Parent 1, 6-year-old female).

In this sample, only one parent clearly articulated how her child’s perception would be congruent with her perspective:

He would agree, for sure. He's gotten a little bit worried about it too, like cyber safety.

He's one of these kids who worries about things in excess. He recently asked to cover his camera. My husband studies cybersecurity. He's got a little bit more of a lens of what would be appropriate for an 10-year-old (Parent 2, 10-year-old male).

While this suggests that the child likely has similar concerns to the parent, it is important to note that the example provided suggests that this may be influenced by child temperament and parental occupation. Other parents highlighted increased awareness in their child after explicit discussions about parental concerns: “We talked about it and she's aware of it. She would say that it’s decreased over the last year and a bit. When she sees the [...] average screen times, she's aware that they're high [...] it's within her realm of awareness” (Parent 5, 16-year-old female).

One parent discussed a more variable outlook, where their child's agreement with parent perspective was somewhat contingent on specific concern or situation. For example, this parent described that it can be difficult to ascertain what her child truly thinks:

Sometimes she'll throw it back that she's doing it for other reasons and that I don't know what she does on her phone. That's a good teenager comeback. Some days, she does agree that she was playing too much of a certain game. I respect her when she uses her words and says things like "I'm talking with my friends right now, can I do it in 10 minutes" (Parent 3, 13-year-old female).

This parent also highlighted factors such as variable insight and a developing capacity to self-reflect: "It takes a lot to self-reflect and she doesn't really look at herself like that yet. That's a 50/50, sometimes she disagrees with me and doesn't like it and sometimes she's like "you're right mom" (Parent 3, 13-year-old female). Additionally, she also noted the impact of medication on her child's ability to self-reflect: "It depends on medication too. If it's in the morning versus like later in the day. Hormones play a big role in that as well" (Parent 3, 13-year-old female).

The influence of ADHD on screen media use

Many parents also spoke about their observations of how having ADHD influences the way in which their child engages with screen media. A common theme that emerged amongst parents in this sample was around differences in the neurodivergent brain. Several parents spoke to the idea of immediate gratification and high stimulation from screen media, and how it might be particularly rewarding for a child with ADHD:

Probably because screen media is so stimulating. You can do whatever you want right then and there. It's like that gambling addiction, it's a constant reinforcement. With his ADHD brain, he's like "I don't want to do my homework, it's boring" and not very

interactive or exciting at all. Screens are better so why would he want to stop using them?

It's highly motivating. Everything an ADHD brain wants (Parent 4, 12-year-old male).

Similarly, one parent talked about how the high need for sensory stimulation makes screens easier for their child to sustain focus: “There's that automatic feedback you get from the TV and that really keeps her engaged. She doesn't stay attentive to a lot of other things. It's constantly changing. I think it's that sensory stimulus that really works for her” (Parent 1, 6-year-old female). Other parents described a similar interaction between the ADHD brain and screens with regard to immediate feedback: “Because [...] you don't have to wait. In three seconds, you can be doing something else on the internet. There's always something to get that boost you need” (Parent 3, 13-year-old female).

In a similar vein, the desire to multitask and be doing things simultaneously was also noted: “I don't know if this is typical of all kids, but he'll sometimes have multiple things going. He's engaged with both of them though. He's playing a video game and listening to a YouTube video. That may be neuroatypical for them to absorb multiple things at once like that” (Parent 2, 10-year-old male). One parent also commented specifically on the impact impulsivity has on her child's screen media use: “At school she has gotten into much more trouble than her peers have for more screen use in the classroom. Her ability to keep it in the bag or turn it over on her desk is like nil. From the teachers, I have heard that this is something she struggles with immensely” (Parent 5, 16-year-old female).

Finally, parents also highlighted environmental factors which impact their child with ADHD and in turn, their screen media use. One parent remarked that their child is more tired at the end of the day from having to work so hard to attend and regulate their behaviour in class: “I think he's more worn out at the end of the school day than your average kid would be. More in

need of something to decompress [...] In the moment, I think it's probably hard to get off” (Parent 2, 10-year-old male). When reflecting on the impact of medication, one parent described that her child tends to have more problems when not on ADHD medication: “She's more tolerant during medication. When she’s not on medication, I see more emotional outbursts, she's very dysregulated, and very angry when she does not have access to screen media” (Parent 3, 13-year-old female).

Mapping parent concerns onto symptoms and theory of PMU

Although many parents conceptualized it as “dependence,” within these interviews were many of the criteria of problematic media use, including **preoccupation** (e.g., *It's the first thing she wants to do in the morning*), **deception** (e.g., *She will sneak it in whenever she can. I turn my back and she will be watching TV*), **unsuccessful control** (e.g., *Her ability to keep it in the bag or turn it over on her desk [at school] is like nil*), **withdrawal** (e.g., *He would prefer to eat meals in front of it [...] he does not want to sit with us anymore. He will take his food up to his room and there are piles and piles of dishes up there. He could live there*), **escape** (e.g., *In any context where he's gotten stressed out over the course of the day and had enough of people. It's a nice distraction that helps him down regulate*), **loss of interest** (e.g., *She would say being able to watch [TV] is the only thing that makes her happy*), **tolerance** (e.g., *Getting off I find is always a challenge. It's always “five more minutes, five more minutes”*), and **psychosocial impairment** (e.g., *She's thinking about if the battery's going to run out, does she have a charger close by, etc. Very much of her day and priorities are centered around her having a charged phone with her always*).

Summary of Study 2 Results

We completed semi-structured interviews about problematic media use with six parents of children and youth with ADHD. We followed an exploratory qualitative case study design in this study, as this consisted of the first qualitative study on this topic with parents of children with ADHD. We then completed an inductive content analysis of the transcripts, and three broad categories emerged: (1) impacts of their child's screen media use, (2) parental perceptions about their child's perspective on their screen media use, and (3) impact of ADHD on their child's relationship with screen media. From this, many sub-themes emerged to help understand problematic media use in this sample.

Discussion

The parents in this study universally expressed concerns about their child's screen media use, highlighting issues such as dependence, online safety, exposure to inappropriate content, and the potential influence of online content on their child's beliefs and behaviours. Many parents described concerns about their child's dependence on screens, noting its impact on daily functioning and routines. Safety concerns were also prevalent, encompassing worries about online predators and exposure to inappropriate content. Parental concerns around safe use of the internet and screen media has been reported extensively in the literature (Danet, 2020; Sobel et al., 2017). Considering that children and youth with ADHD are known to be more prone to risky behaviours (Kennedy et al., 2017; Shoham et al., 2021), it is possible this concern is particularly amplified among parents of young people with ADHD. Parents of older children expressed concerns about the negative emotional effects of excessive screen time, such as social withdrawal and anxiety. This provides further evidence that adolescents may be particularly

susceptible to negative mental health sequelae (e.g., anxiety, poor self-confidence, negative body image) associated with screen media use (Shannon et al., 2022; Valkenburg et al., 2022).

Despite these concerns, parents also identified several positive aspects of their child's screen media use, which are largely consistent with what has already been described in the literature (Puzio et al., 2022). In particular, parents highlighted the social benefits and learning opportunities. Screen media was seen as a valuable tool for enhancing social skills, fostering connections with peers, and even facilitating emotional regulation in some cases. Additionally, parents noted how screens can provide unique learning opportunities and foster interests that may not be accessible through traditional means. This is congruent with quite a large body of literature which describes some learning benefits associated with screen media use (Kucirkova, 2014; Linebarger & Walker, 2005; Radesky et al., 2015).

Interestingly, none of the parents spontaneously discussed their child's understanding or insight about screen media use, underscoring the need for direct inquiry on the topic. When prompted, half of the parents described largely discrepant views, anticipating that their child would likely disagree with their concerns related to screen media use. These discrepancies were attributed to various factors, including the normalization of screen-related behaviours, a focus on perceived benefits rather than acknowledging problems, and developmental concepts such as understanding of time and abstract comprehension. Only one parent believed their child's perception would align with their own, highlighting potential influences child temperament and the parent's expertise, knowledge and comfort on how screen media use is navigated in the family. Parents with this confidence and sense of competency around screen media and technology may mediate their child's use differently. For example, a few parents noted their child's increased awareness of the issues following an explicit discussion about parental

concerns, indicating the importance of open communication. Others described a more variable outlook, with their child's agreement contingent on specific concerns or situations, highlighting factors such as variable insight and the impact of medication.

Parents in the study discussed how their child's diagnosis of ADHD influences how they engage with screen media. Many noted that they felt their children with ADHD are drawn to screens due to the immediate gratification. The idea of increased reward sensitivity and bias towards immediate gratification is well documented in the ADHD literature (Doidge et al., 2018; Patros et al., 2016; Reynolds & Schiffbauer, 2005). Parents described that this immediate feedback and sensory stimulation helps sustain their child's focus on the screen-based activity. A higher need for sensory stimulation, and by consequence, risk-taking behaviour, is also a prevalent finding among young people with ADHD (Shoham et al., 2021; Sonuga-Barke et al., 2010) and a phenomenon often reported clinically. This aligns well with parents' descriptions of their children's tendency to multitask while using screens, reflecting the desire to engage in multiple activities simultaneously and high need for stimulation.

Impulsivity also appears to play a role in screen media engagement, as several parents described that their children with ADHD struggle to control their screen use, often using it in situations where it's inappropriate or when they have been instructed not to. As difficulty with inhibition (i.e., impulsivity) is a core symptom of ADHD and often persists across development, this is unsurprising (Martel et al., 2021). Parents also discussed the impact of environmental and emotional factors, such as fatigue from managing ADHD symptoms throughout the day and challenges with emotion regulation, which lead their children to use screens as a way to “decompress.” Some parents described the use of screens for emotion regulation as adaptive and helpful, while others noted that it simply delays emotional outbursts for when their child must

transition off the screen. Finally, one parent noted that medication for ADHD helps mitigate some of these challenges, further supporting a link between ADHD symptoms and screen media use behaviours.

Conducting qualitative research with a small sample size, such as six parents of children with ADHD, presents several limitations. The small sample size limits the generalizability of the findings, as the experiences of these parents may not represent the broader population. Although this study was approached with as much objectivity as possible (e.g., using multiple coders), the subjectivity inherent in qualitative research can introduce bias, influenced by participants' personal beliefs and the researcher's interactions. Additionally, the depth-focused nature of qualitative studies means the breadth of information is limited, potentially missing a range of experiences. Context-specific findings, variability in ADHD presentation, and non-random sampling further restrict the generalizability of the findings. Nevertheless, PMU, as discussed in the present study, has not previously been characterized in a sample of children and youth with ADHD, and no studies to date have explored problems around screen media use in this population qualitatively. Importantly, parents' descriptions of their children's screen media use behaviours align with symptoms of problematic media use, including preoccupation, deception, unsuccessful control, withdrawal, escape, loss of interest, tolerance, and psychosocial impairment. Overall, these findings highlight the complex relationship between ADHD and screen media use, as well as the importance of additional research in this vulnerable population. Tailored support for children with ADHD and their families is needed.

Chapter Four: General Discussion

Overview and Summary of Studies

The purpose of the present studies was to better understand and characterize how attention difficulties interface with PMU across various developmental stages and use parent cognitions to extend our current understanding of PMU. In order to address these broad aims, two studies with complementary goals and methodologies were conducted. To date, no quantitative study has compared problematic media use across ADHD, early neurological risk and neurotypical populations, nor across development. The first study aimed to compare these groups on PMU, as well as other dimensions of screen-related behaviour (e.g., use and impact). Since the Problematic Media Use Measure (PMUM) was only previously used with parents of children aged 4-11, the study also aimed to assess factor structure and utility in an extended-age sample. Finally, to add to our growing understanding of problematic media use, the study also explored parent cognitions and discrepancies between their own beliefs and their perception of their child's beliefs. We characterized four profiles of parent-reported discrepancy in the neurotypical sample, and then tested the concept in clinical samples. The results from Study One (summarized in Tables 11-12) are discussed in relation to the overarching themes of the studies.

Table 11. *Summary of Study 1a hypotheses and results*

PMUM Factor Structure

Hypotheses	Results
H _{1A} : Replicate PMUM Factor Structure in 6-11 year olds	One-factor <u>not</u> replicated Higher-Order Eight Factor solution, good fit, best solution
H _{1B} : Factor Structure will fit well in full sample (6-18 year olds)	Higher-Order Eight Factor also good fit, best solution

H _{1C} : Age related to PMUM (older)	-
H _{1D} : Sex related to PMUM (male)	Male > Female

Matched Sample Comparisons

Hypotheses	Results
H _{2A} : PMUM Score	ADHD > Community and Neurological
H _{2B} : Impact of Screen Media - Total Negative impact on child - Total Positive impact on child	ADHD > Community and Neurological ADHD < Community and Neurological
H _{2C} : Child screen media use Parental Stress	No significant difference ADHD > Community and Neurological
H _{2D} : Absolute Discrepancy Score	No significant difference

Correlation patterns within community, ADHD, and neurological samples

Hypotheses	Results		
	Community	ADHD	Neurological
H _{3A-E} : Higher total PMUM will be related to:			
- older age	-	-	X
- greater inattention	n/a	n/a	X
- greater externalizing symptoms	n/a	X	X
- more negative impact of screen media on the child	X	X	X
- higher child screen media use	X	-	X
- greater parental stress about screen media	X	X	X
- male sex	X	-	X

Note. X indicates a significant finding, - indicates a non-significant finding

Table 12. Summary of Study 1b exploratory findings

Community Sample

Aim	Results
<p>(1) Investigate variances between parental reports and their understanding of their child's beliefs regarding PMU within a community sample</p>	<p>Found four groups, defined by high or low PMU and parental cognition about agreement or disagreement on PMU:</p> <ul style="list-style-type: none"> - No Discrepancy – Low Problems (42.7%) - No Discrepancy – High Problems (41.5%) - Discrepancy – More Concerned (8.3%) - Discrepancy – Less Concerned (7.5%) <p>Majority of parents fell into one of the No Discrepancy groups (~4/5). Approximately 15% of the sample fell into one of the Discrepancy groups.</p>
<p>(2) Explore how these groups correspond to child factors, technology use and impairment.</p> <ul style="list-style-type: none"> - Age - Sex - Anxiety - Depression - Parental Stress - Negative Impact of Screen Use - Positive Impact of Screen Use - Amount of daily child screen use 	<p>No group differences</p> <p>No group differences</p> <p>No group differences</p> <p>DLC > NDLP, NDHP and DMC</p> <p>NDLP < NPHP, DMC and DLC</p> <p>NDLP < NDHP and DMC</p> <p>No group differences</p> <p>No group differences</p>

Clinical Samples

Aim	Results
<p>(1) Investigate if the discrepancy groups identified in the community sample remain consistent within samples of ADHD and early neurological risk</p>	<p>ADHD</p> <ul style="list-style-type: none"> - Majority (2/3) of parents fell into the NDHP group, followed by DMC (1/4). Only 1 parent fell in the DLC group. <p>Early Neurological Risk</p> <ul style="list-style-type: none"> - Similar to community sample, majority of parents fell into either the NDHP or NDLP

	(~2/5 in each). Fewer fell in DMC and DLC groups.
(2) Explore how these groups correspond to child factors, technology use and impairment.	<p>ADHD (NDHP v. DMC) No group differences on any variables</p> <p>Early Neurological Risk (NDLP v. NDHP) NDLP < NDHP No group difference NDLP < NDHP NDLP < NDHP NDLP < NDHP NDLP < NDHP NDLP < NDHP NDLP < NDHP NDLP < NDHP NDLP < NDHP</p>
<ul style="list-style-type: none"> - Age - Sex - Inattention - Externalizing - Parental Stress - Negative Impact of Screen Use - Positive Impact of Screen Use - Amount of daily child screen use - Parental Comfort 	

Note. DMC: Discrepancy – More Concerned, DLC: Discrepancy – Less Concerned, NDLP: No Discrepancy – Low Problems, NDHP: No Discrepancy – High Problems.

In Study 2, we conducted semi-structured interviews with parents of children with ADHD, allowing parents to share their experiences of how screen media use has impacted their child in the context of ADHD. Results from an inductive content analysis generated three broad themes: (1) impacts of their child’s screen media use, (2) parental perceptions about their child’s perspective on their screen media use, and (3) impact of ADHD on their child’s relationship with screen media. Importantly, the concerns regarding negative impact corresponded well with the domains and items on the PMUM. While many of the emerging sub-themes were consistent with what was endorsed in Study 1, it is notable that parents did not share any reflections about their child’s perceptions or insight without prompting, which may help guide future research and intervention in this area.

Consideration of Child Factors: Towards a Nuanced Understanding of PMU in Children and Youth

Problematic media use across development

This project aimed to evaluate PMU across various stages of development. Given the lack of a validated measure applicable to such a wide age range, it was imperative to first examine the factor structure of the Problematic Media Use Measure (PMUM) among parents of children aged 6 to 18. Previous research has extensively documented the presence of PMU and associated concerns across diverse age groups, including young children, school-aged children, and adolescents (Coyne et al., 2021; Domoff et al., 2019; Moretta et al., 2022; Rega et al., 2023; Shannon et al., 2022). Therefore, it is essential to have an assessment tool that can effectively capture this phenomenon across the developmental continuum.

In the original developmental and validation study with parents of children aged 4-11, the EFA on the PMUM produced a one-factor solution (Domoff et al., 2019), implying a general factor of “problematic media use.” However, our attempt to replicate this factor structure of the PMUM was unsuccessful, as the one-factor model did not demonstrate adequate fit. Several potential explanations exist for this outcome. While our replication subsample fell within the same age range as Domoff and colleagues (2019), we did not include children aged 4 and 5 (preschool age) in our sample. This exclusion may have influenced the fit of a single-factor model, as psychological constructs often become more differentiated with age and development. Research suggests that many psychological constructs tend to exhibit a general factor that becomes more distinct and specialized as individuals age and develop. For example, studies on intelligence have found support for a general factor, often referred to as "g" for general

intelligence, alongside specific factors or abilities that become more refined with age (McArdle et al., 2002).

Similarly, research on the general psychopathology factor (p factor) in children and adolescents suggests variations in symptom expression and profiles with age (Caspi et al., 2014; Lahey et al., 2017). Thus, while a broad vulnerability to psychopathology exists across different age groups, developmental factors must be considered when examining symptomatology and profiles. These findings imply that while a general underlying factor may exist for many psychological constructs, differentiation may occur as individuals mature and accumulate experiences. This may explain why a hierarchical model, which includes a general factor alongside specific factors, fit our data best. Consequently, our sample's slightly older age range may have contributed to our inability to replicate the original findings, emphasizing the importance of considering developmental factors in research design.

While caution is warranted in interpreting these factor findings, it provides preliminary evidence that the construct of PMU can be measured across different developmental stages. It is promising to note that the model that fit best in our replication sample maintained its robust fit even when older children and adolescents were included. This finding supports a unified conceptual framework of PMU across development. Nevertheless, the lack of association between the PMUM total score and age in both community and ADHD samples is intriguing, given established age-related associations with PMU (Jennings & Caplovitz, 2022; Paudel et al., 2017). This may reflect the increased prevalence of screen usage among young individuals both prior to and in the wake of the pandemic, and a trend towards fewer overall age-related differences in the amount of screen use and problematic behaviours across age groups.

A different pattern of findings was shown in the early neurological risk sample, such that older child age was associated with greater total PMUM scores. This is consistent with the existing literature which shows older children experience more PMU during childhood (Rega et al., 2023). Identifying a small yet noteworthy correlation between total PMUM score and age within the early neurological risk sample prompts us to consider the concept of developmentally sensitive periods. These periods suggest that particular phases or stages of development may wield a pronounced influence on outcomes or relationships between variables. The early neurological sample was younger (M age= 8.11yrs) than the other samples, which may suggest a relationship between PMU and age differs across periods of development. Future research may benefit from exploring the concept of developmentally sensitive periods and integrating longitudinal research methods to capture the nuances of the relationship between age and PMU.

Sex differences in PMU. Throughout the studies in this project, it was deemed important to consider the potential effects of child sex on PMU, alongside potential age and developmental differences. Our findings in the community and early neurological risk samples align with many studies to date which have found male gender to be associated with greater PMU in young children (under 10) (Rega et al., 2023). However, the specific construct of PMU has not been examined among adolescents. While our findings suggest males assigned at birth may be more vulnerable across the developmental period, it is worth also considering the way in which PMU may manifest differently by sex. Under the umbrella of issues associated with screens and internet usage, it has been observed that females tend to dedicate more time to smartphones and computers compared to adolescent males. Additionally, females exhibit higher rates of smartphone addiction (Cocoradă et al., 2018; Twenge & Martin, 2020). Previous studies have found similar gender differences in problematic social media use (Bányai et al., 2017; Kuss et al.,

2013) and problematic internet use (Pontes et al., 2015). For instance, Rehbein et al. (2013) found that among adolescents with problematic internet use, girls indicated that social media contributed most to their addiction, while boys also cited online pornography as a primary source of their problems.

It is conceivable that differences between sexes in children and adolescents might not manifest uniformly across all aspects of screen media use issues. Rather, variations could arise in the specific types of screen media they engage with, and there may be an interaction between age and sex. For instance, while both genders might encounter challenges like addiction-like behaviour or excessive screen time, their preferences for certain platforms—such as smartphones, computers, or tablets—may differ between sexes at different points in development. Recognizing and understanding these nuanced distinctions can inform targeted interventions and support strategies tailored to address gender-specific needs and challenges in the digital landscape.

Problematic media use in at-risk samples: ADHD and early neurological risk

The overarching aim of this project was to better understand problematic screen media use in children and youth with attention difficulties. We were particularly interested in whether the two clinical groups (ADHD and early neurological risk) would fare similarly given their shared attentional vulnerabilities or whether differences would emerge between them. It was hypothesized that parents of children in both clinical groups would have a greater problematic media use than the community sample due to their higher risk of attention difficulties (Bolk et al., 2022; Marino et al., 2012; Werling et al., 2022; Williams et al., 2018). However, only parents in the ADHD group reported higher total PMUM scores than the community group. Parents of children in the ADHD group also reported significantly less positive impact and more negative

impact of screen media on their child, compared to both the community and the early neurological risk samples. This is consistent with what has previously been found in the literature regarding the increased difficulties that children with ADHD may have with screen media use (Beyens et al., 2018), further underscoring the distinctive nature of screen-related behaviours among diverse clinical groups.

Contrary to prediction, the early neurological risk group did not differ from the community group on parent-reported PMU. While we anticipated similar trends in problematic media use between the ADHD group and the early neurological risk group due to their shared attentional vulnerabilities, possible explanations could include variations in cognitive functioning, developmental trajectories, or familial factors that differentiate the early neurological risk group from their ADHD counterparts. Importantly, children with early neurological injuries represent a far more heterogeneous group than children with ADHD. They may have specific cognitive profiles or physical limitations that necessitate adaptations influencing their interaction with screen media. For example, depending on the nature and extent of the injury, they may have developed compensatory strategies or have limitations in specific cognitive domains that affect their engagement with screen media. It may be more difficult to see patterns when grouped together as the type and severity of the neurological injury can vary widely among children, leading to heterogeneous responses to screen media.

Additionally, we hypothesized that the early neurological risk clinical group would be susceptible to similar adverse outcomes related to screen media use as the ADHD group due to their susceptibility to attention difficulties (Roberts et al., 2019; Williams et al., 2018). However, unlike the ADHD sample, having attentional difficulties was not an inclusion criterion in the early neurological risk sample. Children only had to have confirmation of early neurological risk

(e.g., perinatal stroke, significant cardiac condition, extreme prematurity, etc.). As a result, our early neurological risk sample included both children with and without significant attention difficulties. This variability could account for the observed lower levels of problematic media use and less negative impact associated with screen media in the early neurological risk group. It is also worth noting that the level of PMU did not differ by sex in this group, suggesting less influence of biology and/or gender in this group. Given that greater symptoms of inattention were strongly associated with total PMUM score in this sample, it is likely that even among children with early neurological risk, inattention represents a vulnerability to PMU.

Qualitative Findings. In Study 2, parents of children with ADHD were also asked more generally about the impact of screen media on their child. Consistent with the item development of the PMUM, parents of children aged 6-16 endorsed concerns that aligned with all of the symptoms of problematic screen media use (i.e., preoccupation, deception, unsuccessful control, withdrawal, escape, loss of interest, tolerance and psychosocial impairment). Although there were differences in the content of the examples provided by age of child, the themes were consistent within this sample of parents of children with ADHD.

Taken together, these findings indicate that child attention problems may be a significant risk factor for developing negative outcomes related to screen media use across at-risk populations, which is largely consistent with the broader literature (Santos et al., 2022). Given that children and youth with ADHD consistently experience symptoms of inattention and impulsivity, they are likely to constitute a more consistently vulnerable group.

Parent Cognitions: Discrepancy Group as a Novel Index For Understanding PMU in Children and Youth

A novel contribution of these studies was to explore parental perceptions regarding their child's perception of their screen media usage behaviour. Study one findings revealed that while most parents believed their child would endorse similar levels of problematic media use (PMU), some reported differences between their own perception and their beliefs about their child's perception. Four distinct groups were identified based on these perceived discrepancies, each exhibiting unique clinical characteristics: No Discrepancy – Low Problems (42.7%), No Discrepancy – High Problems (41.5%), Discrepancy – More Concerned (8.3%), and Discrepancy – Less Concerned (7.5%). The majority of parents fell into the no discrepancy groups.

Of particular interest and significance are the two discrepancy groups. There are several possible interpretations of the group where parents endorsed higher PMU from their own point of view than from their child's: (1) parents may *perceive themselves* as more concerned about screen use than their child, (2) parents may be more concerned than they *perceive their child* to be (e.g., believe that their child has poor insight), or (3) a combination of both. As parents were not asked directly to compare their own point of view with their understanding of their child's, it is not possible to determine for certain. Nevertheless, this group, defined by parents having rated screen media problems higher from their own perspective than from their child's, may reflect the wisdom and insight that comes with life experience and age. First, parents often have a broader understanding of the potential risks associated with excessive screen time, including concerns about its impact on physical health, mental well-being, and academic performance (Hinkley & McCann, 2018). Additionally, parents may have personal experiences or anecdotal evidence of negative consequences from their own screen use or that of others, further reinforcing their concerns. Crucially, parents feel a sense of responsibility for their child's well-being and development, leading them to overtly prioritize mitigating potential risks associated with screen

media. It is also possible that parents in this group have a tendency or bias towards minimizing their child's insight into their own behaviour.

It was somewhat surprising to find a group of parents who reported fewer problems from their own perspective than from their child's. As before, parents in this group may perceive themselves to be less worried than their child about their screen media use than they are themselves, or they may be less worried than they perceive their child to be. Notably, parents of children diagnosed with depression were more likely to fall into the Discrepancy – Less Concerned group. Internalizing symptoms, like low mood, can profoundly influence a child's insight and perception. Children experiencing depression may demonstrate negative biases, increased rumination and sensitivity to negative emotions, causing them to scrutinize their behaviours (Cole et al., 1997; Papadakis et al., 2006; Sfarlea et al., 2021), which may amplify perceived problems with screen media use. Moreover, children with depression may lack confidence in their ability to regulate screen time or cope with negative consequences, heightening worry and anxiety about media habits. It is possible that parents who report fewer concerns from their own point of view than from their child's may be attuned to these cognitive attributions in their child. The unique characteristics observed in the No Discrepancy – Low Problem group may also offer insights into understanding the Discrepancy – Less Concerned group. While both groups displayed lower levels of PMU, parents in the Discrepancy – Less Concerned group did not report significant differences in impairment compared to the two higher problematic media use groups. This highlights the importance of considering both parental perceptions of their child's awareness and the extent of parent-reported problematic media use together.

Discrepancy group showed no association with child's age, suggesting that perception gaps persist across development. The identification of distinct groups based on parental perception discrepancies underscores the relevance of this perspective in understanding PMU and holds significant implications for intervention strategies. Overall, these findings underscore the complex interplay among parental perceptions, child behaviours, and familial dynamics in shaping the assessment and management of PMU.

Parent cognition groups in at-risk samples. The pattern of results regarding group characteristics and sample proportion were similar in the early neurological risk sample but not in the ADHD sample. Among parents of children with ADHD, most fell into the No Discrepancy – High Problem group, likely reflecting higher levels of PMU in this at-risk group. The next largest group was parents in the Discrepancy – More Concerned group. Of note, only one parent fell into the Discrepancy – Less Concerned group. This is perhaps unsurprising, given the literature on risk for PMU (Beyens et al., 2018; Werling et al., 2022) and positive illusory bias in ADHD (Emeh et al., 2018; McQuade et al., 2017). As this bias may hinder accurate self-assessment of strengths, weaknesses, and behaviour, parents may be attuned to or expect this difficulty in their child, making it more likely they would perceive themselves as more worried, than less worried. Indeed, it may be that parents in the ADHD group are more likely to believe their child has poor insight or underestimate their ability to assess their own behaviour.

Qualitative Findings. In Study Two, qualitative interviews with parents revealed a prevailing belief that their child would likely disagree with their concerns about screen media. Themes emerged, including normalizing certain screen-media-related behaviours, emphasizing the benefits, comprehension of time and abstract concepts, varying levels of insight, and a developing capacity for self-reflection. Parents who anticipated alignment in concerns with their

child often cited their child's temperament (e.g., anxious or cautious) and reported engaging in explicit discussions about problems and risks. Conversely, other parents described a more variable outlook, suggesting that whether their child would agree or disagree with their perspective depends on factors like the situation, specific concerns, and ADHD-related variables, such as medication use. These findings support our conceptualization regarding parental cognition groups, indicating that child factors such as temperament, age, and inattention may significantly influence how parents perceive their viewpoint.

The Interplay of Parent and Child Factors in PMU: Developmental Psychopathology Perspectives

Considering both child and parent factors, as well as their interaction is crucial for understanding the development and maintenance of problems resulting from screen media use. For instance, parental perceptions of their child's media use can shape parental responses and potentially contribute to ongoing patterns of problematic behaviour. Although research on PMU has grown, little theoretical consideration has been described regarding the etiology and maintenance of PMU earlier in childhood or across development. Domoff et al. (2020) recently presented the Interactional Theory of Childhood Problematic Media Use (IT-CPU), a theoretical framework for children under 12 that combines developmental and clinical psychology theories with communication and human-computer interaction perspectives (Figure 2).

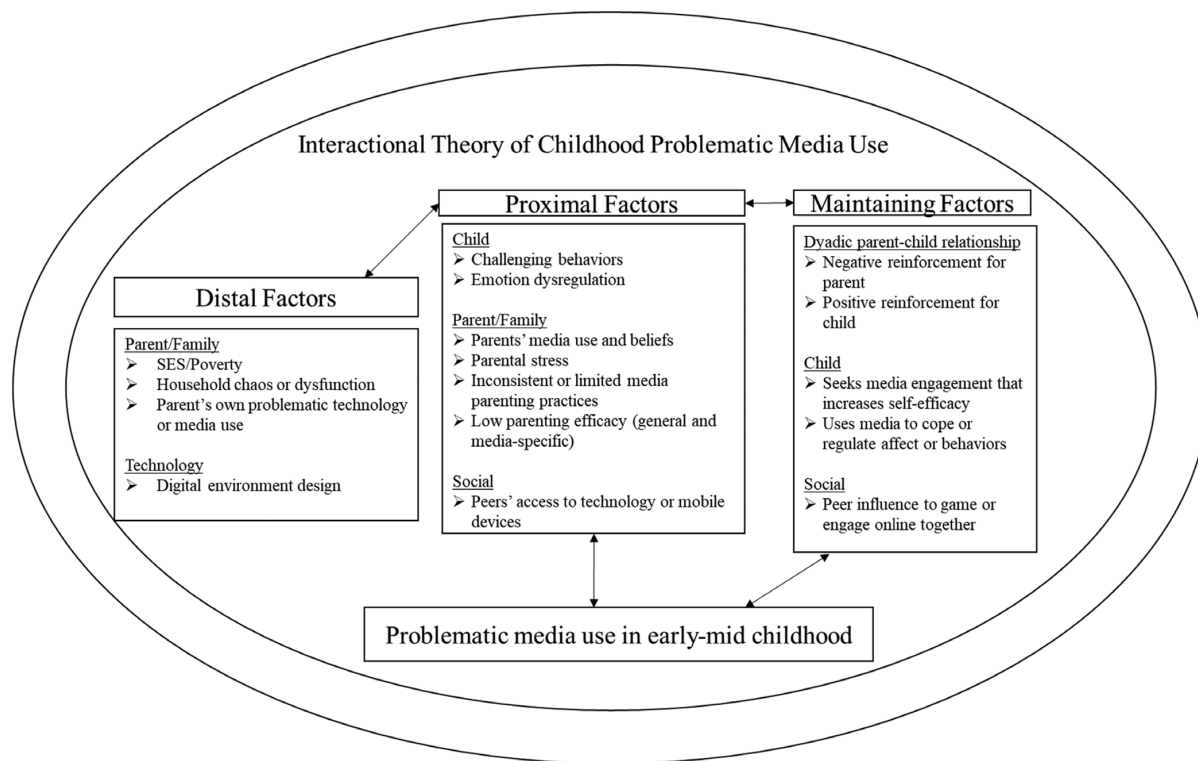


Figure 2. Interactional Theory of Childhood Problematic Media Use (Domoff et al., 2020)

The ITC model delineates distal and proximal factors believed to influence the development of problematic media use in early childhood, highlighting maintaining factors that could serve as intervention targets. Drawing from Bronfenbrenner’s bioecological model, this framework underscores the complexity of a child's problematic media use, shaped by various factors such as family dynamics, peer interactions, and technology features, emphasizing the importance of understanding how children interact with their environment (Domoff et al., 2020). Within the proximal factors influencing problematic screen media use, parent/family factors play a crucial role. These factors encompass various aspects, including parents' own media use habits and beliefs, levels of parental stress, consistency or lack thereof in media parenting practices, and their perceived effectiveness in parenting, both in general and specifically related to screen media. This was an important step towards conceptualizing this phenomenon within the

developmental context. However, to date, no framework has purported to examine this construct across development.

As we have done in the current studies, it is also important to consider parents' perception of alignment or discrepancy in perspective between themselves and their child, as this can significantly influence these proximal factors and contribute to the maintenance of problematic screen media use behaviours. When parents and children are not attuned to each other's viewpoints regarding screen media use, it can lead to breakdowns in communication, ineffective implementation of strategies to manage screen time, and heightened frustration for both parties involved. This misattunement underscores the potential importance of addressing parent-child alignment in perspective as a crucial component in interventions to mitigate problematic media use.

This developmental psychopathology approach differs from the focus on adolescents and adults, where research and clinical diagnoses (e.g., Gaming Disorder in the ICD-11) primarily emphasize addictive behaviours related to gaming and social media. Among adolescents, the Interaction of Person-Affect-Cognition-Execution (I-PACE) model, developed by Brand et al. (2016), has emerged as a leading theoretical framework for understanding specific and generalized internet-use disorders (Figure 3). It suggests that individual characteristics such as personality traits, early childhood experiences, social cognition, psychopathology, and cognitive responses to situations contribute to the origin of internet use disorders. Notably, executive function, inhibitory control, and decision-making are also considered, with difficulties in these areas increasing the risk of developing addictive usage patterns. However, this model and other existing models in adolescence overlook the developmental perspective and fail to account for parent and family factors.

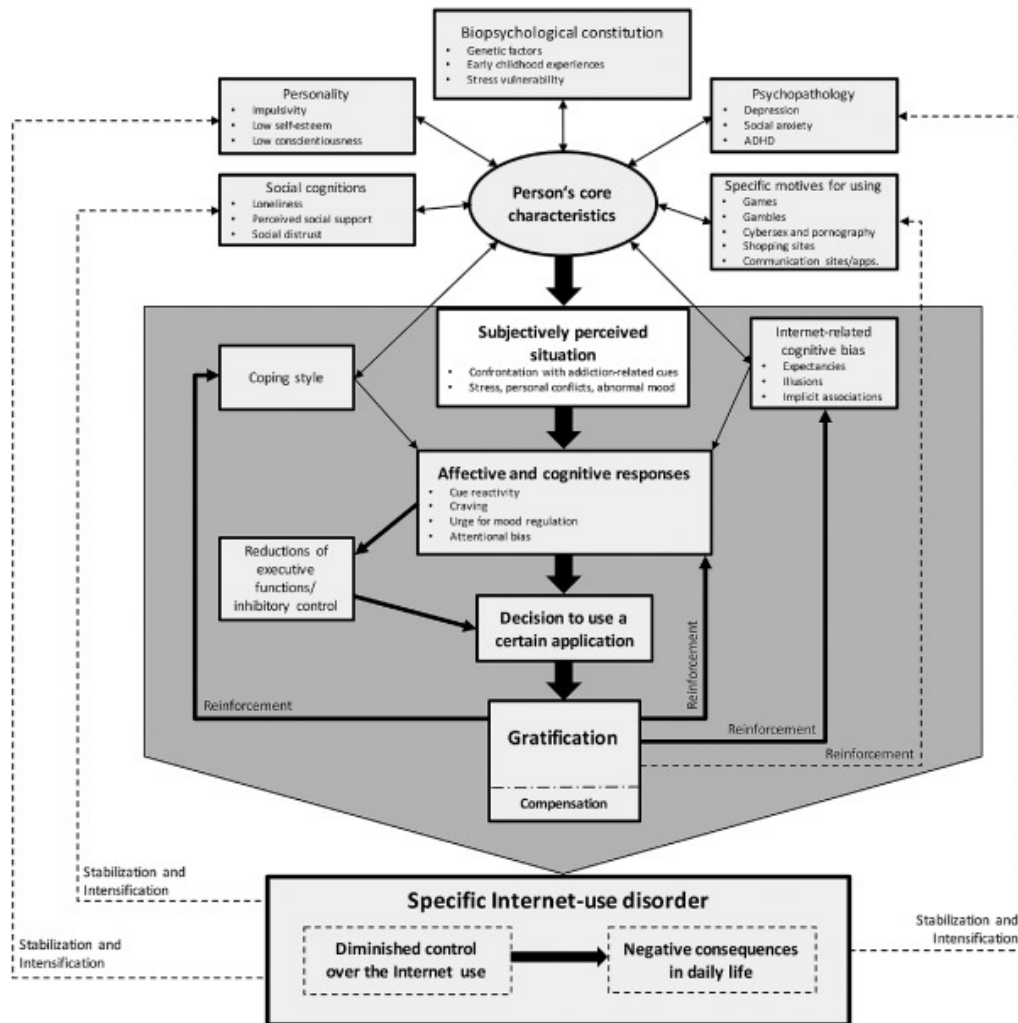


Figure 3. I-PACE model for Specific Internet-use disorder (Brand et al., 2016)

A developmental psychopathology approach proves particularly useful in understanding behaviour across development, including adolescence, by comprehensively considering the young person within the family context and accounting for factors related to parents. The consideration of parent cognitions is a valuable addition to this framework of PMU. Indeed, findings from these studies suggest that existing theoretical frameworks of PMU may need refinement to adequately capture the nuanced complexities observed across developmental stages and within at-risk populations. Additionally, while current theories draw from developmental

psychopathology frameworks, there is a need for a more nuanced understanding that accounts for the unique challenges faced by children with attentional difficulties..

Clinical Implications

In clinical practice, addressing challenges related to screen media use and guiding parents on effective strategies is a recurring topic of concern, irrespective of whether their child has attention difficulties or not (Hale et al., 2018). Most notably, identifying groups of parents who report a discrepancy in perspective when asked to consider their child's perspective on PMU, as well as those who do not, offers a unique opportunity for refining intervention. This finding underscores the importance of tailoring interventions to address the nuanced interplay between parental perceptions and how they perceive their child's beliefs. One notable clinical implication of this finding is the need for interventions that acknowledge and address the potential gap between parental beliefs and the child's actual perspective. Supporting parents to reflect upon and consider their child's perspective will allow parents and clinicians to intervene appropriately. For example, if a parent identifies that they are more concerned than their child, interventions should also aim to bridge the gap between parental perceptions and the child's actual beliefs through psychoeducation, prior to engaging in problem-solving and skill-building exercises. In a parenting group context, this might involve supporting parents to work with their children to enhance their awareness of the potential consequences of screen media use and then develop effective self-regulation skills that can empower them to make healthier choices independently. On the other hand, if a parent identifies that their child's views are not different from their own (e.g., they are both concerned) or that the alignment of their perspectives varies across contexts (e.g., type of device or platform, attention-related factors), then less time might be spent on

building a shared understanding of the problem, and skill development and problem solving might be prioritized.

It is also important to recognize that parents may not accurately assess their child's perspective, which could lead to a mismatch in the intervention approach. However, by recognizing and validating the possibility of divergent viewpoints within the family system, clinicians can facilitate open and honest communication, fostering a collaborative approach to problem-solving. This may involve engaging both parents and children in discussions aimed at exploring their respective beliefs and experiences related to screen media use, with the goal of achieving better parent-child attunement. Clinicians should be mindful of the potential impact of discrepancies in parental beliefs on parent-child relationships and family dynamics. Parents who perceive a disconnect between their own beliefs and their child's may experience feelings of frustration or helplessness, which can strain parent-child interactions and become barriers to intervention. Addressing these emotional responses and providing parents with support and guidance can help mitigate potential conflicts and promote positive family functioning.

These studies also highlight the importance of considering PMU in children with attentional difficulties. Specifically, we found that individuals diagnosed with ADHD are particularly susceptible to PMU, and perhaps to a lesser extent, those with early neurological risk and cooccurring attentional problems. This is important for clinicians to consider, as incorporating assessments of media use habits into routine clinical evaluations may be of particular benefit to these populations, enabling early identification and intervention to mitigate potential adverse outcomes. The qualitative component of the study also provides invaluable insights into parental perceptions of screen media use in children with ADHD, shedding light on both the positive and negative aspects as perceived by parents, as well as the interplay between

screen media and ADHD. Understanding these perspectives is crucial for tailoring interventions to address specific concerns raised by parents while also recognizing the inherent complexities associated with ADHD symptoms and developmental factors.

Limitations and Future Directions

These findings should be viewed with certain limitations in mind, as well as avenues for future research. Considering the characteristics of our study participants is important for a comprehensive interpretation of our findings. It's worth noting a disparity in sample sizes between the community and clinical samples. While smaller sample sizes are typically expected in clinical research, future studies would benefit from investigating these phenomena in clinical populations with larger sample sizes. In particular, our study included an early neurological risk sample intended to represent a transdiagnostic, heterogeneous group of children with diverse medical and psychological presentations. However, in future research, deliberate recruitment based on specific patient characteristics (such as medical diagnosis, cognitive/ intellectual functioning, co-occurring attention, intellectual, or learning diagnoses) may yield valuable insights and guide specific medical/neurodevelopmental clinical follow up programs. This approach would enable a more nuanced exploration of whether specific child attributes (e.g., attention, emotional regulation, cognition) are pertinent to the development of PMU.

Additionally, the differences in parent characteristics between our community and clinical samples, particularly in caregiver level of education, highlight a potential confounding factor that may influence our understanding of problematic media use and parental cognitions. While similarities were observed in parent age, relationship to the child, and child race/ethnicity across the samples, a notable contrast emerged in the proportion of parents with a college or university education, with a significantly higher percentage in the clinical samples compared to the

community sample. Research suggests that parental education level can impact parental attitudes and behaviours regarding media use, potentially influencing their ability to recognize and address problematic screen time behaviours in their children. This aligns well with the distal factors included in Domoff's ITP model, whereby socioeconomic status is linked to the development of PMU (Domoff et al., 2020). Parent characteristics, including education level, have been shown to influence parental cognitions and insight into their child's behaviour. Therefore, future research should explore how these differences in parent characteristics shape parental perceptions of screen media and inform parental mediation strategies to mitigate the adverse effects of problematic media use.

Furthermore, it would have been advantageous to gather information from the parents who completed the questionnaires regarding their own attentional profile, including whether they experience difficulties with attention or have received a diagnosis of ADHD. This is particularly pertinent in the context of children with ADHD, as ADHD is widely recognized as highly heritable, with estimates suggesting heritability rates of up to 80% (Grimm et al., 2020). Currently, it remains unclear how parental ADHD impacts problematic media use (PMU); however, broader research indicates potential implications. Therefore, investigating parental ADHD as a variable in future studies on parental mediation within the context of ADHD would be both intriguing and essential. If parental ADHD is identified as a significant factor in understanding PMU, this insight could substantially inform interventions tailored for parents with ADHD. Moreover, exploring whether having a parent with ADHD influences their cognition about PMU and their perceived alignment with their child's perspective could offer valuable insights.

This research was grounded within a developmental psychopathology framework. While there are many advantages to this dimensional and dynamic conceptualization of PMU, current models of PMU tend to prioritize individual experiences and characteristics while neglecting the broader societal and cultural contexts in which children and youth operate. They often overlook the pervasive impact of social media culture, which plays a significant role in shaping norms, behaviours, and perceptions across diverse populations. By focusing narrowly on individual traits and behaviours, we fail to capture how societal structures, cultural expectations, and digital environments influence and shape the experiences and outcomes of individuals within larger social contexts. Although Domoff's ITC model (2020) begins to consider some of these broader factors (e.g., design of technology, social factors), this research did not explicitly consider the impact of culture and context on PMU. This remains a large gap in our empirical understanding. This research also focused specifically on the construct of problematic media use. Of course, there are also many advantages to screen media and many children who do not experience negative impacts from their screen use. It will be crucial for future research endeavours to also explore protective factors more thoroughly.

Last, future research focused on developing and administering a youth-perspective version of the Problematic Media Use Measure (PMUM) would be beneficial to gain a more comprehensive understanding of problematic media use from children's and adolescents' viewpoints. In the current study, we relied only on parent-reported data regarding problematic media use in this study. While this is in line with prior research on PMU in children and is typical for questionnaires of developmental psychopathology (e.g., ADHD), conducting semi-structured interviews directly with children and youth on these topics would provide rich qualitative data and deeper insights into their perceptions and experiences. Currently, there is a

paucity of information regarding problematic media use and related variables from the perspective of youth with ADHD and other attention-related concerns. Exploring these perspectives could yield valuable insights into the unique challenges and needs of these populations, informing more targeted interventions and support strategies.

Conclusion

Understanding screen media use in children and youth is essential for safeguarding their physical and mental well-being in today's digital age. By studying its patterns and impacts, we can develop strategies to promote healthier media habits and support children's overall development. The overarching goals of this research were to use parent cognitions to extend our understanding of how attention difficulties interface with PMU across various development and how parents understand PMU when asked to consider their child's perspective. Contrasting patterns of problematic media use were observed between clinical groups, with children with ADHD showing higher levels of PMU compared to those with early neurological risk and the neurotypical group. When asked to reflect on their child's perspective about screen media use, four groups emerged with most parents reporting no discrepancy between their own and their child's perspectives on PMU. However, a portion of parents perceived themselves as either more or less concerned than their child. Similar patterns were observed in the early neurological risk sample, while parents in the ADHD sample mainly fell into groups without discrepancy or where parents were more concerned than their child. Qualitative interviews with parents highlighted the influence of child factors, such as temperament, age and ADHD symptoms, on perceptions of screen media use.

Overall, the findings contribute to our understanding of PMU in at-risk populations and highlight the need for further research to explore parent cognitions and child-reported

perspectives. This research emphasizes the need for tailored interventions that consider both parent and child perspectives to address PMU effectively. While the present research was developed from within a developmental psychopathology framework, we hope that it contributes to the growing voices urging thoughtfulness and care with the way in which young people's screen media use research is formulated and discussed. Important questions remain that deserve ongoing research efforts and need to be appropriately contextualized in the behaviours, processes, and outcomes that matter, particularly when supporting children with attentional difficulties in navigating screen media use.

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Appendices

Appendix A: Participant demographics form

Please fill out this questionnaire as completely as you can about you and your child. You may skip any questions that you do not feel comfortable answering or are unable to answer.

The definition of a caregiver means an individual(s) who is/are looking after a child's daily basic needs and ensure that they are safe and healthy.

We understand that families may come in all shapes and sizes. Kindly please reflect on your child's caregiver(s) and complete the following questions as it best fits your family structure.

Caregiver filling out this form: (e.g., mother, father, step-parent, grandparent, aunt/uncle)

Questions about your family

How many caregivers does your child live with?

- Two caregivers
- One caregiver
- Other; Please specify: _____

Please describe your living arrangement with your child (e.g., child lives with me full time, lives with me every other week, on weekends, etc.): _____

Your current age: _____

Your highest level of education completed:

- Less than 7th grade
- Junior high/middle school (9th grade)
- Partial high school (10th or 11th grade)
- High school graduate
- Partial college/university (at least one year)
- College/university education
- Graduate/professional degree
- Would rather not say

Your employment status:

- Not currently employed
- Part-time
- Full-time

Is there another caregiver: Y or N

Please specify other caregiver relation TO CHILD (e.g., mother, father, grandparent, aunt, uncle): _____

Please specify YOUR relation to other caregiver (e.g., husband, wife, common-law partner, ex-spouse, mother, father, brother, sister, etc.): _____

Other caregiver's current age: _____

Other caregiver's highest level of education completed:

- Less than 7th grade
- Junior high/middle school (9th grade)
- Partial high school (10th or 11th grade)
- High school graduate
- Partial college/university (at least one year)
- College/university education
- Graduate/professional degree
- Would rather not say

Other caregiver's employment status:

- Not currently employed
- Part-time
- Full-time

How many siblings does your child have?

- None
- 1
- 2
- 3
- 4
- 5
- More than 5

Where does your child rank in birth order (1st, 2nd, etc.)? _____

Is the primary language (strongest/main language) at home English?

- Yes
- No

Primary language spoken at home: _____

Is English your child's first language (first language the child learned)?

- Yes
- No

What is your child's first language? _____

Does your child have any diagnosed medical or neurodevelopmental diagnoses? Please check all that apply:

___ Attention Deficit Hyperactivity Disorder (ADHD)

___ Learning Disability (LD)

___ Intellectual Disability (ID)

___ Autism Spectrum Disorder (Swanson et al.)

___ Tourette's or other tic disorders

___ Stroke

___ Epilepsy

___ Diabetes

___ Heart/Cardiac Condition (Please specify: _____)

___ Thyroid Condition

___ Cancer (Please specify: _____)

___ Premature Birth

___ Fetal Alcohol Spectrum Disorder (FASD)

___ Traumatic Brain Injury

___ Psychosis

___ Anxiety

___ Obsessive Compulsive Disorder (OCD)

___ Depression

___ Substance Use Disorder

___ Oppositional Defiant Disorder

___ Conduct Disorder

___ Other (Please specify: _____)

If your child has been diagnosed with ADHD, please answer the following questions:

What type of health professional diagnosed your child with ADHD?

- _____ Family doctor
- _____ Pediatrician
- _____ Psychologist
- _____ Psychiatrist
- _____ Other (Please specify: _____)

At what age was your child diagnosed with ADHD? _____

At what age did you notice that your child had difficulties with attention, impulsivity and/or hyperactivity? _____

Does your child have difficulties with attention, impulsivity and/or hyperactivity in the following settings:

- _____ home
- _____ school
- _____ extra-curricular activities
- _____ socially with peers
- _____ other: (please specify: _____)

Does your child's difficulties with attention, impulsivity and/or hyperactivity interfere in the following life domains:

	Not at all	Only a little	A medium amount	A great deal
HOME LIFE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FRIENDSHIPS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CLASSROOM LEARNING	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LEISURE ACTIVITIES	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Does your child take any prescription medications? Please list any medication(s) that your child is currently taking: _____

What is your child's sex (assigned at birth)?

- Female
- Male
- Intersex

What is your child's MONTH of birth? _____

What is your child's YEAR of birth? _____

How old is your child? _____

Is your child adopted?

- Yes
- No
- Unknown/Prefer not to answer

In what country was your child BORN? _____

In what country does your child CURRENTLY live? _____

In what city and province/state does your child CURRENTLY live? _____

What is your child's ethnicity (Ethnicity is defined as an identity based on shared attributes, such as traditions, ancestry, language, history, society, culture, nation, religion, or social treatment.)?

What race does your child best identify with (Race is defined as a concept used to group people according to various factors including ancestral background and social identity.)?

On average, my child's current grades in academic subjects are:

- A's (exceeds expectations)
- B's (meets expectations)
- C's (working towards meeting expectations)
- D's (is not meeting expectations)

Does your child receive formalized accommodations or additional support at school?

- Yes; Please describe: _____
- No

Appendix B: Swanson, Nolan, and Pelham Rating Scale – Fourth Version (SNAP-IV)

For each item, check the column which best describes this child.	Not at all	Just a little	Quite a bit	Very much
1. Often fails to give close attention to details or makes careless mistakes in schoolwork or tasks				
2. Often has difficulty sustaining attention in tasks or play activities				
3. Often does not seem to listen when spoken to directly				
4. Often does not follow through on instructions and fails to finish schoolwork, chores, or duties				
5. Often has difficulty organizing tasks and activities				
6. Often avoids, dislikes, or reluctantly engages in tasks requiring sustained mental effort				
7. Often loses things necessary for activities (e.g., toys, school assignments, pencils, or books)				
8. Often is distracted by extraneous stimuli				
9. Often is forgetful in daily activities				
10. Often fidgets with hands or feet or squirms in seat				
11. Often leaves seat in classroom or in other situations in which remaining seated is expected				
12. Often runs about or climbs excessively in situations in which it is inappropriate				
13. Often has difficulty playing or engaging in leisure activities quietly				
14. Often is "on the go" or often acts as if "driven by a motor"				
15. Often talks excessively				
16. Often blurts out answers before questions have been completed				
17. Often has difficulty awaiting turn				
18. Often interrupts or intrudes on others (e.g. butts into conversations/ games)				

Appendix C

Table S1. *Psychological and medical diagnoses for participants in the clinical groups*

Variable	Sample	
	ADHD (n=66)	Early neurological risk (n=65)
Psychological diagnosis		
ADHD	100%	35.4%
Learning Disability	33.3%	24.6%
Intellectual Disability	4.5%	21.5%
Autism Spectrum Disorder	9.1%	24.6%
Tourette Syndrome/Tic Disorder	1.5%	-
Fetal Alcohol Spectrum Disorder	3%	-
Anxiety disorder	33.8%	18.5%
OCD	6.2%	4.6%
Depression	7.7%	1.5%
ODD/Conduct disorder	1.5%	1.5%
Eating disorder	1.5%	-
PTSD	1.5%	-
Developmental coordination disorder	4.5%	-
Sensory processing disorder	1.5%	-
Medical diagnosis		
Stroke	-	16.9%
Epilepsy	-	7.7%
Congenital Heart Disease (CHD)	-	20%
Hypoxic Ischemic Encephalopathy	-	1.5%
Thyroid disease	-	1.5%
Cancer	-	1.5%
Premature birth	9.1%	13.8%
Traumatic brain injury	-	16.9%
Cerebral palsy	-	3.1%
Hydrocephalus	-	1.5%
Moyamoya disease	-	1.5%
Loeys-Dietz syndrome	-	1.5%
Kidney disease	-	1.5%

Appendix D: PMUM – Full Scale (27 items)

We want to know about how your child uses screen media and your experiences with your child’s media use. When we say screen media, we mean any type of media that your child uses that has a screen, such as:

- | | |
|---------------|------------------------|
| --television | --handheld video games |
| --video games | --laptops |
| --tablets | --computers |
| --smartphones | |

We will use the shortened term “SCREEN MEDIA” to refer to ANY screen media device or format that your child uses. When you see the term “SCREEN MEDIA” in the following questions, think of ANY type of screen media or devices that your child uses.

For each statement, please select (circle) the option that is true for your child in the past month.

	Never	Rarely	Sometimes	Very Often	Always
1. My child lies in order to use screen media.	1	2	3	4	5
2. My child uses screen media to feel better.	1	2	3	4	5
3. My child loses sleep due to screen media use.	1	2	3	4	5
4. My child uses screen media for increasing amounts of time.	1	2	3	4	5
5. My child sneaks using screen media.	1	2	3	4	5
6. My child lies about doing chores or schoolwork in order to use screen media.	1	2	3	4	5
7. My child feels better when they use screen media.	1	2	3	4	5
8. Screen media is all that my child seems to think about.	1	2	3	4	5
9. My child’s screen media use negatively affects their friendships.	1	2	3	4	5
<i>Continue on next page.</i>					

	Never	Rarely	Sometimes	Very Often	Always
10. My child attempts to use screen media for increasing amounts of time	1	2	3	4	5
11. It is hard for my child to stop using screen media.	1	2	3	4	5
12. When my child has had a bad day, screen media seems to be the only thing that helps them feel better.	1	2	3	4	5
13. There is nothing my child enjoys as much as screen media.	1	2	3	4	5
14. My child is always thinking about using screen media.	1	2	3	4	5
15. My child's screen media use causes problems for the family.	1	2	3	4	5
16. The amount of time my child wants to use screen media keeps increasing.	1	2	3	4	5
17. The first thing my child asks to do when they come home from school is to use screen media.	1	2	3	4	5
18. My child would find life boring without screen media.	1	2	3	4	5
19. My child gets upset when they cannot use screen media.	1	2	3	4	5
20. Screen media is the only thing that seems to motivate my child.	1	2	3	4	5
21. Problems occur for our family when my child cannot use screen media.	1	2	3	4	5
22. It is really difficult to get my child to stop using screen media.	1	2	3	4	5

23. My child becomes angry when they cannot use screen media.	1	2	3	4	5
24. Life would be easier if my child was not so attached to screen media.	1	2	3	4	5
25. It is increasingly difficult to pull my child away from screen media.	1	2	3	4	5
26. My child becomes frustrated when he/she cannot use screen media.	1	2	3	4	5
27. My child's screen media use interferes with family activities.	1	2	3	4	5

Appendix E: Parent Report Child Perspective on Screen Media Use



Sometimes parents and children have different ideas and perceptions of a situation (e.g., how things are going). There are lots of reasons why this might be. Our ability to recognize and to have a clear understanding of a situation develops as we get older.

You previously rated YOUR perception of your child’s screen media use. Now we would like you to think about your CHILD’S perception.

For each sentence, please select **what you believe your child would answer**, based on their behaviour over the past month.

1. I lose sleep due to my screen media use.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

2. I hide my screen media use from my parents.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

3. Screen media is all that I seem to think about.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

4. My screen media use hurts my friendships.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

5. It is hard for me to stop using screen media.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

6. When I have a bad day, screen media seems to be the only thing that helps me feel better.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

7. I am doing poorly in school (not doing well in classes) because of my screen media use.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

8. The amount of time I want to use screen media keeps increasing.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

9. Screen media is the only thing that motivates me.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

10. I become frustrated when I cannot use screen media.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

11. My screen media use gets in the way of family activities.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

12. I lie to my parents so that I can use screen media.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

13. I use screen media to feel better when I am feeling bad.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

14. I try to use screen media for more and more time.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

15. There is nothing I enjoy as much as screen media.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

16. My screen media use causes problems for my family.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

17. The first thing I think about when I get home from school is using screen media.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

18. I get upset when I can't use screen media

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

19. It is hard to get me to stop using screen media.

1	2	3	4	5
Never	Rarely	Sometimes	Very often	Always

Appendix F: Screen Media Use and Impact Questionnaire

Child Screen Media Use

Please answer the following questions about the different screen media devices that YOUR CHILD uses.

Select all of the screen media devices that your child has access to.

- a smartphone (e.g., iPhone, Android).
- a laptop computer
- a desktop computer
- an iPad, iPod Touch or similar tablet device
- a handheld videogame player like a Gameboy, PSP, or Nintendo Switch;
- a videogame console like xbox or playstation
- a television (including smart TV)
- Other; Please specify _____

Does your child have access to screen media devices in their bedroom DURING THE DAY? Y/N

Does your child have access to screen media devices in their bedroom AT NIGHT? Y/N

On average, how many hours does your child spend using screen media devices per day:

- On a weekday: _____
- On a weekend: _____

Roughly, what percent of your child's screen media use is for school/homework? _____%

Parent Screen Media Use

Please answer the following questions about the different screen media devices that YOU USE:

Select all of the screen media devices that you use.

- a smartphone (e.g., iPhone, Android).
- a laptop computer
- a desktop computer
- an iPad, iPod Touch or similar tablet device
- a handheld videogame player like a Gameboy, PSP, or Nintendo Switch;
- a videogame console like xbox or playstation
- a television (including smart TV)
- Other; Please specify _____

Rate the degree of NEGATIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

How does your child's screen media use impact them in the domain of MENTAL HEALTH?

Rate the degree of POSITIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

Rate the degree of NEGATIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

How does your child's screen media use impact them in the domain of PHYSICAL HEALTH AND EXERCISE?

Rate the degree of POSITIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

Rate the degree of NEGATIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

How does your child's screen media use impact them in the domain of SLEEP?

Rate the degree of POSITIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

Rate the degree of NEGATIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

How does your child's screen media use impact them in the domain of PEERS/SOCIAL LIFE?

Rate the degree of POSITIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

Rate the degree of NEGATIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

How does your child's screen media use impact them in the domain of RECREATION AND HOBBIES?

Rate the degree of POSITIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

Rate the degree of NEGATIVE impact

None	A little	Somewhat	Moderate	A lot
1	2	3	4	5

Parental stress about child screen media use

Parenting around screen media use can also impact parents. Thinking about the past SIX months, please rate how much you agree with the following statements:

My child's overall use of screen media is concerning to me.

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

My child's screen media use is manageable, and any problems with it can be easily solved. (R)

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

I wish I could change the AMOUNT my child uses screen media devices.

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

I wish I could change WHAT my child is doing when they are using screen media devices.

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

Trying to manage my child's screen media use causes me stress.

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

Other parents are better able to manage their children's screen media use.

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

I wish I could reduce the amount of time my child uses screen media devices.

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

Parenting would be easier if my child's screen media use was different.

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

I spend a lot of time worrying about my child's screen media use.

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

I meet my own personal expectations for parenting around my child's screen media use. (R)

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

I know what works for my child to help them manage their screen media use. (R)

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

My child's screen media use negatively affects our relationship.

Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Slightly Agree 4	Moderately Agree 5	Strongly Agree 6
---------------------------	-----------------------------	---------------------------	------------------------	--------------------------	------------------------

Appendix G

Table S2. Demographic information and psychological/medical diagnoses for participants in the matched sample (n=36 per group)

Variable	Sample		
	Community (n=36)	ADHD (n=36)	Early neurological risk (n=36)
Age of child (years)	9.97 ± 2.34	10.03 ± 2.36	9.75 ± 2.33
Range	6-16	6-16	6-16
Sex of child			
Female	25%	25%	25%
Male	75%	75%	75%
Child race/ethnicity/cultural identity			
White/Caucasian	75%	75%	72.2%
Black/African American	5.6%	-	2.8%
Indigenous	2.8%	11.1%	-
American	2.8%	-	-
Canadian	-	30.6%	19.4%
French Canadian	-	8.3%	-
Asian	-	8.3%	13.9%
Hispanic/Latino	16.7%	5.6%	2.8%
Middle Eastern	2.8%	-	-
South Asian	-	-	2.8%
European	2.8%	19.4%	22.2%
Jewish	-	2.8%	-
Hawaiian	-	-	-
Biracial	2.8%	8.3%	5.6%
Multiracial	-	-	-
Prefer not to say	-	2.8%	2.8%
Caregiver completing questionnaire			
Mother	69.4%	88.9%	91.7%
Father	16.7%	8.3%	8.3%
Grandparent	8.3%	2.8%	-
Step-parent	5.6%	-	-
Legal guardian	-	-	-

Other	-	-	-
Age of caregiver (years)	38.25 ± 10.84	45.19 ± 6.22	42.22 ± 5.91
Range	25-62	32-64	31-56
Caregiver level of education completed			
Did not complete high school	5.6%	-	-
High school graduate	16.7%	-	5.6%
Partial college/university (at least one year)	36.1%	-	5.6%
College/university degree	27.8%	58.3%	72.2%
Graduate/professional degree	13.9%	41.7%	13.9%
Would rather not say	-	-	2.8%
Psychological diagnosis			
ADHD	-	100%	33.3%
Learning Disability	-	25%	27.8%
Intellectual Disability	-	2.8%	25%
Autism Spectrum Disorder	-	8.3%	30.6%
Tourette Syndrome/Tic Disorder	-	2.8%	-
Fetal Alcohol Spectrum Disorder	-	2.8%	-
Anxiety disorder	-	27.8%	13.9%
OCD	-	8.3%	2.8%
Depression	-	2.8%	-
ODD/Conduct disorder	-	2.8%	-
Eating disorder	-	-	-
PTSD	-	2.8%	-
Developmental coordination disorder	-	5.6%	-
Sensory processing disorder	-	-	-
Medical diagnosis			
Stroke	-	-	16.7%
Epilepsy	-	-	8.3%
Congenital Heart Disease	-	-	19.4%
Hypoxic Ischemic Encephalopathy	-	-	2.8%
Thyroid disease	-	-	2.8%
Cancer	-	-	2.8%
Premature birth	-	8.3%	11.1%
Traumatic brain injury	-	-	11.1%

Cerebral palsy	-	-	5.6%
Hydrocephalus	-	-	2.8%
Moyamoya disease	-	-	2.8%
Loeys-Dietz syndrome	-	-	2.8%
Kidney disease	-	-	-

Note. Presented as Mean \pm SD where relevant

Appendix H: Descriptive Statistics of PMUM for CFA

Table S3. *Descriptive Statistic of PMUM items in full sample (N= 386)*

Item	<i>M</i>	<i>SD</i>	<i>Skewness</i>	<i>Kurtosis</i>
1. My child lies in order to use screen media.	1.82	1.01	1.01	0.18
5. My child sneaks using screen media.	2.71	1.06	-0.13	-0.58
6. My child lies about doing chores or schoolwork in order to use screen media.	2.35	1.16	0.39	-0.85
2. My child uses screen media to feel better.	2.83	1.21	-0.03	-0.86
7. My child feels better when they use screen media.	2.02	1.15	0.79	-0.49
12. When my child has had a bad day, screen media seems to be the only thing that helps them feel better.	1.90	1.12	1.12	0.37
4. My child uses screen media for increasing amounts of time.	2.91	1.05	-0.14	-0.19
10. My child attempts to use screen media for increasing amounts of time	2.50	1.24	0.3	-0.97
16. The amount of time my child wants to use screen media keeps increasing.	1.74	0.94	1.18	0.81
8. Screen media is all that my child seems to think about.	2.67	1.14	0.00	-0.80
14. My child is always thinking about using screen media.	2.53	1.21	0.24	-0.92
17. The first thing my child asks to do when they come home from school is to use screen media.	2.60	1.12	0.09	-0.70
11. It is hard for my child to stop using screen media.	2.52	1.22	0.23	-1.00
22. It is really difficult to get my child to stop using screen media.	2.59	1.22	0.2	-0.96
25. It is increasingly difficult to pull my child away from screen media.	1.84	1.02	0.97	-0.02
13. There is nothing my child enjoys as much as screen media.	2.51	1.15	0.15	-0.90
18. My child would find life boring without screen media.	2.82	1.28	0.02	-1.05
20. Screen media is the only thing that seems to motivate my child.	3.05	1.31	-0.19	-1.06

19. My child gets upset when they cannot use screen media.	2.66	1.26	0.24	-0.90
23. My child becomes angry when they cannot use screen media.	2.30	1.19	0.53	-0.67
26. My child becomes frustrated when he/she cannot use screen media.	1.96	1.12	1.05	0.25
3. My child loses sleep due to screen media use.	2.42	1.20	0.36	-0.86
9. My child's screen media use negatively affects their friendships.	2.25	1.20	0.64	-0.57
15. My child's screen media use causes problems for the family.	2.34	1.32	0.45	-0.93
21. Problems occur for our family when my child cannot use screen media.	2.34	1.20	0.53	-0.65
24. Life would be easier if my child was not so attached to screen media.	2.42	1.20	0.47	-0.65
27. My child's screen media use interferes with family activities.	2.00	1.14	0.93	-0.05

Appendix I: Interpretation of Higher Order Eight-Factor Solution

Table S4. *Higher Order Eight-Factor Analysis (ages 6-18) n=387*

Latent Construct PMUM Item	B	Uniqueness
General Factor: Problematic Screen Media Use		
Deception	.741	.450
Escape	.873	.238
Tolerance	.909	.173
Preoccupation	.959	.081
Unsuccessful Control	.968	.063
Loss of Interest	.973	.054
Withdrawal	.937	.123
Psychosocial Impairment	.898	.193
Deception		
1. My child lies in order to use screen media.	.784	.385
5. My child sneaks using screen media.	.848	.282
6. My child lies about doing chores or schoolwork in order to use screen media.	.815	.325
Escape		
2. My child uses screen media to feel better.	.802	.357
7. My child feels better when they use screen media.	.815	.336
12. When my child has had a bad day, screen media seems to be the only thing that helps them feel better.	.879	.227
Tolerance		
4. My child uses screen media for increasing amounts of time.	.844	.287
10. My child attempts to use screen media for increasing amounts of time	.815	.278
16. The amount of time my child wants to use screen media keeps increasing.	.879	.231
Preoccupation		

8. Screen media is all that my child seems to think about.	.844	.218
14. My child is always thinking about using screen media.	.910	.172
17. The first thing my child asks to do when they come home from school is to use screen media.	.809	.346

Unsuccessful Control

11. It is hard for my child to stop using screen media.	.851	.276
22. It is really difficult to get my child to stop using screen media.	.910	.160
25. It is increasingly difficult to pull my child away from screen media.	.809	.208

Loss of Interest

13. There is nothing my child enjoys as much as screen media.	.828	.315
18. My child would find life boring without screen media.	.809	.346
20. Screen media is the only thing that seems to motivate my child.	.880	.226

Withdrawal

19. My child gets upset when they cannot use screen media.	.899	.192
23. My child becomes angry when they cannot use screen media.	.891	.207
26. My child becomes frustrated when he/she cannot use screen media.	.925	.145

Psychosocial Impairment

3. My child loses sleep due to screen media use.	.656	.569
9. My child's screen media use negatively affects their friendships.	.676	.543
15. My child's screen media use causes problems for the family.	.818	.331
21. Problems occur for our family when my child cannot use screen media.	.857	.265
24. Life would be easier if my child was not so attached to screen media.	.824	.321
27. My child's screen media use interferes with family activities.	.877	.232

Note. All items load significantly onto the respective latent construct ($p < .05$); B: Standardized Factor Loadings; Uniqueness: proportion of variance explained

Appendix J: Normality Testing in Matched Samples

Table S5.

Means, standard deviations, skewness and kurtosis indices, and results of Shapiro-Wilks and Levene's tests for all variables within the matched sample (N=36 per group).

	Mean (SD)	Skewness	Kurtosis	Shapiro-Wilks	Levene's test
PMUM total					7.18*
Community	69.17 (25.8)	.12	-.61	.97	
ADHD	94.00 (16.1)	.06	.06	.99	
Neurological	69.81 (27.7)	.24	-1.0	.96	
Negative impact of screen media on child					2.09
Community	16.36 (5.97)	.15	-.60	.96	
ADHD	20.36 (5.64)	-.77	.01	.94*	
Neurological	17.46 (7.59)	.48	-.58	.95	
Positive impact of screen media on child					2.58
Community	19.86 (6.24)	.45	.23	.98	
ADHD	16.11 (4.41)	.88	1.25	.94*	
Neurological	17.40 (6.13)	.28	-.88	.96	
Child screen media use (daily average)					1.56
Community	4.96 (2.94)	1.05	.61	.91*	
ADHD	4.07 (2.72)	1.72	3.19	.84*	
Neurological	3.65 (2.07)	1.06	.43	.89*	
Parental stress					1.94
Community	34.83 (13.62)	.08	-.14	.94*	
ADHD	51.28 (11.62)	-.68	.06	.94	
Neurological	38.51 (16.13)	.03	-1.12	.95	

Appendix K

Table S6.

Correlations between PMUM domains and child variables in the community sample (N=386), ADHD sample (N=66), and early neurological risk sample (N=65)

	Child Age	SNAP-IV Inattention	SDQ Extern.	Negative Impact	Child Daily Use	Parent Stress
PMUM – Total						
Community	-.06	n/a	n/a	.59*	.25*	.70*
ADHD	.05	n/a	.29*	.65*	.06	.60*
Neurological	.26*	.46*	.56*	.86*	.52*	.86*
Sensitivity Analyses by Age Bands						
6-11 years						
Community (n=168)	.003	n/a	n/a	.61*	.29*	.62*
ADHD (n=20)	.36	n/a	-.03	.77*	.20	.71*
Neurological (n=49)	.27	.32*	.40*	.83*	.42*	.86*
12-14 years						
Community (n=117)	.08	n/a	n/a	.54*	.17	.69*
ADHD (n=29)	.30	n/a	.43*	.72*	.04	.59*
Neurological (n=15)	.08	.82*	.92*	.91*	.75*	.85*
15-18 years						
Community (n=101)	-.12	n/a	n/a	.64*	.31*	.71*
ADHD (n=16)	-.11	n/a	.53*	.39	-.24	.47
Neurological (n=1)	-	-	-	-	-	-

*Note. * signifies a Spearman Correlation significant at the .05 level*

Appendix L: Semi-Structured Interview (Study 2)

Semi-Structured Interview Questions - Interview

Interview Date: _____ Start Time: _____
Interviewer: _____ End Time: _____
Study ID: _____

Introduction: Thank you for agreeing to do this interview with our team. You may remember that you completed a survey about your child’s screen media use a couple of months ago. You completed this survey specifically for your child who has attentional difficulties. We would like you to answer the questions today about this same child.

Today we are going to ask questions regarding your experiences with parenting around your children’s use of screen media. As we do this, I’m going to ask you some questions about your strategies, successes, challenges, and concerns. If there is anything you don’t feel comfortable answering, you can just let me know. Only members of the research team will see your answers. I would like to remind you that the interview will be audio recorded to allow us to document your responses as completely as possible.

We want to know about how your child uses screen media in this study. Screen media refers to devices that have a screen, including: smartphones, handheld video games, laptops, computers, television, video games, tablets. When you hear the term screen media in the following questions, think of ANY type of screen media or devices that your child uses.

*Remind parents of devices they endorsed on questionnaire and re-establish primary device(s).

Most commonly used device: _____

Items:

1. Overall, how would you describe your child’s relationship with screen media?

2. Do you have concerns/worries about your child’s screen media use? (Y/N)
 - a. (If yes) What are your primary concerns/worries? _____
 - b. Would your child agree or disagree with your perspective on their screen media use? Why or why not? _____
3. Do you see positive impacts of screen media use for your child? (Y/N)
 - a. (If yes) What are they? _____
4. Do you have challenges in managing your child’s screen media use (Y/N)
 - a. (If yes) What are they? _____
 - b. What strategies do you use, successful or unsuccessful, to try to manage your child’s technology use? How do they work for you? _____

5. How much time does your child spend on screen media devices on average? _____
approximate # hours per day
 - a. Has that changed as they've gotten older? (Y/N)
 - b. Has what they do on screen media use changed with age? (Y/N) Please describe how it has changed. _____
 - c. Now that your child is XX age, has your degree of concerns about screen media use changed? (Y/N). Please describe. _____
 - d. Have you needed to implement different strategies as your child has gotten older? (Y/N) If yes, please provide examples. _____
6. Do you think your child's difficulties with attention impact how they use screen media? (Y/N) If yes, how so? _____
 - a. Do you think your child would agree or disagree with your perspective on this? (Y/N). Please elaborate. _____
7. Are there unique parenting challenges or approaches regarding screen media use that you consider /use due to your child's attentional abilities? (Y/N). If yes, please provide examples.
 - a. Does your parenting around screen media use differ for your child with attentional difficulties than with other children in your home? (Y/N). Please elaborate.
8. Did your child participate in online learning during the pandemic? (Y/N) – If no, don't ask subsequent questions.
 - a. How did your child do with online learning? _____
 - b. Were they able to manage accessing online learning materials independently? (Y/N) If no, what kind of support did they require?
 - c. Were they able to manage submitting assignments online independently? (Y/N) If no, what kind of and/or how much help did they require?
 - d. Was your child's academic progress differentially impacted during online learning? (Y/N) If yes, please describe.

Thank you very much for participating in this project. The information you provided will be most helpful in understanding how screen media use affects families!