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Reading, screen exposure, and the developing brain in childhood and adolescence: A topical review

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Abstract

Childhood is increasingly unfolding in media environments unlike those that shaped earlier generations. As reading engagement declines and screen exposure expands, an important developmental question emerges: do these experiences place different demands on the developing brain? This topical review examines selected neuroimaging findings on reading and screen exposure in childhood and adolescence, with particular attention to white matter organization and functional connectivity. The literature on reading is comparatively more consistent, linking literacy development to neural systems involved in language, attention, and cognitive control. By contrast, findings on screen exposure are more heterogeneous, partly because screen use encompasses activities that differ in pace, interactivity, and cognitive demand, and partly because much of the available evidence concerns problematic or excessive use rather than ordinary digital experience. Overall, the review suggests that reading and screen exposure should not be treated as equivalent developmental experiences.

Keywords

reading, screen exposure, white matter, functional connectivity, neurodevelopment, childhood, adolescence

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Introduction

Children and adolescents are growing up in environments that are markedly different from those of prior generations. Screen media are deeply embedded in daily life, influencing how youth spend their time, access information, and communicate. The increasing integration of digital media into children's and adolescents' daily lives has raised important questions about how screen-based experiences may relate to neurodevelopment.[1–3] That question becomes more pressing when the rise in screen exposure is viewed alongside the decline in reading reported across many settings. In the United States, for example, Twenge et al.[4] documented a pronounced long-term decline in adolescents' reading of books and magazines, occurring in parallel with increased digital media use. Bone et al.[5] likewise reported a substantial reduction in reading frequency in the U.S. population between 2003 and 2023. Similar patterns have been observed in the United Kingdom, where adolescents report reading less often and taking less pleasure in reading than in previous years.[6,7] Over the same period, children's screen use has continued to rise. In a longitudinal study of 2,179 Australian children, daily screen time increased by 85.9 minutes over a four-year period.[8] In a meta-analysis, Choi et al.[9] found that average daily screen time increased during the COVID-19 period across age groups, including in early childhood.

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From the standpoint of developmental neuroscience, these trends matter because reading and screen exposure do not represent equivalent forms of experience. Reading is acquired through repeated exposure to print, speech, and the kind of sustained attentional engagement that develops gradually over time. It recruits brain systems involved in phonological processing, word recognition, and cognitive control, and recent neuroimaging work has continued to link literacy development to white matter maturation and to the functional integration of reading-related networks.[10,11] Screen exposure, by contrast, is much more variable. It may refer to a range of activities, from passive viewing to texting, gaming, interactive use, or educational use. These experiences are unlikely to place the same demands on attention, language, or self-regulation. This heterogeneity makes the literature difficult to interpret. Recent reviews and longitudinal neuroimaging studies likewise emphasize that different forms of digital media use may relate differently to brain development, and that broad claims based on undifferentiated "screen time" remain difficult to sustain.[3,12]

Some forms of digital media use may be cognitively enriching, whereas others may be associated with reduced language-rich interaction, attentional fragmentation, or different patterns of neural engagement. For that reason, the central issue is not whether screen use is simply "good" or "bad," but how different forms of experience may relate to neurodevelopment, and how these experiences compare with developmental contexts that are already known to support literacy-related brain plasticity.

More broadly, neuroimaging has long played an important role in the evaluation of developmental differences and disorders in childhood, not only as a clinical tool but also as a means of clarifying how developmental trajectories may relate to brain structure and organization.[13–16] In this topical review, we bring together selected neuroimaging findings on reading and screen exposure in childhood and adolescence, with particular attention to white matter organization and functional connectivity. Rather than treating reading or digital media as uniform experiences, we emphasize the heterogeneity of both domains and the interpretive limits of the current evidence. Our aim is not to provide an exhaustive or systematic account of the literature, but to clarify what is currently known, what remains uncertain, and why these questions matter for language, attention, and self-regulation during development.

Because this is a topical rather than systematic review, study selection was purposive and conceptually guided rather than governed by prespecified inclusion and exclusion criteria. Relevant studies were identified through targeted literature searches and through examination of the reference lists of recent systematic reviews and meta-analyses. Priority was given to peer-reviewed neuroimaging studies that were directly relevant to reading or screen-related neurodevelopment, particularly those involving developmental samples, established imaging modalities such as DTI, structural MRI, or fMRI, and longitudinal designs where available. Influential and representative studies were also selected to reflect major methodological and conceptual strands in the field. These considerations were used as flexible selection principles rather than as formal eligibility criteria. Studies involving young adults or problematic media use were included only when they provided relevant contextual evidence and were interpreted separately from ordinary pediatric screen exposure.

Reading and the Developing Brain

Reading does not emerge in the way spoken language does. It depends on prolonged contact with print, repeated engagement with language, and forms of attention that are built gradually through instruction and use. For that reason, literacy is not best conceived as the unfolding of a preformed capacity. Rather, reading acquisition involves a developmental reorganization in which neural systems already involved in vision and spoken language are progressively recruited and functionally reorganized to support literacy.[17]

This is where the neuroimaging literature becomes especially informative. Across studies, reading development has been linked to white matter pathways that are central to language and literacy, particularly the arcuate fasciculus and the superior longitudinal fasciculus.[14,18,19] In a longitudinal diffusion tensor imaging study, Su et al.[20] reported that vocabulary development was related to the structure of the posterior and direct segments of the left arcuate fasciculus. Other work has suggested that weaker reading performance is associated with less favorable white matter characteristics over time, including lower fractional anisotropy values.[21] Studies of structural connectivity have extended this picture by linking reading-related skills to the organization of pathways involved in word reading efficiency, phonemic decoding, and thalamic contributions to reading-related processing.[22,23]

What this literature supports is not a single deterministic account, but a more modest and more plausible conclusion: learning to read appears to coincide with measurable changes in developing neural pathways. Roy et al.,[11] for example, found that gains in reading skill were associated with longitudinal changes in white matter, while also noting that cross-sectional differences in white matter did not straightforwardly predict reading ability. That contrast is important. It suggests that developmental change may tell us more than static comparisons between children. Vandecruys et al.[24] used a longitudinal school-cutoff design and found that white-matter changes across school entry were predominantly related to age-related

maturation rather than specific schooling effects, despite clear schooling effects on early reading and arithmetic skills. This distinction cautions against attributing developmental white-matter change directly to formal instruction.

The broader point is that reading should not be treated merely as an academic outcome. It is also a developmental experience with neural consequences. Reading skill has been associated with the organization and developmental trajectories of white matter pathways involved in reading, including longitudinal changes related to reading proficiency.[25,26] At the same time, the evidence does not justify simplistic causal claims. It does, however, support the view that sustained engagement with print and language forms part of the developmental context within which neural systems relevant to literacy, attention, and control are shaped.

Screen Exposure and the Developing Brain

The diversity of screen-based activities presents an important challenge for interpreting neurodevelopmental findings. Differences in content, pace, interactivity, and cognitive demands need to be considered when evaluating the available evidence.[3] The distinction between reading and screen exposure is therefore conceptual rather than strictly medium-based. In this review, reading refers to sustained engagement with written language, primarily as examined in the literacy studies discussed here, and is not necessarily limited to printed books. Digital reading and e-books may overlap with the broader category of screen exposure. The relevant distinction thus concerns the nature of the activity and its cognitive demands, rather than the device alone.

The screen-exposure literature also varies considerably in methodological quality and evidential weight. A recurrent limitation is the treatment of screen use as a unitary exposure, often operationalized through broad estimates of total screen time despite substantial differences in content, interactivity, social context, and patterns of engagement. This measurement problem is compounded by the predominance of cross-sectional designs, relatively small or selected samples, and frequent reliance on parent-reported measures of media use. Moreover, some of the neuroimaging evidence derives from adolescents or young adults with problematic or addictive patterns of use, populations that cannot be assumed to represent ordinary screen engagement in children. These sources of heterogeneity limit direct comparison across studies and make causal or developmental inferences necessarily cautious. Accordingly, findings from this literature are interpreted here in relation to the specific exposure, age group, study design, and population from which they were derived, rather than as evidence about "screen use" in general. For synthesis, the screen-related evidence is therefore considered across three distinct but complementary evidence streams: (1) pediatric studies of ordinary or broadly measured screen exposure, (2) pediatric studies examining specific media formats or modes of presentation, and (3) contextual evidence from problematic-use populations or young adults. These streams are not treated as equivalent in evidential weight. The first two provide the most direct evidence for childhood and adolescence, whereas the third is used only to inform possible mechanisms and boundary conditions and is not generalized directly to ordinary pediatric screen use. The broad scope of the review is intentional, but the different evidence streams are interpreted separately according to their population, exposure, and evidential relevance rather than being treated as directly comparable.

This heterogeneity helps explain why the empirical picture remains uneven. Some of the most influential work in younger children has suggested that heavier screen exposure may be associated with less favorable neural organization in regions relevant to language and executive functioning. Hutton et al.,[27] for example, reported associations between greater screen-based media use and lower white matter integrity in preschool-aged children. In a related functional MRI study, Horowitz-Kraus and Hutton[28] found that time spent reading was associated with stronger functional connectivity between the visual word form area and language-related and executive regions, whereas screen time showed the opposite pattern. Hutton et al.[29] likewise reported that, in preschool children, illustrated story formats supported stronger cross-network integration than continuous animation, which was associated with more restricted and less integrated patterns of connectivity. Taken together, these studies do not suggest that all screen exposure is harmful. They do, however, raise the possibility that some forms of screen-based experience may provide less support for the integration of language, imagery, and control systems than literacy-related activities do.

At the same time, the evidence is not uniform, and that matters. Rodriguez-Ayllon et al.,[30] in a large population-based study, did not find significant associations between screen time and white matter microstructure, even though they did observe associations for outdoor play and sports participation. Findings such as these caution against strong claims based on a small number of studies or on a single metric of media exposure. They also suggest that the neural correlates of screen use may depend on how screen time is measured, at what age it is assessed, and what kinds of activities are grouped together under that label. Total screen time, by itself, may be too crude to capture the developmental issue at stake.

A further complication is that a sizable portion of the neuroimaging literature concerns Internet Gaming Disorder or other forms of problematic media use rather than ordinary screen exposure. These studies are relevant, but they should not be read too quickly as evidence about children's everyday digital experience. Work on IGD has reported altered white matter and

network organization in adolescents and young adults, including increased fractional anisotropy in the thalamus, posterior cingulate cortex, anterior thalamic radiation, internal capsule, corpus callosum, and other long association fibers.[31,32] Du et al.[33] further reported that associations between impulsivity and fractional anisotropy differed between adolescents with IGD and healthy controls, particularly in the right corticospinal tract and right occipital white matter. Qin et al.[34] similarly identified altered connectome organization in young men with IGD, while Chen et al.[35] reported structural asymmetries in regions implicated in reward processing, self-reflection, and visuospatial attention. These findings are important, but they almost certainly do not describe the neural correlates of screen use in general. They are better interpreted as evidence about intensive, dysregulated, or addictive patterns of engagement, in which pre-existing vulnerabilities may already be part of the picture.

The same caution applies to functional findings. Gao et al.[36] reported a nonlinear pattern in connectivity between dorsal attention and visual networks, with greater connectivity in highly engaged gamers but reduced connectivity among individuals meeting criteria for IGD. In young adults, Su et al.[37] found that personalized TikTok videos elicited greater activation in default mode network subregions and the ventral tegmental area, together with stronger functional coupling between activated default mode network regions and auditory/visual processing pathways and the frontoparietal network. These findings are suggestive, particularly because they indicate that personalized short-form video engagement may recruit reward-related and large-scale cognitive networks in distinctive ways. Still, they derive from highly specific media ecologies and cannot simply be generalized to children's screen use more broadly.

What, then, can be said with confidence? The most defensible conclusion is not that screen use is uniformly detrimental, but that it is developmentally consequential enough to require differentiation. Some forms of digital engagement may be cognitively or socially enriching. Others may reduce opportunities for sustained attention, language-rich interaction, or reflective processing. The task, therefore, is not to oppose screens to reading in a simple moral register. It is to ask what kinds of experience are being repeated, what demands they place on developing neural systems, and under what conditions they support or undermine the maturation of attention, language, and self-regulation. Figure 1 provides a conceptual overview of the distinction between reading and screen exposure in relation to the developing brain, and Table 1 summarizes the principal neuroimaging findings discussed in this review.

Discussion and Implications

This review points to a tension that increasingly defines contemporary childhood. Digital technologies are increasingly integrated into young people's daily lives, raising important questions about how different forms of screen-based engagement may relate to neurodevelopment.[1–3,12] The contrast reviewed here should not be reduced to a simple opposition between "old" and "new" media. Even so, the literature does suggest that reading and screen exposure tend to place different demands on the developing brain, and that those differences are developmentally meaningful.

The strongest evidence on the reading side converges on a relatively clear point. Literacy development is associated with white matter pathways and functional systems implicated in phonological processing, orthographic recognition, and cognitive control. These findings do not imply that reading outcomes can be explained by one tract or one neural mechanism alone. Nor do they establish a simple causal chain from print exposure to later cognitive advantage. They do, however, support the view that sustained engagement with language and text forms part of the developmental context within which neural systems relevant to literacy, attention, and executive functioning are shaped.[21,26,39–44]

The screen literature is more difficult to interpret, not because it is unimportant, but because the category itself is so broad. Screen exposure may involve passive viewing, socially interactive communication, short-form algorithmically curated content, gaming, or educational use. It is therefore unlikely that all forms of digital media bear the same relation to neurodevelopment. Some studies suggest that heavier or less structured screen exposure is associated with weaker white matter organization and less favorable patterns of connectivity in systems relevant to language and executive functioning.[27] Behavioral evidence also points to associations with early language development. Longitudinal studies have linked greater screen exposure in early childhood with poorer vocabulary development[45] and higher television screen time with reduced child talk and fewer parent–child conversational turns.[46] At the same time, these associations are not uniform, and they should not be interpreted as evidence that all digital engagement is developmentally detrimental.

This need for caution becomes especially clear in the literature on problematic or excessive media use. Several studies of Internet Gaming Disorder have reported increased fractional anisotropy or altered connectivity in pathways related to reward, visual-spatial processing, and attentional control. These studies indicate atypical white-matter characteristics associated with IGD and, in some cases, with addiction severity or impulsivity, although the functional meaning of these differences remains uncertain.[31–33] Recent epidemiological evidence provides further context. A 2026 global meta-analysis of 19 studies involving 251,037 children and adolescents estimated the pooled prevalence of IGD at 10% (95% CI: 6–15%), although estimates varied substantially across regions and diagnostic approaches.[47]

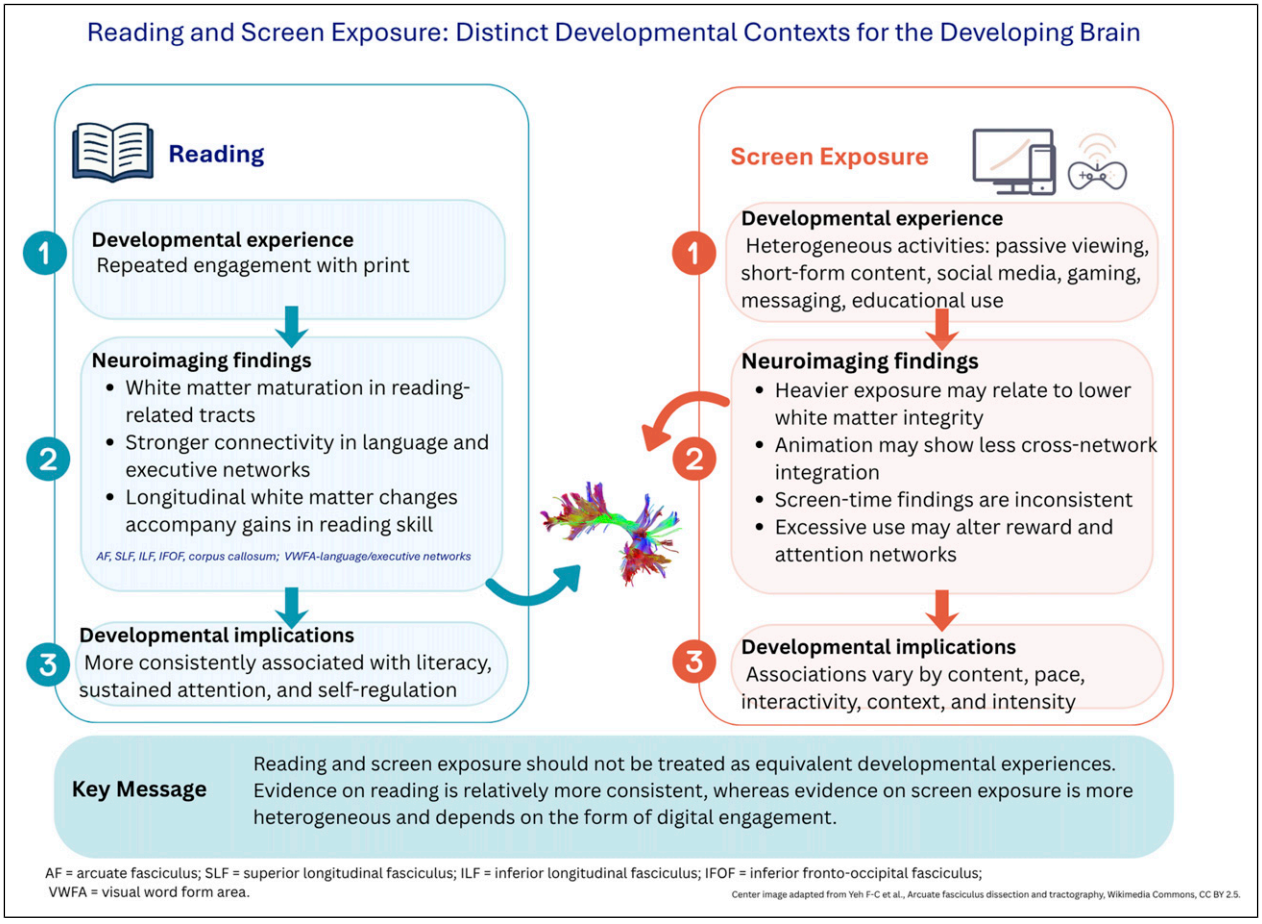

Figure 1. Conceptual overview of reading and screen exposure in relation to the developing brain. Reading is more consistently associated with neural systems relevant to language, attention, and cognitive control, whereas findings on screen exposure are more heterogeneous and depend on the form of digital engagement. Center tractography image adapted from Yeh F-C et al., Arcuate fasciculus dissection and tractography, Wikimedia Commons, CC BY 2.5.

More broadly, the evidence remains mixed. While some studies have linked weaker reading performance to lower FA values in major reading-related tracts, others have shown that white matter differences are more informative longitudinally than cross-sectionally. Similarly, while some screen-related studies have reported less favorable neural correlates, large population-based work has not always found significant associations between screen time and white matter microstructure.[30] These inconsistencies are not incidental. They likely reflect differences in age, sample composition, imaging modality, behavioral measures, and, above all, the way screen exposure is defined.

What follows from this is not indecision, but precision. Future work will need to move beyond broad contrasts and examine more carefully the timing, intensity, and form of digital engagement. Longitudinal designs remain especially important here. They are better suited than static comparisons to clarifying whether neural differences precede certain media habits, emerge alongside them, or reflect reciprocal developmental processes over time. However, longitudinal observation alone cannot establish whether deliberately modifying these experiences alters developmental trajectories. Intervention studies are therefore also needed, both to strengthen reading skills and reading enjoyment and to reduce forms of solitary screen use with limited educational value, while examining whether such changes are accompanied by measurable differences in neural development. Both longitudinal and intervention designs should be developmentally sensitive, with particular attention to ages or developmental windows in which neural systems supporting language, attention, and self-regulation may be especially responsive to enriching or less supportive experiences. Just as importantly, future research should distinguish among passive and active use, educational and entertainment-oriented content, solitary and socially scaffolded engagement, and the presence or absence of language-rich interaction around the medium itself. Without such distinctions, claims about the effects of digital media will remain too blunt to be theoretically or practically useful.

Table 1. Selected neuroimaging findings on reading and screen exposure in childhood and adolescence.

Panel A. Reading and the Developing Brain

Study	Sample/Age	Design/Measure	Imaging modality	Principal finding
Roy et al.[11]	Longitudinal sample n=73, age 5–10 y at baseline; four cross-sectional datasets n=14,176 (total N=14,249)	Five-year longitudinal analysis plus four large cross-sectional datasets	Diffusion MRI/ tractometry	Gains in reading skill corresponded to longitudinal changes in white matter, whereas cross-sectional datasets provided no consistent evidence that individual differences in white matter predicted reading skill.
Su et al.[20]	n=79, mean age 14.1 y at MRI; followed developmentally from early childhood	Longitudinal; family environment assessed at 1–3 y, vocabulary assessed annually during childhood	DTI/tractography	Age of literacy exposure was associated with FA in the direct segment of the left arcuate fasciculus and moderated the relationship between vocabulary development and arcuate structure.
Gullick & Booth[21]	n=30, age 8.1–13.8 y at baseline	Longitudinal, approximately 3-y follow-up; reading identification and fluency measures	DTI/probabilistic tractography	Lower FA in the direct segment of the left arcuate fasciculus predicted less favorable change in reading performance over time.
Lou et al.[22]	n=64, age 8.83–14.68 y, with and without reading difficulties	Cross-sectional; word-reading efficiency and phonemic-decoding measures	Diffusion MRI/ structural connectome analysis	Feeder-connection strength was associated with word-reading efficiency and phonemic decoding.
Lou et al.[23]	Primary n=64, age 8.83–14.68 y; independent validation n=96	Cross-sectional connectome analysis; multiple reading and reading-related measures	3-T diffusion MRI/ connectome analysis	Left-thalamic network topology was associated with reading-related performance, particularly phonemic decoding.
Vandecruys et al.[24]	n=67: first graders n=34, mean age 68 months; preschoolers n=33, mean age 66 months	Longitudinal school-cutoff design	Diffusion MRI/ white-matter microstructure	White-matter changes across school entry were predominantly related to age-related maturation; specific schooling effects on white matter were not detected, despite clear schooling effects on reading and arithmetic skills.
Yeatman et al.[26]	n=39, initial age 7–12 y, followed for 3 y	Longitudinal; annual standardized reading assessments	Diffusion-weighted MRI/ fiber tractography	Developmental trajectories of FA in the left arcuate and inferior longitudinal fasciculi differed according to reading proficiency.

(continued)

Table 1. (continued)

Panel B. Screen Exposure and the Developing Brain

Study	Sample / Age	Design / Measure	Imaging modality	Principal finding
Hutton et al.[27]	n=47, age 3–5 y; mean 54.3 ± 7.5 months	Cross-sectional; parent-reported ScreenQ assessing access, frequency, content, and co-viewing	DTI	Higher ScreenQ scores were associated with lower FA and higher RD in white-matter tracts supporting language, executive function, and emergent literacy.
Horowitz-Kraus & Hutton[28]	n=19, age 8–12 y	Cross-sectional; parent-reported independent reading and screen-media time	Resting-state fMRI	Reading time was associated with stronger connectivity between the left visual word form area and language, visual, and cognitive-control regions; screen time was associated with lower connectivity with language and cognitive-control regions.
Hutton et al.[29]	n=27, mean age 58 ± 8 months; range 44–71 months	Within-subject story-format experiment; audio, illustrated, and animated stories	Task fMRI/ functional connectivity	Illustrated stories showed greater cross-network integration than animation; animation was associated with reduced connectivity across several language, imagery, and attention networks.
Rodriguez-Ayllon et al.[30]	Total cohort n=2,532, mean age 10.12 ± 0.58 y; screen-time analyses n=2,346	Population-based cross-sectional study; parent-reported television/video and computer/video-game use	DTI	No significant associations were observed between screen time and white-matter microstructure; outdoor play and sports participation showed modest associations with FA and MD.
Dong et al.[31]	n=16 IGA, n=15 HC; males; mean age 22.2 ± 3.3 vs 21.6 ± 2.6 y	Cross-sectional case-control comparison of internet gaming addiction and healthy controls	DTI	The gaming-addiction group showed higher FA in the bilateral thalamus and left posterior cingulate cortex; thalamic FA was positively associated with addiction severity.
Dong et al.[32]	n=42 IGD, n=44 recreational game users; university students/young adults	Cross-sectional case-control comparison; IGD vs recreational gamers with substantial gaming experience	DTI	IGD was associated with higher FA in anterior thalamic radiation, internal capsule, corticospinal, inferior fronto-occipital and inferior longitudinal tracts, and corpus callosum; FA was positively related to addiction severity.

(continued)

Table 1. (continued)

Panel B. Screen Exposure and the Developing Brain				
Du et al.[33]	n=33 male IGD adolescents, n=32 male HC; mean age 16.82 ± 3.46 vs 17.28 ± 3.01 y	Cross-sectional case-control; IGD criteria plus impulsivity assessment	DTI/voxel-wise FA analysis	Associations between impulsivity and FA differed between groups, particularly in the right corticospinal tract and right occipital white matter.
Qin et al.[34]	n=47 young men with IGD, n=34 HC; mean age 20.60 ± 0.97 vs 20.85 ± 1.79 y	Cross-sectional case-control; DSM-5 criteria and IAT; structural-connectome analysis	DTI/tractography/graph analysis	IGD was associated with altered cortico-limbic-striatal structural connectivity, including increased sensory/insular and decreased striatal/limbic subnetworks; connectivity in one altered subnetwork correlated with IAT severity.
Chen et al.[35]	n=104 IGD, n=104 recreational game users; mean age 20.93 ± 2.17 vs 21.52 ± 2.55 y	Cross-sectional case-control; IGD vs recreational gamers	Structural MRI/voxel-based asymmetry	IGD was associated with altered gray-matter asymmetry in medial prefrontal, orbitofrontal, precuneus, temporal, and superior parietal regions implicated in reward, self-referential processing, and visuospatial attention.
Gao et al.[36]	Final n=217: IGD n=98, highly engaged gaming n=59, lowly engaged gaming n=60; mean ages ≈23–24 y	Cross-sectional gaming-spectrum comparison; IGD-20T and DSM-5 classification	Resting-state fMRI/ICA	dAN–visual-network connectivity was highest in highly engaged gamers and lower in both IGD and low-engagement groups, consistent with a non-linear pattern across gaming involvement.
Su et al.[37]	fMRI n=30, age 19–30 y; mean 23.73 ± 2.38 y	Within-subject comparison of personalized vs generalized TikTok videos; problematic-use questionnaire	Task fMRI/PPI	Personalized videos produced greater activation in DMN subregions, ventral tegmental area, and other regions, with stronger coupling between activated DMN regions and auditory/visual pathways and the frontoparietal network.
He et al.[38]	n=20 Facebook users; age 18–23 y; mean 20.3 ± 2.25 y	Cross-sectional correlational study; excessive social-media-use score	DTI/ROI + TBSS	Greater excessive social-media use was associated with higher MD in corpus-callosum and left longitudinal-fasciculus regions and higher FA in the right corticospinal tract.

Note. DTI = diffusion tensor imaging; FA = fractional anisotropy; IGD = Internet Gaming Disorder. Studies involving young adults and/or problematic-use populations are included as contextual or indirect evidence and should not be interpreted as equivalent to pediatric evidence on ordinary screen exposure.

The practical implications are nevertheless clear enough to merit attention. Early environments that support sustained attention, dialogic interaction, narrative immersion, and reflective conversation are likely to remain important, regardless of the media ecology in which children grow up. Literacy-rich settings may therefore function not only as educational advantages, but also as developmental supports for neural systems relevant to language, control, and self-regulation. At the same time, the question is not whether children should be shielded from digital media altogether. It is whether digital experiences are being organized in ways that support exploration, meaning-making, and interaction, rather than fragmentation, passivity, and constant attentional capture.

In that sense, the central challenge is ecological rather than technological. Supporting young minds in the digital era requires more than setting limits on time alone. It requires attending to content, context, pace, and social scaffolding. The developmental issue is not screens in the abstract, but the kinds of repeated experiences through which attention, language, and self-regulation are being formed.

Conclusion

The contrast reviewed here should not be reduced to a simple opposition between reading and screen use. Reading is a comparatively well-defined developmental experience, and the literature reviewed here repeatedly links it to neural systems relevant to language, attention, and cognitive control. By contrast, the screen literature remains more heterogeneous, not only because screen exposure encompasses very different kinds of activity, but also because much of the neuroimaging work concerns problematic or excessive use rather than ordinary digital experience. For that reason, the current evidence does not justify sweeping claims about digital media in general. It does, however, suggest that repeated engagement with print and language, on the one hand, and repeated exposure to certain forms of screen-based activity, on the other, may not place the same demands on the developing brain.

A second point follows from the asymmetry of the evidence base. Research on reading and white matter development is now substantially richer than research on screen exposure and white matter development, and the latter remains marked by inconsistencies in sampling, measurement, and definition. What is needed next is not simply more work, but more discriminating work: longitudinal studies that distinguish among forms of screen engagement, attend more closely to developmental timing, and relate neural measures to language, attention, and self-regulation in more specific ways.

For developmental science, the broader implication is straightforward. The issue is not whether digital media belong to childhood; they plainly do. The issue is what kinds of developmental environments are being organized around them. To the extent that sustained attention, shared reading, dialogic interaction, and rich language exposure continue to matter for the developing brain, they remain important not as nostalgic ideals, but as developmental conditions under which learning, reflection, and self-regulation may proceed differently.

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Author contributions

Yunus Pınar was solely responsible for the conception and design of the article, literature review, analysis and interpretation of the relevant literature, drafting of the manuscript, and critical revision of the final text. The author read and approved the final manuscript.

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Yunus Pınar is the guarantor of this article.

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