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SCREEN HYPEREXPOSURE AND CONTEMPORARY YOUTH: VARIABLE REWARD, FRAGMENTED ATTENTION, AND CHALLENGES FOR HUMAN DEVELOPMENT

HIPEREXPOSIÇÃO ÀS TELAS E JUVENTUDE CONTEMPORÂNEA: RECOMPENSA VARIÁVEL, ATENÇÃO FRAGMENTADA E DESAFIOS PARA A FORMAÇÃO HUMANA

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Abstract

This article critically discusses possible relationships between screen hyperexposure and digital environments and the attention, memory, emotional health, and everyday experience of children, adolescents, and young people. The central hypothesis is that this phenomenon cannot be reduced to increased time spent in front of devices, but rather configures a reorganization of experience mediated by engagement algorithms, variable rewards, intensified social comparison, and the systematic competition for human attention. The study takes the form of a critical theoretical essay with elements of narrative review, drawing on contributions from developmental psychology, behavioral neuroscience, the sociology of digital culture, and education, while engaging with relevant empirical studies. It discusses the engagement mechanisms of digital platforms, the specific sensitivity of adolescence during brain development, and the possible consequences for school learning, socialization, and identity formation. The article also offers notes on the Brazilian context, with reference to data on internet use among children and adolescents, to the digital inequalities that pervade the phenomenon, and to the recent Law No. 15,100/2025, which restricts the use of personal electronic devices in basic education schools. It is acknowledged that the available empirical literature indicates heterogeneous effects, with frequently small effect sizes, and that causal claims should be treated with caution. The article concludes that the central problem is not technology itself, but excessive, passive, and unregulated use oriented toward the monetization of attention, and that adequate responses require critical digital education, responsible adult mediation, platform regulation, and public policies aimed at the protection and integral development of children and young people.

Keywords: Screen Hyperexposure. Attention Economy. Youth Development. Digital Education. Mental Health.

Resumo

O presente artigo discute criticamente possíveis relações entre a hiperexposição às telas e aos ambientes digitais e processos de atenção, memória, saúde emocional e experiência cotidiana de crianças, adolescentes e jovens. Parte-se da hipótese de que esse fenômeno não se reduz ao aumento do tempo diante de dispositivos, mas configura uma reorganização da experiência mediada por algoritmos de engajamento, recompensas variáveis, comparação social intensificada e disputa sistemática pela atenção. O estudo adota a forma de ensaio teórico-crítico com elementos de revisão narrativa, articulando contribuições da psicologia do desenvolvimento, da neurociência do comportamento, da sociologia da cultura digital e da educação, e dialogando com estudos empíricos relevantes. Discutem-se os mecanismos de engajamento das plataformas digitais, a sensibilidade específica da adolescência em fase de desenvolvimento cerebral, e as consequências possíveis para aprendizagem escolar, socialização e construção identitária. Apresentam-se também notas sobre o contexto brasileiro, com referência a dados de uso de internet por crianças e adolescentes, às desigualdades digitais que atravessam o fenômeno e à recente Lei nº 15.100/2025, que restringe o uso de dispositivos eletrônicos pessoais nas escolas de educação básica. Reconhece-se que a literatura empírica disponível indica efeitos heterogêneos, com tamanhos de efeito frequentemente pequenos, e que afirmações causais devem ser tratadas com cautela. Conclui-se que o problema central não é a tecnologia em si, mas o uso excessivo, passivo e desregulado orientado pela monetização da atenção, e que respostas adequadas demandam educação digital crítica, mediação adulta responsável, regulação de plataformas e políticas públicas voltadas à proteção e ao desenvolvimento integral de crianças e jovens.

Palavras-chave: *Hiperexposição às Telas. Economia da Atenção. Desenvolvimento Juvenil. Educação Digital. Saúde Mental.*

1 INTRODUCTION

The presence of screens in the daily lives of children, adolescents, and young people has ceased to be exceptional and has become structural. Mobile phones, tablets, computers, and connected televisions now compose an environment that not only accompanies but often organizes the time, the relationships, the emotions, and the cognitive processes of younger generations. This phenomenon is not neutral: the way digital platforms are designed, the contents they disseminate, the algorithms that personalize them, and the incentives they offer for continuous engagement produce effects that deserve rigorous, critical, and scientifically responsible examination.

The expansion of digital connectivity represents one of the most far-reaching cultural and technological transformations of our time. Castells (1999) noted that the emergence of a network society implied not only new forms of communication, but also a reconfiguration of power structures, collective identities, and cognitive dynamics. Since then, the speed and scale of this transformation have surpassed all expectations, and digital platforms for entertainment, communication, and information have come to operate under a specific economic logic: the monetization of human attention. Simon (1971) anticipated that an information-rich society would necessarily be poor in attention, foreseeing what would become one of the central tensions of contemporary experience: attention, a finite cognitive resource, has been converted into a good contested by the digital industry on an unprecedented historical scale.

Wu (2016) historically demonstrated how human attention has been progressively transformed into a commodity, tracing this process from the early days of the mass press to digital platforms. Zuboff (2019) deepened this analysis by describing a surveillance capitalism oriented toward the collection, processing, and commercialization of behavioral data for purposes of prediction and behavior modulation. In this context, the time users spend in front of a screen is not merely the consequence of spontaneous interest, but the result of architectures deliberately designed to maximize engagement.

It is in this scenario that screen hyperexposure emerges as a legitimate and growing object of concern among researchers, educators, health professionals, and public policy makers. The problem is not technology itself, conceived as a neutral tool or as inevitably harmful, but a set of specific conditions: excessive exposure time, passive

consumption, persuasive interface design, the absence of adequate adult mediation, the cognitive and emotional vulnerability of children and adolescents, and the cumulative effects on attention, memory, sleep, socialization, and mental health. It should be noted, however, that the recent empirical literature is marked by relevant methodological controversies: reviews and meta-analyses have found statistically significant but frequently small-magnitude associations between digital technology use and adolescent well-being (Orben; Przybylski, 2019; Odgers; Jensen, 2020), which requires caution when transposing findings to public debate.

Against this backdrop, this article aims to critically discuss how screen hyperexposure, social networks, and digital stimuli of immediate reward can interfere with attention, memory, emotional health, subjective formation, and the lived experience of children, adolescents, and young people. The discussion articulates the attention economy and the engagement mechanisms based on variable reward and intermittent reinforcement, the possible effects on attentional and mnemonic processes, the dynamics of social comparison, the specific sensitivity of youth neurobiological development, the contemporary sense of acceleration and loss of presence, educational challenges and the particularities of the Brazilian context — including national usage data, digital inequalities, and recent school regulation — and, finally, the shared responsibility of platforms and public authorities. The path taken is that of a critical theoretical essay, the methodological assumptions of which are made explicit below.

2 METHODOLOGICAL PATH AND NATURE OF THE STUDY

This study takes the form of a critical theoretical essay with elements of a narrative review of the literature — a textual modality recognized in academic production in the humanities and applied social sciences for the examination of complex phenomena that require interdisciplinary articulation. The choice of the critical theoretical essay is justified by the interdisciplinary nature of the object and by the need to articulate empirical evidence, sociological concepts, educational debates, and contributions from developmental psychology — an articulation that is difficult to achieve in experimental designs restricted to a single methodological tradition.

The selection of sources followed three main criteria. First, theoretical relevance and recognition in the field, observed through the academic circulation of authors and works and through their conceptual pertinence to the proposed analytical axes. Second, disciplinary diversity, prioritizing contributions from four domains: behavioral and developmental psychology, with reference to Ferster and Skinner (1957), Festinger (1954), Posner and Petersen (1990), and Erikson (1976); behavioral neuroscience and adolescent developmental neuroscience, particularly the studies of Schultz (1998) on the predictive reward signal of the dopaminergic system, the investigations by Ophir, Nass, and Wagner (2009) on media multitasking, and the works of Casey, Jones, and Hare (2008) and Steinberg (2008) on brain development in adolescence; the sociology of digital culture and critical philosophy of the contemporary, with Castells (1999), Lévy (1999), Bauman (2001), Han (2015, 2018), Sibilia (2008), Turkle (2011, 2015), Zuboff (2019), and Wu (2016); and education and media studies, with Buckingham (2003), Lemos (2002), Carr (2011), and Wolf (2018). Third, topicality and empirical relevance at specific points, particularly in the discussions on sleep and screens (Chang *et al*., 2015; Carter *et al*., 2016), adolescent well-being (Twenge, 2017; Orben; Przybylski, 2019; Odgers; Jensen, 2020; Haidt, 2024), and the quality of in-person social interaction in the presence of mobile devices (Przybylski; Weinstein, 2013).

Sources were consulted in widely recognized academic databases — Google Scholar, SciELO, Scopus, and Web of Science — and supplemented by direct consultation of the websites of journals, publishers, and official bodies when necessary for bibliographic confirmation. Descriptors in Portuguese and English were used in combined and cross-referenced searches, among them: screen time, digital technology use, adolescent well-being, social media, sleep, attention, media multitasking, reward, attention economy, surveillance capitalism; and, in Portuguese, “tempo de tela”, “tecnologias digitais”, “bem-estar adolescente”, “redes sociais”, “sono”, “atenção”, “multitarefa midiática”, “economia da atenção”, “educação digital”, and “saúde mental adolescente”. The temporal cut-off prioritized classic contributions that structure the debate, without date restrictions when dealing with authors who founded the discussions mobilized, and recent productions, preferably from the last decade, when the topic required empirical updating — as in the sections devoted to sleep, adolescent mental health, and platform regulation.

The limitations of this investigative modality must be made explicit. This is not a systematic review or a meta-analysis: protocols such as PRISMA were not applied, there is no exhaustive list of quantified descriptors, and there is no calculation of effect sizes. The selection of authors and works reflects interpretive choices that privilege conceptual diversity over empirical exhaustiveness in each topic addressed. As a consequence, some statements throughout the text should be read as analytical hypotheses oriented by the available literature, and not as empirical conclusions definitively established. The relationship between intensive use of digital technologies and different cognitive, emotional, and social outcomes remains an object of active debate in the specialized literature, with studies suggesting small and heterogeneous effects (Orben; Przybylski, 2019) coexisting with analyses that emphasize deeper structural transformations (Haidt, 2024). Acknowledging this controversy is a condition of the scientific quality of the work.

Finally, the critical theoretical essay fulfills an epistemically legitimate function: organizing a fragmented field of debates, articulating contributions from diverse origins, identifying gaps, and proposing intelligibility for socially relevant phenomena that do not yet have a consolidated empirical paradigm — without, however, replacing large-scale empirical longitudinal studies that remain necessary for the advancement of the field.

3 DIGITAL CULTURE, THE ATTENTION ECONOMY, AND ENGAGEMENT MECHANISMS

The digitalization of everyday life did not occur in a gradual or predictable manner. In just a few decades, internet-connected devices moved from being specialized work instruments to becoming bodily and cognitive extensions for growing portions of the world's population. Lévy (1999) described this process as the emergence of cyberspace — a new space of communication, sociability, organization, and transaction, and also a new market for information and knowledge. What Lévy could not fully anticipate is that this space would become, in the following decades, the main locus of dispute over human attention on an industrial scale.

Hyperconnectivity, understood as the state of permanent and simultaneous connection to multiple devices, networks, and information flows, has profoundly transformed the relationship between subjects and time. Han (2015) argues that

contemporary society is marked by an excessive acceleration and positivity that produce exhaustion, dispersion, and incapacity for contemplation. For the Korean-German philosopher, the culture of performance and hyperactivity does not liberate the subject but submits him to a form of internalized coercion that prevents him from resting, deepening, and experiencing the slowness necessary for reflective thought.

Wu (2016) offers a complementary historical perspective by tracing what he calls the attention trade from the early days of the mass press to contemporary digital platforms. His analysis reveals a structural logic: companies and media have always competed for the public's attention, but digital platforms have radicalized this process by combining algorithmic personalization, instant feedback, and continuous engagement incentives. The result is an informational environment that not only offers content but actively competes to retain the user's attention for as long as possible. Zuboff (2019) deepens this analysis with the notion of surveillance capitalism, describing how the major digital platforms have transformed behavioral data into raw material for the production of predictive products sold to advertisers. In this model, the user's attention is not only disputed: it is monitored, analyzed, and fed back to make algorithms progressively more effective at keeping the user connected.

For children, adolescents, and young people who have grown up immersed in this environment, the digitalization of experience is not a disruptive novelty but the natural context of development. This does not eliminate the risks, but it makes them more subtle and harder to perceive. Boyd (2014), in an ethnographic study with American adolescents, argues that young people are not passive victims of social networks but social actors who navigate them with agency, creativity, and contextual awareness. At the same time, the author recognizes that platforms are not neutral: their designs reflect economic and technical choices that can amplify certain social dynamics, such as comparison, visibility anxiety, and pressure for identity performance. The tension between connectivity as a resource and connectivity as retention is central to any responsible analysis of the phenomenon: ignoring the real benefits of digital technologies would be as mistaken as disregarding the effects of persuasive design, excessive exposure, and engagement maximization on developing subjects.

Understanding why screens exert such attraction on children and young people requires going beyond explanations based solely on individual volition or parental

neglect. The mechanisms through which digital platforms operate are rooted in principles derived from behavioral psychology and behavioral neuroscience, and have been deliberately incorporated into the design of interfaces, feeds, notifications, and recommendation systems. The concept of intermittent reinforcement was systematized in the classic studies of the experimental analysis of behavior, most notably in the work of Ferster and Skinner (1957), which mapped different reinforcement schedules — continuous, fixed ratio, variable ratio, fixed interval, and variable interval — and their differential effects on behavior maintenance. The variable-ratio reinforcement schedule, in particular, proves especially effective in producing behaviors resistant to extinction, precisely because it generates expectation and anticipation in the face of unpredictable rewards. Digital platforms such as social networks, games, and short-video applications structurally incorporate this principle: the user does not know exactly when he or she will receive a like, a positive comment, an especially engaging piece of content, or a relevant notification. This unpredictability — the central feature of the so-called variable reward — sustains the behavior of compulsive device checking and has a structural analogy with the schedules Ferster and Skinner described in the laboratory.

The question of the dopaminergic system deserves careful and academically responsible treatment, given the frequency with which it appears in reductionist formulations in public debate. The dopaminergic system is associated with motivation, anticipation of rewards, reinforcement learning, and executive control, among other complex functions. Schultz (1998) demonstrated that dopaminergic neurons respond not only to the reward itself but, above all, to the predictive signal of the expected reward, which means that the anticipation of a positive result is neurochemically more potent than the result itself. It is imprecise and reductive, therefore, to claim that social networks release dopamine in a manner analogous to psychoactive substances. What the neuroscientific literature suggests, more rigorously, is that highly rewarding and unpredictable digital stimuli can activate circuits of anticipation and motivation in an intense and repeated way, contributing to the formation of habits that are difficult to interrupt. The problem is not dopamine itself — a molecule whose role in the regulation of motivation, attention, and learning is indispensable — but the overstimulation of reward systems by frequent, variable, and easily accessible stimuli, which may reduce motivation to engage in activities that require sustained effort and offer delayed rewards.

The short-video phenomenon, exemplified by platforms such as TikTok, Instagram Reels, and YouTube Shorts, represents an intensification of this logic. High-stimulation content produced in very short formats, with rapid transitions, catchy soundtracks, and immediate emotional appeals, maximizes stimulation per unit of time. Carr (2011) had already discussed, before the explosion of short videos, how the hypertextual and fragmented logic of the internet affected reading and attention habits, favoring a cognition oriented toward skimming and averse to depth. The proliferation of ever-shorter and more stimulating contents radicalizes this process, although the specific cognitive effects of this format still require systematic empirical investigation. Infinite scroll, automatic content autoplay, push notifications, and gamification systems are other elements of persuasive design that operate deliberately on engagement mechanisms. These are not aesthetic details but architectural choices that reflect platforms' economic interest in maximizing usage time. Zuboff (2019) argues that this design is not the product of an inevitable technology, but of a specific business model, and that its prevalence results from political and economic choices that could be questioned and altered through public regulation.

It is important to distinguish problematic use from intensive use. Not all extensive use of digital devices is necessarily harmful, and effects vary significantly according to the type of activity, the content consumed, the social context, the user's age, the presence of adult mediation, and individual characteristics. Boyd (2014) documents that adolescents use social networks for legitimate social purposes, such as maintaining friendships, exploring identity, and participating in communities of interest. What tends to become problematic is the passive, compulsive, and unregulated use of highly stimulating content of low cognitive and emotional value, especially when it occurs without supervision and to the detriment of sleep, in-person interaction, and other activities essential to development.

4 FRAGMENTED ATTENTION, MEMORY, AND LEARNING IN THE AGE OF SCREENS

Attention is one of the most fundamental cognitive resources for learning, memory, and adaptive functioning. Posner and Petersen (1990) described attention as a

functional system involving alerting, orienting, and executive control mechanisms, each with relatively distinct neural bases. These mechanisms are highly plastic and respond to environmental demands, which means that cognitive habits formed over years of digital exposure have the potential to reshape, to some extent, the attentional patterns of subjects.

Carr (2011) argues that intense digital experience modifies not only what we think but how we think, favoring a broad-sweep, fast, and multitasking cognition at the expense of deep reading, prolonged concentration, and linear analytical thinking. The author draws on data from the neuroscience of brain plasticity to suggest that prolonged exposure to fragmented cognitive environments, such as hypertextual browsing and digital multitasking, may reinforce attentional circuits adapted to dispersion. This hypothesis remains a matter of debate, and its causal implications must be treated with caution: correlations between intensive use of digital technology and lower performance in sustained-attention tasks do exist, but the underlying causal mechanisms are difficult to isolate in studies of humans under natural conditions.

Memory lapses, increasingly reported by young people and adults and often attributed to excessive screen use, deserve a differentiated analysis. Not every retention difficulty results from neurological alteration: informational overload, divided attention during memory encoding, insufficient sleep, and the lack of experiential consolidation are factors that interfere with the formation and retrieval of memories without necessarily implying structural damage. Digital multitasking, studied by Ophir, Nass, and Wagner (2009), is associated with greater difficulty in filtering irrelevant information and greater susceptibility to distraction, which may compromise the quality of memory formed during engagement with multiple simultaneous demands. The authors observed that users considered heavy digital multitaskers performed worse on tasks of working memory and attentional control compared to users with lower multitasking engagement. The causal relationship, however, remains uncertain: one may ask whether intensive multimedia use produces these deficits or whether individuals with certain attentional characteristics tend naturally toward more frequent multitasking use.

Sleep is a critical mediator in this relationship, and here the empirical literature is relatively more robust than in other associations frequently invoked in public debate. Chang *et al*. (2015), in an experimental study published in PNAS, demonstrated that evening reading on light-emitting devices, compared to reading on printed books,

prolonged the time required to fall asleep, suppressed melatonin secretion, delayed the circadian rhythm, and reduced next-morning alertness. Carter *et al*. (2016), in a systematic review and meta-analysis published in JAMA Pediatrics involving a large pediatric and adolescent population sample, found a significant association between access to or use of screen-based devices in the sleep environment and negative outcomes in sleep duration and quality. These studies offer more robust empirical anchoring for the hypothesis that screen use — especially at night — compromises sleep, a variable particularly relevant for learning, given the role of sleep in memory consolidation and in cognitive and emotional regulation.

The issue of deep reading is particularly relevant. Wolf (2018) examines, from the perspective of the cognitive neuroscience of reading, how the human brain developed circuits for analytical and contemplative reading that are not given biologically but rather formed through cultural practice over the course of development. The author hypothesizes that fragmented reading habits, associated with intense digital navigation, may weaken these circuits through disuse, making deep reading progressively more cognitively costly. This is a hypothesis that requires more rigorous longitudinal investigation, but it is consistent with what is known about the plasticity of the neural systems for reading.

Desmurget (2019) argues, based on reviews of literature on child and adolescent cognitive development, that the distinction between types of use is decisive for assessing the impacts of screens. The passive use of low-complexity entertainment content is consistently associated with more negative effects than the active, creative, and supervised use of digital technologies. For school learning, the challenges are multiple: a classroom that requires sustained attention, frustration tolerance, cognitive patience, and interest in abstract content of delayed reward competes, under disadvantageous conditions, with digital environments designed to offer continuous stimulation and immediate rewards. This does not imply that schools should spectacularize teaching to survive the comparison, but rather that the formation of subjects capable of concentration, deep reading, and engagement with complex problems becomes, paradoxically, more necessary and more difficult in the current context.

5 SOCIAL MEDIA, SOCIAL COMPARISON, AND EMOTIONAL HEALTH: EVIDENCE AND CONTROVERSIES

Festinger (1954) formulated social comparison theory to describe the human tendency to evaluate one's own opinions, capacities, and personal attributes through comparisons with others. This process is cognitively natural and socially functional in many contexts, but it can produce suffering when systematically oriented toward upward comparisons with individuals perceived as superior. Social networks, by structuring the visibility of others' lives in a selective, edited, and frequently idealized manner, create conditions for social comparison to be constant, asymmetrical, and tendentially unfavorable to the observer.

Sibilia (2008) analyzed the phenomenon of intimacy as spectacle in contemporary cultures, examining how social networks have transformed the display of private life into an ordinary cultural practice. For the author, this displacement implies a reconfiguration of subjectivity, in which existence comes to require public validation in order to acquire meaning. The construction of idealized profiles, of carefully edited life narratives, and of performative identities oriented toward the approval of others transforms experience on social networks into a constant exercise of image management and anxiety about recognition.

Twenge (2017) examined longitudinal data on subjective well-being and mental health of North American adolescents, observing that from the mid-2010s — coinciding with the massive adoption of smartphones and social networks — indicators of well-being and mental health worsened among adolescents, with effects more pronounced among girls. The author proposes that intensive use of image-based networks may contribute to this decline through mechanisms of social comparison, exposure to cyberbullying, and sleep deprivation. The relationship, however, is correlational, and Twenge herself recognizes that other factors — such as academic pressures, changes in family dynamics, and economic insecurity — operate simultaneously and make it difficult to isolate the specific contribution of social networks.

Haidt (2024) deepened this argument, describing what he calls a reconfiguration of childhood and adolescence brought about by the spread of smartphones and social networks since 2012, and associating this transformation with increases in indicators of

depression, anxiety, and self-injury among adolescents in several high-income countries. Haidt argues that the social nature of human beings — particularly of adolescents in the process of identity formation — makes them particularly vulnerable to environments that amplify the pursuit of approval and constant public exposure.

However, Haidt's strong thesis is subject to significant contestation in the specialized literature. Orben and Przybylski (2019), in an analysis of large databases involving more than 350,000 adolescents in three countries, found a negative association between digital technology use and adolescent well-being, but with a very small effect size — explaining, according to the authors, at most about 0.4% of the variation in young people's well-being. The researchers pointed out that this effect is comparable in magnitude to factors such as regular eyeglasses use or regular potato consumption, which suggests substantial caution in translating statistical findings into strong causal narratives. Odgers and Jensen (2020), in a critical review published in the Journal of Child Psychology and Psychiatry, argue that public fears about the impact of digital technologies on adolescent mental health frequently exceed what the available empirical evidence permits affirming, and they advocate research agendas with greater methodological care — attention to longitudinal designs, refined measures of use, and investigation of vulnerable subgroups.

This controversy does not invalidate concern about the possible impacts of social networks on youth development, but it does require more cautious formulations. It is more academically defensible to affirm that there are statistically significant associations, with frequently small effect sizes, between intensive use of image-based social networks and indicators of emotional distress in specific subgroups — especially adolescent women — than to sustain a generic causal thesis about an integral generational reconfiguration. The literature also suggests that heterogeneous effects coexist: active use of networks for the maintenance of social ties can have protective effects, whereas passive, comparative, and prolonged-immersion use tends to be associated with negative outcomes.

The illusion of reality produced on social networks is an additional element of this dynamic. Image filters, careful editing of moments, selective public display of achievements, and systematic concealment of difficulties and failures produce an environment in which others' lives consistently appear more attractive, successful, and happy than one's own. The intellectual awareness that networks show edited versions of

reality is not sufficient to attenuate the emotional impact of comparison: the affective processing of visual and social information can operate relatively independently of rational judgment, especially in adolescents whose executive control systems are still in the process of maturation.

Han (2018) analyzes social networks as spaces of coercive transparency, in which exposure replaces deep communication and visibility becomes an imperative. For the author, this logic does not deepen relationships but impoverishes them, replacing genuine otherness with the surface of the profile and experience with spectacle. Turkle (2011, 2015) documents ethnographically how adolescents and young adults — paradoxically more connected than any previous generation — report feelings of loneliness, difficulty dealing with silence, and inability to sustain deep in-person conversations. In a complementary experimental investigation, Przybylski and Weinstein (2013) demonstrated that the mere visible presence of a mobile device during an in-person conversation reduces the perceived quality of the interaction, the feeling of connection, and empathy between interlocutors, with effects more pronounced in conversations about personally meaningful topics. This study offers specific experimental evidence for one of Turkle's main qualitative theses on the impact of devices on contemporary sociability.

6 YOUTH, BRAIN DEVELOPMENT, AND PSYCHOSOCIAL SENSITIVITY

Childhood and adolescence are periods of intense brain plasticity, in which environmental experiences exert significant influence on the development of neural structures and functions. The neuroscience of adolescent development has, in the last decade, accumulated important contributions to the understanding of this stage. Casey, Jones, and Hare (2008), in a review on the adolescent brain published in the Annals of the New York Academy of Sciences, describe a pattern of asymmetric development in which subcortical systems associated with reward and emotional reactivity — including regions such as the ventral striatum and the amygdala — reach greater functional reactivity before the full maturation of the prefrontal regions responsible for executive control, planning, and behavior regulation. This developmental mismatch helps explain why adolescents tend to display greater sensitivity to immediate incentives, social

rewards, and risk situations, especially in contexts of high emotional load or the presence of peers.

Steinberg (2008), in a convergent formulation, proposes a social neuroscience perspective applied to adolescent risk, arguing that the decision-making pattern typical of this stage results from the interaction between an early-maturing socioemotional system, highly sensitive to rewards and social contexts, and a cognitive control system of late maturation. This configuration does not constitute a deficit or dysfunction but rather a developmental characteristic that fulfilled adaptive functions throughout human evolutionary history — favoring exploration, autonomy, and the formation of social bonds outside the family nucleus. The point, however, is that this same configuration makes adolescents particularly sensitive to digital environments whose design relies precisely on the circuits of social reward and peer approval, at times of the day when executive control is cognitively overloaded or fatigued.

These neurodevelopmental contributions converge with contemporary sociological arguments such as that of Haidt (2024), without being identical to it: while Casey, Jones, and Hare (2008) and Steinberg (2008) describe general neurobiological mechanisms of adolescent development, Haidt formulates a specific historical-cultural thesis about the interaction between these mechanisms and the digital platforms that emerged from the 2010s onward. The first layer of argumentation has robust empirical neuroscientific support; the second remains, as discussed in the previous section, the object of relevant methodological contestation. It is important not to confuse the two levels: the differentiated neurobiological sensitivity of adolescents is a well-established fact; its translation into a specific crisis caused by smartphones is a sociocultural hypothesis still in dispute.

Erikson (1976) described adolescence as the central period of identity formation, marked by the tension between the consolidation of the self and the diffusion of roles. The search for belonging, recognition, and identity definition is constitutive of this stage, and social networks offer a space of experimentation that can be both fertile and disorienting. The construction of digital profiles, the curation of self-presentation, and constant exposure to public evaluation insert adolescent identity formation into an environment of intensified visibility, in which the gaze of others acquires unusual weight

and the boundaries between authenticity and performance become progressively more tenuous.

Desmurget (2019) argues, based on reviews of literature on child and adolescent development, that young children are especially vulnerable to the effects of excessive screen use because they are in critical phases of the development of language, attention, social cognition, and emotional regulation. The World Health Organization (2019), in its guidelines for children under five years old, specifically recommends that children under one year old have no sedentary screen time; that children aged one to two have no sedentary screen time, with up to one hour of screen time per day being acceptable for two-year-olds, although less is better; and that children aged three and four have no more than one hour of sedentary screen time per day. These recommendations recognize the potential impact of excessive use on motor, cognitive, and social development in early childhood. The available evidence is generally more consistent for young children than for adolescents, and the literature on adolescence frequently documents associations — but not clearly established causal links — between screen use and specific negative outcomes.

It is not possible, however, to treat youth as a homogeneous bloc. Conditions of access, family context, schooling, socioeconomic conditions, the quality of adult mediation, and individual characteristics produce very distinct experiences with the same technologies. Young people in families with greater cultural and economic capital tend to have more resources to regulate their own use, more adults available for mediation, and to use technologies in more active and creative ways. Young people in contexts of greater social vulnerability frequently have less supervision, more exposure to inappropriate content, and less access to enriching alternatives to passive screen use. This means that the effects of hyperexposure are not distributed equally but follow, to some extent, the lines of preexisting social inequalities. An analysis that ignores this dimension is not only analytically insufficient but also potentially unjust in holding individuals responsible for structural conditions that are beyond their control.

7 ACCELERATION, LOSS OF PRESENCE, AND IMPOVERISHMENT OF EXPERIENCE

One of the dimensions less frequently investigated systematically — but widely reported in clinical, educational, and everyday contexts — is the subjective sensation that time passes without being truly lived. Young people and adults describe, with growing frequency, the experience of looking back and being unable to recall what they did, with whom they spent time, or what they felt during significant periods of their lives — periods often occupied by intense and fragmented digital consumption.

Bauman (2001) described liquid modernity as an era marked by acceleration, fluidity, and the impossibility of fixing stable experiences. Permanent connection to digital networks deepens this liquefaction: attention, when fragmented into multiple simultaneous and brief stimuli, loses the capacity to dwell on an experience, to inscribe it in memory with depth, and to construct narratives of meaning from it. The result, according to this perspective, is an experience of time marked by speed and discontinuity, in which the accumulation of stimuli does not amount to the accumulation of meaningful experience.

Han (2015) formulates this problem in precise philosophical terms: the burnout society is also a society of distraction, in which the inability to contemplate and rest produces a peculiar form of emptiness. The contemporary hyperconnected subject is saturated with information and stimulation but may find himself impoverished in experience. Incessant scrolling, the consumption of content at growing speed, compulsive switching between applications, and the permanent checking of notifications produce a state of chronic dispersion that tends to be incompatible with the concentration necessary for deep experience — be it aesthetic, intellectual, relational, or simply present-focused.

Turkle (2015) documents how the presence of devices qualitatively alters human in-person interactions. In family, educational, and social contexts, the mere fact of a device being on the table — even without being used — can reduce conversation quality and the depth of perceived connection between participants, an observation experimentally corroborated under controlled conditions by Przybylski and Weinstein (2013). The so-called continuous partial attention, the state in which the subject never fully engages in any activity because part of his cognition is always monitoring the device,

tends to become, in environments of high exposure, a habitual way of inhabiting the world, with consequences for the quality of relationships, learning, and subjective experience.

In the Brazilian context, Costa *et al*. (2026) examine convergent themes by analyzing how hyperconnectivity reconfigures technological mediations, relational bonds, and the place of pedagogical presence in contemporary schooling — concerns that acquire particular relevance in inclusive education settings, where the qualitative dimensions of presence, relationship, and attentive encounter are central to learning and to the integral development of children and adolescents.

The memory lapses reported by young people exposed to intensive screen use deserve, in this context, a plural interpretation. They may result from insufficient attention during the encoding of experience, from fragmented sleep that impairs mnemonic consolidation — a relationship for which Chang *et al*. (2015) and Carter *et al*. (2016) offer relevant empirical anchoring — from informational overload that compromises the selection and retention of relevant stimuli, or from the simple substitution of in-person experiences with passive digital consumption that, by its very nature as a fragmented flow, leaves no lasting mnemonic traces. None of these explanations requires postulating permanent neurological damage, which does not diminish the relevance of the phenomenon for the quality of experience and autobiographical memory.

This dimension has implications that go beyond the neuropsychology of memory. The construction of the sense of self, of personal narrative, and of identity continuity depends on the capacity to accumulate and integrate experiences over time. When daily life is lived in a mode of permanent dispersion, experience tends to fragment into disconnected episodes that resist narrative integration. This is, above all, an interpretive hypothesis of a phenomenological nature, which would require specific empirical investigation, but which dialogues with recurrent observations in contemporary clinical and educational contexts.

8 EDUCATIONAL IMPLICATIONS, THE BRAZILIAN CONTEXT, AND THE LEGAL FRAMEWORK

The school, as an institution, was historically conceived in an environment of sustained attention, linear progression of knowledge, and delayed reward. Students were called to tolerate cognitive effort, to postpone gratification, and to build competencies in a cumulative and slow manner. This model, already challenged by multiple social and cultural transformations prior to the advent of the digital, today faces an additional and qualitatively distinct pressure: the need to engage the attention of subjects accustomed to environments of intense stimulation, immediate reward, and rapid transitions between contents.

This does not mean that the school should abandon depth in favor of the spectacularization of teaching. Rather, it means that the school must develop pedagogical strategies that recognize the cognitive and cultural context of students without capitulating to the most impoverishing logics of this environment. The formation of subjects capable of concentration, deep reading, critical thinking, frustration tolerance, and engagement with complex problems is, paradoxically, more necessary and more difficult than in previous generations. The role of teachers in this context is central and demanding. Teachers must not only understand digital technologies but also develop a capacity for critical reflection on their uses, impacts, and limitations, integrating this repertoire into pedagogical practice in a non-naive manner. Buckingham (2003) argues that media education does not consist of teaching children to use technologies — something they often already do with ease — but of developing critical skills of reading, analysis, and media production, enabling them to understand the interests, choices, and effects of the digital environments they inhabit.

In the Brazilian debate, the growing platformization of teaching adds further complexity to the discussion on teacher mediation. Mendes *et al.* (2026) analyze the platformization of education as a phenomenon that simultaneously offers pedagogical potential and poses risks of massification within digital culture, situating qualified teacher mediation as a critical safeguard against the impoverishment of educational practice — an analysis particularly relevant when read alongside the broader concerns about engagement architectures and the attention economy discussed in this article.

In the family field, the question is equally complex. Holding parents exclusively responsible for the use their children make of screens disregards relevant structural factors: the reduced presence of adults in everyday family life due to extensive working hours, inequalities in access to information about the risks of excessive use, the absence of public policies to support families, and the fact that the technologies themselves are designed to maximize engagement regardless of users' will. Nevertheless, parental mediation — understood as the capacity of adults to set limits, dialogue about the content consumed, and model healthy habits of technology use — is consistently pointed out by the literature as a relevant protective factor (Boyd, 2014). When present and qualified, it can mitigate the risks associated with excessive use and enhance the benefits of critical and intentional use of digital technologies.

Although the literature mobilized in this article is predominantly of international origin, it is important to situate the debate within the Brazilian context, marked by relevant demographic, socioeconomic, and regulatory particularities. The TIC Kids Online Brasil survey, conducted regularly by the Brazilian Internet Steering Committee (CGI.br), constitutes an empirical reference for understanding internet use among children and adolescents in the country. According to the 2023 edition, it is estimated that 95% of people aged 9 to 17 in Brazil are internet users, with 97% accessing the network primarily through portable devices (Brazilian Internet Steering Committee, 2024). The data also indicate that 24% of respondents began connecting to the network in early childhood, by the age of six, and that 88% of users aged 9 to 17 had profiles on social networks, a percentage that reached 99% among young people aged 15 to 17. These figures highlight the centrality of digital environments in the everyday experience of contemporary Brazilian youth and the precocity of contact with platforms designed for adult users.

These data, however, are not homogeneously distributed across the national territory. The same survey indicates that the mobile phone constitutes the only means of internet connection for around 20% of respondents aged 9 to 17, a proportion that rises to 38% among those belonging to classes D and E of the Brazilian socioeconomic classification (Brazilian Internet Steering Committee, 2024). While 71% of children and adolescents in classes A and B also access the internet by computer, this proportion falls to 15% in classes D and E. Such asymmetries have relevant implications for the Brazilian

debate on screen hyperexposure. For a significant portion of Brazilian youth, the smartphone is not merely an entertainment device but the primary — sometimes exclusive — infrastructure for accessing information, communication, remote school work, and public services. Discussions of screen time and use regulation in Brazil cannot, therefore, ignore these inequalities, lest they produce simultaneously elitist and ineffective prescriptions. A Brazilian response to the phenomenon must articulate, in indissociable fashion: restriction when pertinent, expansion of critical digital literacy, guarantee of plural access infrastructure, and confrontation of the socioeconomic conditions that make the mobile phone, for many young people, the only available window onto the digital environment.

On the normative plane, Brazil has a relevant framework for the protection of children and adolescents in the digital environment, even though its effective application remains challenging. The Brazilian Statute of the Child and Adolescent (Brazil, 1990) enshrines the doctrine of integral protection and imposes duties shared by the family, society, and the State. The General Data Protection Law (Brazil, 2018a), in its article 14, establishes that the processing of personal data of children and adolescents must be carried out in their best interest, requiring specific and prominent consent from parents or guardians for the processing of children's data. The Brazilian National Common Curricular Base (Brazil, 2018b), in turn, includes Digital Culture among the ten general competencies of basic education, foreseeing the formation of students to use, create, and disseminate information with criticality, ethics, and responsibility. This normative set offers a basis for educational and regulatory policies that articulate protection, the development of competencies, and respect for the progressive autonomy of subjects in formation.

In January 2025, Brazil took a recent and relevant regulatory step with the sanction of Law No. 15,100, of January 13, 2025, which restricts the use of personal portable electronic devices — including mobile phones — in public and private establishments of basic education. The law prohibits the use of such devices during classes, recess, and intervals at all stages of basic education — early childhood, elementary, and secondary education — with exceptions for pedagogical purposes authorized by the teacher, accessibility conditions, health situations, and guarantee of fundamental rights (Brazil, 2025). It is an initiative that fits within a broader international trend of regulating the use

of digital devices by children and adolescents in educational contexts, with declared grounds in the protection of students' mental, physical, and psychic health and in the promotion of a school environment more conducive to concentration, in-person interaction, and learning.

The effectiveness of this legislation will, however, depend on factors that extend beyond the legal text and that will still require empirical evaluation in the coming years. Effective implementation requires a pedagogical agreement built with the school community, teacher training to articulate the restriction with critical media education practices, informed dialogue with families, and follow-up mechanisms that avoid both a punitive tone and the abandonment of compliance with the norm. There are, moreover, dimensions that the restriction in itself does not resolve: domestic screen use, frequently longer and less mediated than school use; access to inappropriate content at times and contexts beyond the school's reach; and the configuration of the platforms' algorithms and interfaces themselves, which demands regulation on a larger scale — encompassing product design, behavioral advertising directed at minors, and the responsibility of technology companies. The Brazilian law, in this sense, is best understood as an initial component of a broader policy of digital protection of children and adolescents, not as an isolated solution to the phenomenon examined in this article.

9 PLATFORM RESPONSIBILITY, REGULATION, AND CRITICAL DIGITAL EDUCATION

To examine screen hyperexposure without considering the responsibility of digital platforms would be analytically incomplete and politically mistaken. The architectures of engagement do not emerge spontaneously from user behavior: they are designed by specialized teams with the explicit objective of maximizing use time and return frequency. Zuboff (2019) demonstrates that this model is not a neutral consequence of technological development but a political and economic choice that could be regulated, limited, or redirected by public intervention.

The discussion on the regulation of digital platforms has gained increasing intensity in several countries, especially concerning the protection of children and adolescents. Regulatory proposals range from prohibiting certain persuasive-design

functionalities directed at minor users — such as infinite scroll and autoplay — to requiring transparency about the functioning of recommendation algorithms, including restrictions on behavioral advertising directed at children and adolescents and the obligation to conduct impact assessments on the well-being of young users. Haidt (2024) is emphatic in arguing that individual and family changes, although necessary, are insufficient without structural transformations in the business models of platforms and in the regulatory structures that govern them. This argument, although contested in its strongest version, has found echo in recent regulatory initiatives in several jurisdictions, including, in the Brazilian case, Law No. 15,100/2025 directed at the school environment.

The notion of critical digital education, developed by authors such as Buckingham (2003), refers not to training in technical skills of technology use but to the development of an analytical and reflective competence that enables subjects to understand how digital media function, identify the interests that structure them, critically evaluate the contents circulating in them, and make informed choices about their own use. This competence does not form spontaneously through immersion in the digital environment: it requires intentional educational mediation, spaces for collective reflection, and adult models that exemplify it.

Lemos (2002) argued that cyberculture is neither inherently alienating nor inherently emancipatory: its effects depend on the forms of social appropriation, the conditions of access, the competencies of users, and the policies that regulate it. This perspective suggests that the problem of screen hyperexposure does not admit a simple technical solution — such as the indiscriminate prohibition of devices or the blocking of platforms — but requires an approach that combines public regulation, critical education, family mediation, and the promotion of enriching alternatives.

The healthy and balanced use of digital technologies presupposes, among other conditions, the existence of concrete alternatives that offer forms of experience, relationship, and pleasure not mediated by screens. The valuation of face-to-face time, of physical activities, of reading, of the arts, of free play, of community involvement, and of adequate sleep is not a moralistic imperative but a developmental necessity that contemporary societies have systematically neglected in favor of technological entertainment solutions that meet the economic interest of platforms more than the integral needs of children and young people. It is not, therefore, a question of

technological morality but a question of public health, human formation, and social justice. The responsible answer to the problem lies neither in moralism nor in neglect, but in the combination of effective regulation, critical education, qualified mediation, and the creation of social and cultural conditions so that children and young people can develop relationships with technologies that are at once informed, autonomous, and oriented toward human flourishing.

10 FINAL CONSIDERATIONS

The examination of screen hyperexposure as a cultural, educational, psychological, and political phenomenon reveals a reality that resists both simplistic condemnation and analytical indifference. The problem is not technology itself, nor devices as objects, nor even the fact that children and young people inhabit digital environments. The problem, strictly delimited, is excessive, passive, unregulated use oriented toward the maximization of engagement, which takes place in a specific economic context: that of surveillance capitalism, which profits from continuous engagement and which designs interfaces deliberately oriented to maximize it, frequently without sufficient consideration for the well-being of its youngest and most sensitive users.

The hypothesis developed throughout this article — that screen hyperexposure represents a reorganization of everyday experience mediated by algorithms, variable rewards, social comparison, and cognitive dispersion — finds support in a significant portion of the interdisciplinary literature consulted, although with different degrees of empirical robustness in each of its axes. Behavioral psychology, since Ferster and Skinner (1957), offers a solid basis for understanding the schedules of intermittent reinforcement incorporated into the design of platforms. The neuroscience of adolescent development, as systematized by Casey, Jones, and Hare (2008) and Steinberg (2008), points to the specific neurobiological sensitivity of this stage of development. Behavioral neuroscience emphasizes the effects of intermittent reinforcement and the overstimulation of reward systems. The sociology of digital culture dismantles the illusion of the neutrality of platforms and their business models. Empirical studies on sleep and digital devices (Chang *et al*., 2015; Carter *et al*., 2016) offer relatively robust evidence for one of the

most documented relationships in the field. On the other hand, the relationships between social media use and adolescent mental health, although statistically detectable, appear to operate with frequently small effect sizes (Orben; Przybylski, 2019; Odgers; Jensen, 2020), requiring caution in causal formulations.

It is necessary, therefore, to resist two symmetrical and equally problematic errors. The first is technological determinism, according to which screens inevitably produce negative effects on all young people, regardless of context, type of use, mediation, and individual characteristics. The second is analytical neglect, according to which there is no reason for concern because youth has always adapted to new technologies and the benefits outweigh the risks. Both positions are inadequate to the complexity of the phenomenon. What the literature permits us to affirm, with scientific responsibility, is that there are real risks, that these risks vary according to specific conditions, that certain groups appear more vulnerable, and that the absence of adequate responses — at the individual, family, school, institutional, and regulatory levels — is unjustifiable given what is already known.

The implications of this examination are multiple. For education, they point to the need for teacher training that includes the critical digital dimension, curricula that value deep reading and reflective thinking, and pedagogical practices that cultivate sustained attention as a fundamental competence. For families, they suggest that qualified mediation, built through dialogue and not only through restriction, tends to be more effective than purely prohibitive strategies, and that attentive adult presence is irreplaceable. For public policies, they indicate the urgency of regulating digital platforms, especially with regard to the design of interfaces aimed at children and adolescents, behavioral advertising, and algorithmic transparency — an agenda in which Brazil has taken a recent step with Law No. 15,100/2025, although other dimensions of child and youth digital protection await normative development and attention to the digital inequalities that pervade the country. For mental health, they signal the need to integrate the digital dimension into the care of children and young people, without pathologizing the use of technologies but recognizing their potential effects on sleep, self-esteem, anxiety, and the quality of relationships.

It is recognized, as a central limitation of this study, that no systematic review, meta-analysis, or direct empirical analysis was conducted. Its conclusions should

therefore be understood as an interpretive and critical synthesis of selected literature, not as a causal demonstration. The critical-essayistic approach, although epistemically legitimate for organizing a field of debates marked by partial evidence and disputed interpretations, does not replace high-quality empirical longitudinal studies that can establish, with greater precision, the causal relationships between different patterns of digital technology use and different cognitive, emotional, and social outcomes. Future research would benefit from designs that contemplate different age groups, diverse socioeconomic conditions, different types of use, and follow-up periods sufficiently long to capture cumulative effects, as well as empirical evaluations, in the Brazilian context, of the pedagogical and psychosocial effects of the implementation of Law No. 15,100/2025.

Life mediated by screens is already the condition of contemporary childhood and adolescence. The question that arises is not how to eliminate this mediation — a task as naive as it is unfeasible — but how to build social, educational, and political conditions for it to occur in a more conscious, balanced, critical manner, oriented toward integral human development. This is a task that requires more than good will: it requires knowledge, shared responsibility, and the political will to confront economic models that compete, with high technical efficiency, for the attention of the youngest generations.

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