Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

How Widespread is Prolonged Digital Device Usage and Its Link to Delays in Development among Young Children from Six Months Through Five Years of Age

1.Dr Nabila Ansari, 2.Dr Ashvini Kumar Verma, 3.Dr Richa Yadav

1Junior resident, Dept of Pediatrics, IIMSR, Lucknow

2Professor, Dept of Pediatrics, IIMSR, Lucknow

3Assistant Professor, Dept of pediatrics, IIMSR, Lucknow

Corresponding authors-

Dr Ashvini Kumar Verma

(Received: 25 November 2025 Revised: 27 December 2025 Accepted: 11 January 2026)

KEYWORDS

Digital Device

ABSTRACT:

The overuse of digital platforms during the earliest years of life has emerged as a significant concern for public health worldwide. Our examination synthesized research from epidemiological studies and clinical investigations regarding how frequently young children between six months and five years encounter digital screens, and how this exposure correlates with their developmental progress. Database searches through PubMed, Scopus, and Google Scholar extending to December 2025 located observational research and experimental investigations evaluating duration of digital device usage or excessive utilization (typically exceeding one hour daily) alongside developmental markers. Worldwide statistical analysis reveals minimal compliance with established screen-time recommendations; merely around 25 percent of infants below two years and 36 percent of children between two and five years adhere to suggested limits. Prolonged digital exposure demonstrates consistent links to diminished expressive communication abilities, limited vocabulary acquisition, compromised cognitive function, delayed motor skill development, and impaired social-emotional maturation. Studies tracking children over time reveal clear patterns where increased exposure produces greater negative effects; specifically, digital device usage of four hours or more daily at twelve months significantly elevates the likelihood of communication difficulties and problem-solving impairments at both two and four years. Significant influencing elements encompass the child's age, the quality of digital content consumed, whether parents watch alongside their children, and various socioeconomic circumstances. Our discussion encompasses current recommendations and prevention approaches, identifies limitations in existing research, and suggests pathways for subsequent investigations.

1 Background

The earliest years of childhood represent a critical window of accelerated brain maturation, during which neurological pathways supporting communication, thinking abilities, physical coordination, and emotional-social competence become established. Throughout the initial three to five years of existence, young children need abundant sensory stimulation, attentive caregiver engagement, and opportunities for active physical exploration to reach appropriate developmental benchmarks. Throughout the past twenty years, digital technologies—including televisions, mobile phones, touchscreen tablets, and personal computers—have proliferated extensively. During 2010, merely half of American toddlers consistently interacted with electronic devices; however, by 2016, approximately ninety-five percent of infants below two years had encountered screens, with typical first contact occurring at **four months of age** [1]. Caregivers frequently employ screens as calming tools, for purportedly educational applications, or to keep children occupied during other activities. The global COVID-19 health crisis substantially amplified dependence on digital technologies, as movement restrictions resulted in increased indoor confinement and distance-based education.

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

Numerous professional medical associations have published recommendations to restrict early digital exposure. The American Academy of Pediatrics (AAP) advises against all screen usage excluding video communication for infants below eighteen months, suggests premium educational material with parental co-viewing for children eighteen through twenty-four months, and restricts digital time to **no more than one hour daily** for children aged two through five years [2]. The World Health Organization and various national pediatric organizations similarly recommend zero screen exposure for newborns and a one-hour maximum for young preschool children [3]. Notwithstanding these guidelines, research surveys indicate substantial levels of digital device usage among infants and young preschoolers. Premature and prolonged exposure substitutes for physical movement and interactive activities, potentially influencing brain adaptability. Research through observation connects digital media to numerous detrimental consequences including weight gain, disrupted sleep patterns, shortened concentration abilities, communication delays, intellectual impairment, and social-emotional challenges [4]. Nevertheless, certain educational content and interactive applications might offer learning benefits when utilized thoughtfully, and research findings have shown variability across different developmental areas.

This examination consolidates worldwide research regarding the frequency of digital screen exposure among children between six months and five years of age and assesses its relationship with developmental delays. We outline conceptual frameworks, approaches to measurement, and theoretical constructs connecting media consumption and developmental progress. Information regarding frequency derives from population surveys, tracking studies following children over time, and comprehensive statistical analyses. Relationships with intellectual, communication, physical, and social-emotional achievements are examined individually, emphasizing patterns showing increasing harm with greater exposure and the impact of content characteristics, shared viewing, and socioeconomic circumstances. Present guidelines and actionable approaches for caregivers and medical professionals undergo review, succeeded by recognition of research limitations and priorities for future investigation. In general, we intend to furnish medical practitioners, investigators, and policy developers with thorough comprehension of available evidence to guide prevention efforts and early support initiatives.

2 Theoretical Framework and Terminology

2.1 Understanding screen time

Digital screen exposure indicates the duration spent engaging with electronic visual interfaces including televisions, mobile phones, touchscreen tablets, personal computers, or gaming systems. This encompasses both inactive observation (such as viewing television programs or online videos) and active engagement (such as learning applications or video games). Ambient screen presence happens when devices operate within the surroundings without focused attention; this situation can nonetheless diminish caregiver-child exchanges and distract young children. Certain classification systems distinguish between **educational** or **superior-quality** material (deliberately paced, prosocial programming) and **recreational** material (rapidly paced cartoons, aggressive games). Assessment techniques incorporate caregiver-documented records, organized questionnaires, and electronic device tracking. While objective assessment methods yield more precise calculations, the majority of investigations depend on parental documentation, which frequently underestimates genuine usage. Active screen interactions (where children participate with material) and passive experiences (where children receive content without participation) might produce distinct developmental consequences, with interactive educational technology potentially offering certain cognitive advantages [5].

2.2 Defining excessive screen time

The characterization of "excessive" varies according to different guidelines and age categories. The World Health Organization and American Academy of Pediatrics suggest eliminating screen exposure (beyond video communication) for infants below two years and restricting usage to maximum one hour each day for ages two through five [6,7]. Consequently, digital exposure surpassing these parameters may be deemed excessive. Certain investigations employ higher thresholds (for instance, two hours or more daily) whereas others treat digital time as a continuous

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

measurement. "Excessive use" might additionally include premature age of introduction (prior to twelve through eighteen months) and unmonitored usage.

2.3 Understanding developmental delay

Delays in development indicate substantial lags in accomplishing age-suitable milestones across one or multiple areas—intellectual, communication, physical, or social-emotional domains. Validated assessment instruments including the Ages & Stages Questionnaire (ASQ-3), Bayley Scales for Infant Development, Denver Developmental Screening Test, MacArthur-Bates Communicative Development Inventories, and the Trivandrum Developmental Screening Chart (TDSC) are frequently utilized for evaluating these domains. The TDSC represents an uncomplicated age-linked milestone instrument created in India and finds widespread application in community-level screening and clinic environments, especially in settings with limited resources. Developmental delays frequently receive definition as performance scores two or more standard deviations beneath the average for a specific age category. Certain investigations categorize delays according to caregiver-expressed concerns, whereas others utilize organized clinician-conducted evaluations.

2.4 Conceptual models connecting screen time and development

Multiple mechanisms have received proposals. The **displacement theory** suggests that digital screen exposure substitutes for essential experiences including caregiver communication, physical exploration, and interactive play, resulting in diminished language exposure and reduced physical skill practice. **Excessive stimulation** theory proposes that rapidly changing audiovisual content might reduce attention duration and disturb arousal regulation systems, impeding sustained concentration and higher-order thinking. The **interactive learning** framework highlights that knowledge acquisition from technology requires adult participation and responsive engagement; absent such guidance, inactive viewing provides minimal educational benefit [8]. For physical development, digital usage encourages inactive behavior, decreasing opportunities for both large-scale and fine motor practice. Social-emotional consequences might stem from reduced caregiver engagement and amplified contact with inappropriate material.

3 Review Methodology (approximately 200 words)

We executed a narrative examination of investigations published in English spanning 1999 through December 2025. Database searches occurred across PubMed, Scopus, and Google Scholar employing various combinations of terminology including "screen time,""digital media,""television,""smartphone,""tablet,""child,""infant,""preschool,""toddler,""development,""language,""cognitive,""motor," and "social-emotional." Bibliography lists from pertinent articles and contemporary reviews underwent examination for supplementary investigations. Requirements for inclusion were: (1) subjects aged six months through five years; (2) exposure characterized as digital screen duration or frequency of exceeding guidelines; (3) results incorporated developmental assessments; (4) observational or experimental methodology. Investigations concentrating on older children or exclusively physical health results (such as visual problems) faced exclusion. Given heterogeneity in research methodology, we refrained from conducting systematic statistical meta-analysis but instead synthesized discoveries qualitatively. Research quality underwent evaluation based on participant numbers, assessment techniques, tracking studies compared to snapshot designs, and adjustment for confounding variables. Statistical prevalence calculations from meta-analyses received documentation when accessible [9]. For individual developmental areas, discoveries underwent consolidation once to prevent replicating investigation information.

4 How Common is Screen Time Exposure

4.1 Worldwide frequency and comprehensive analyses

The most exhaustive calculations originate from a 2022 methodical examination and comprehensive analysis that combined information from ninety-five investigations involving 89,163 children under five years. The researchers documented that merely **24.7 percent** (95% Confidence Interval 19.0–31.5%) of children younger than two years adhered to the recommendation of zero digital time. For children between two and five years, **35.6 percent** (95% Confidence Interval 30.6–40.9%) satisfied the guideline of one hour or less daily. Moderator examinations

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

revealed that adherence to established guidelines proved superior in investigations employing questionnaires compared to structured conversations and when digital usage incorporated a mixture of technologies instead of television exclusively. Adherence to guidelines demonstrated modest improvement over temporal progression, yet generally merely a small proportion of young children follow recommendations [9].

4.2 Geographic studies

India: Within a community-level population survey conducted in Tamil Nadu (participant count = 1,000), average digital exposure measured **2.39 hours daily**, and seventy-three percent of children below five years surpassed the one-hour-per-day recommendation. Prolonged digital exposure demonstrated robust correlation with developmental impairments, especially regarding communication and language abilities, with modified probability ratios reaching **52.92** for communication delay in children two years or older [10]. A population survey of 379 young preschool children in countryside Western India documented average digital exposure of **2.7 hours daily**, with merely **17 percent** satisfying AAP recommendations, and mobile phone contact by three years for the majority of children. Beyond four among five children surpassed suggested thresholds, and contributing elements incorporated older age, increased household technology availability, caregiver mobile phone utilization, and consuming meals while viewing television [11]. An additional Indian investigation (Akola region) not accessible here documented ninety-five percent of newborns experiencing digital exposure with average digital duration of 100 minutes daily.

China: A monitoring investigation conducted in real-time in Shanghai observed 240 children between zero and thirty-six months employing wearable recording devices and caregiver documentation. Merely **35.6 percent** satisfied the one-hour daily recommendation, and average digital exposure surpassed 60 minutes daily. Non-educational content, rapidly presented or animated material demonstrated correlation with diminished ASQ-3 performance across comprehensive and precise motor abilities. The investigation determined that digital contact exceeding one hour daily and contact with non-educational material demonstrated consistent association with developmental impairments [12].

Peru: A population snapshot investigation of 1,800 young preschoolers in Lima discovered that **74 percent** exceeded the suggested television digital duration and **37 percent** exceeded electronic technology usage. Prolonged digital exposure demonstrated correlation with elevated household prosperity and maternal digital utilization [13].

Wealthy nations: The Canadian participant group employed in the worldwide comprehensive analysis documented that before the COVID-19 health crisis, children below five years utilized approximately twenty-five percent of their conscious hours engaging with digital screens [14]. United States information from the ABCD investigation indicates that zero-to-two-year-old children utilized on average 2.4 hours daily on digital screens, with sixty percent employing mobile technologies. European research similarly document substantial frequency of premature contact and failure to follow guidelines, although precise numbers differ. The substantial frequency of digital utilization across varied environments demonstrates worldwide technology infiltration and highlights the requirement for situation-specific approaches.

4.3 Patterns related to age and trends

Digital contact escalates quickly with increasing age. In Western India, merely ten children (three percent) experienced zero digital exposure on regular days, and approximately half of caregivers began screen exposure before age two. Numerous newborns encounter television exposure starting at three months forward. Data indicate that regular days experience elevated digital duration (3.5 hours compared to 2.7 hours on rest days). Older young preschoolers (four through six years) demonstrate increased probability compared to younger children to experience substantial digital duration, whereas females might experience moderately elevated contact compared to males. Mobile phones and television represent the predominant sources of digital exposure, and children frequently employ technologies for viewing videos or engaging in games [15,16]. Caregiver mobile utilization, quantity of technologies, and employing digital screens during food consumption represent robust indicators of prolonged contact. Socioeconomic associations (elevated income,

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

unmarried parenthood, maternal occupational status) differ across environments yet consistently affect digital patterns.

5 Screen Time and Intellectual Development

Intellectual maturation includes concentration, memory retention, higher-order thinking abilities (cognitive memory, mental adaptability, restraint), and analytical reasoning. Research connecting digital exposure to intellectual results presents inconsistency yet indicates harmful consequences at substantial levels.

5.1 Tracking and snapshot investigations

Tracking information proves especially revealing. The Japanese population study (TMM BirThree) observed 7,097 children and assessed digital exposure at twelve months alongside developmental results at two and four years [17]. Following modification for demographic characteristics, digital duration of four hours or more at twelve months indicated substantially elevated probability for higher-order thinking deficits (modified probability 4.78 at age two and probability 2.68 at age four) and analytical reasoning impairment (modified probability 2.67 at age two and probability 1.91 at age four) when contrasted with exposure below one hour. Clear patterns emerged: exposure of one to two hours daily presented reasonable risk while exposure of two to four hours daily increased risk substantially. The investigation highlighted that developmental impairments demonstrated area-specificity, with comprehensive motor abilities and individual-social competencies affected exclusively at the most substantial contact levels. An additional forward-looking investigation from Singapore (featured in the Frontiers comprehensive review) discovered that digital duration at twelve months indicated diminished oral intelligence and mathematical abilities at 4.5 years. Satisfying digital duration suggestions demonstrated correlation with superior higher-order thinking including restraint abilities and cognitive memory [18].

Population snapshot investigations additionally demonstrate associations. An extensive participant group of **1,016** Serbian young preschoolers evaluated higher-order thinking employing the Developmental Neuropsychological Assessment (NEPSY-II) and discovered **extremely weak inverse associations** between both engaged and inactive digital exposure alongside intellectual adaptability and oral cognitive memory. Despite modest magnitude of consequences, the researchers determined that restricting digital duration below one hour daily of superior-quality material and encouraging active physical movement and intellectual exercise would strengthen higher-order thinking maturation [19]. An additional population snapshot investigation of Chinese children demonstrated that every supplementary hour of digital exposure correlated with diminished analytical reasoning and mathematical performance. In contrast, one tracking investigation referenced in the comprehensive review discovered no substantial correlation between digital utilization at 3.5 years and intellectual maturation measures at 5.5 years, indicating that material characteristics and interaction quality might moderate consequences [20].

5.2 Underlying mechanisms and influencing factors

Suggested mechanisms for intellectual consequences incorporate substitution of intellectually activating pursuits, excessive arousal from swift audiovisual content, and diminished chance for caregivers to support analytical reasoning. Higher-order thinking abilities mature through interactive play, social engagement, and purposeful investigation. Inactive digital observation might diminish these opportunities, whereas interactive educational technology could strengthen intellectual adaptability when employed sparingly and alongside adult supervision. Research demonstrates that shared viewing and content examination reduce harmful consequences and might generate modest beneficial outcomes. Situational elements including socioeconomic position, caregiver education level, and household communication surroundings demonstrate reasonable relationships. Within the Japanese population study, modification for maternal education level and family income reduced certain correlations yet substantial consequences remained. Consequently, policy concentrating exclusively on duration restrictions might neglect significant quality and situational elements.

5.3 Synopsis of intellectual discoveries

Taken together, research indicates that substantial levels of digital contact (exceeding two hours daily) during

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

early childhood and young preschool years correlate with diminished intellectual results. Clear patterns and tracking information reinforce causal relationships. Nevertheless, consequence magnitudes demonstrate general moderation; reasonable utilization (below one hour daily) of superior-quality interactive material with caregiver shared viewing might produce neutral or modest beneficial consequences. Additional investigation remains necessary to establish safe upper limits and recognize protective elements including active physical movement, interactive play, and encouraging parenting approaches.

6 Screen Time and Communication Development

Communication acquisition during early years depends on contact with abundant, attentive oral exchanges. Prolonged digital exposure might reduce caregiver-child communication and diminish chances for children to rehearse expressive communication. Research evidence reveals consistent relationships between substantial digital contact and communication impairments.

6.1 Research from tracking and population snapshot investigations

The Japanese population study referenced previously noticed robust correlations between digital duration at twelve months and impairments in communication at ages two and four. Modified probability ratios escalated in a pattern-dependent fashion (probability 1.61 for exposure of one to two hours daily; probability 2.04 for exposure of two to four hours daily; probability 4.78 for exposure exceeding four hours daily compared to below one hour daily) [17]. Comparable discoveries surfaced from Canadian and United States population studies [21]. A forward-looking community investigation ("Calgary Language and Environment Media and Development") documented that digital exposure at six and twelve months indicated expressive and receptive communication impairments at eighteen months, particularly following modification for maternal education level and household literacy surroundings. Population snapshot examinations among young children demonstrate that every **30-minute escalation** in mobile technology usage correlates with **49 percent elevated probability** of expressive communication delay [22]. An additional investigation discovered that children between seventeen and thirty-six months encountering television demonstrated diminished vocabulary production, whereas those employing touch-screen technologies with caregiver participation acquired new vocabulary more successfully [23]. A population snapshot research from India observed that digital duration demonstrated robust correlation with communication delay, with probability of impairment as substantial as 52.92 in children two years or older [10].

6.2 Consequences of content and situation

Not every form of media proves equivalent. Deliberately paced, story-focused content (such as Sesame Street) can enhance vocabulary acquisition when caregivers watch alongside and examine the material. Interactive applications that promote identification and repetition might additionally strengthen communication acquisition. Conversely, rapidly presented cartoons, non-educational activities, and ambient television demonstrate inverse relationships with communication results [24]. Ambient television diminishes caregiver verbal input and interrupts caregiver-child exchanges. Investigations employing Language Environment Analysis (LENA) recording devices discovered that substantial electronic media contact associated with reduced adult vocabulary, reduced conversational exchanges, and reduced child speech production [25]. The interactive digital screens methodical examination determined that the majority of investigations documented **inverse correlations between** prolonged digital utilization alongside expressive communication and vocabulary acquisition, although certain investigations discovered no substantial correlation when digital utilization demonstrated limitation and shared viewing happened [26]. Consequently, quality and social exchanges significantly modulate consequences.

6.3 Underlying mechanisms and suggestions

Digital utilization substitutes caregiver-child engagement and diminishes immediate feedback crucial for communication acquisition. Newborns acquire vocabulary more successfully from direct social associates compared to video recordings, a occurrence termed the "video limitation"; Adult shared viewing reduces this through supplying identification, supporting, and attentive feedback. Content incorporating child participation and deliberate pacing

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

strengthen imitation. Nevertheless, interactive applications might yet impede communication when they generate more non-verbal exchanges compared to verbal communication or when caregiver participation proves absent. The American Academy of Pediatrics suggests that caregivers examine digital material, select superior-quality content, and observe alongside their children [27]. Promoting reading activities and narrative sharing instead of digital utilization encourages communication-abundant exchanges [28]. Medical practitioners should provide guidance to families regarding these subtleties when examining digital duration.

6.4 Synopsis of communication discoveries

Research consistently indicates that digital duration surpassing one to two hours daily throughout early childhood and childhood correlates with impairments in expressive and receptive communication. Clear pattern associations and tracking investigations strengthen this connection. Nevertheless, reasonable utilization of educational, deliberately paced content with caregiver shared viewing might strengthen vocabulary acquisition, especially among young preschoolers. Considering the swift acquisition of communication during the initial three years, restricting inactive digital contact and encouraging interactive pursuits should remain a focus.

7 Screen Time and Physical Development

Physical maturation incorporates comprehensive motor abilities (ambulating, walking, running, leaping) and precise motor abilities (grasping, sketching, controlling, manipulating items). Engaged active physical activity proves crucial for cultivating muscle power, coordination abilities, and spatial awareness. Prolonged digital duration frequently substitutes active physical movement and might impede achievement of physical milestones.

A 2025 methodical examination consolidated 24 observational investigations regarding digital duration and physical maturation in children below five years [29]. The majority of investigations discovered inverse relationships between increased digital contact alongside precise and comprehensive motor maturation, whereas limited investigations documented no relationship or modest beneficial consequences. For instance, the Canadian population study (participant count = 2,400) discovered that digital exposure at 24 months indicated diminished developmental performance at 36 months [30]. A Chinese population snapshot investigation documented a superior probability of suspected developmental coordination impairment among children viewing digital screens for exposure of one to two hours daily [31]. The Shanghai tracking investigation observed that digital duration exceeding 60 minutes daily alongside contact with non-educational, rapidly presented material correlated with diminished ASQ-3 comprehensive and precise motor performance [24]. In contrast, an experimental investigation discovered that interactive movement-focused video activities could encourage physical coordination and equilibrium when employed temporarily alongside adult guidance, demonstrating that material category matters.

Mechanistically, extended inactive digital utilization diminishes chances for ambulating, walking, and controlling items essential for motor ability acquisition. Precise motor abilities might additionally experience impediment through restricted rehearsal employing drawing implements, manipulation toys, or sketching instruments. Visual concentration directed toward digital screens might restrict investigation of the surroundings. Nevertheless, interactive movement-focused content (such as physical activities) might improve comprehensive motor ability through promoting active physical movement.

Overall, the preponderance of research strengthens a **inverse relationship between** substantial digital contact alongside physical maturation. Caregivers should promote unorganized physical activity, exterior pursuits, and manipulative playthings. Digital utilization should not function as a replacement for caregiver-supervised physical rehearsal. When digital technology proves employed, movement-focused material alongside caregiver guidance might diminish potential harm.

8 Screen Time and Social-Emotional Development

Social-emotional maturation incorporates compassion, emotional control, social engagement, and conduct. Prolonged digital contact can influence these areas through diminished direct social engagement and

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

contact with unsuitable material. Nevertheless, discoveries demonstrate inconsistency.

The comprehensive review by Madigan and associates consolidated investigations examining digital duration and social-emotional results [16]. Multiple population snapshot investigations documented that elevated digital contact correlated with amplified internalizing conduct (nervousness, sadness), externalizing conduct (excessive activity, behavioral difficulties), and social isolation. For instance, a United States population study discovered that young preschoolers viewing exceeding two hours daily experienced elevated excessive activity and emotional difficulty performance compared to those viewing one hour or less daily. An additional investigation documented that newborns encountering aggressive entertainment content at 24 months demonstrated increased hostile conduct and disrupted sleep [24]. In Peru, prolonged digital duration associated with children consuming food during television viewing and reduced exterior pursuits, conduct connected to diminished social-emotional results [13].

A suggested mechanism involves substitution of attentive caregiver exchanges. Emotional control matures through social connection and caregiver feedback. Inactive observation might diminish collaborative concentration occurrences and the capacity to interpret facial expressions. Contact with unrealistic or aggressive material can disturb emotions and encourage hostile conduct. Social technology and interactive activities might additionally encounter young preschoolers to excessive stimulation surroundings and compensate immediate satisfaction, compromising self-control and emotional management. Conversely, meticulously selected content teaching prosocial conduct can strengthen compassion and sharing when watched alongside and examined with caregivers. The National Association for the Education of Young Children highlights that technology should prove employed to broaden authentic-world social opportunities instead of substitute them [32].

Consequently, social-emotional results rely substantially on material characteristics and caregiver participation. Medical practitioners should evaluate not merely the quantity yet additionally the quality of digital contact and the family surroundings. Promoting screen-free interactive activities, narrative sharing, and caregiver-child exchanges encourages social-emotional abilities. Subsequent tracking investigations prove necessary to explain causal mechanisms and recognize protective elements.

9 Situational and Cultural Elements

Digital duration practices experience influence through cultural standards, socioeconomic situations, and family compositions. Within lower- and middle-prosperity nations (LMICs), availability to digital technologies proves rapidly expanding, yet recommendations and consciousness might prove lacking. In India, household technology possession and caregiver digital patterns robustly indicated children's contact. Caregivers might regard educational applications and actions as advantageous or might employ mobile phones to pacify children when managing household responsibilities. Countryside families experiencing restricted availability to secure exterior environments might depend increasingly on television for recreation. Within the Peruvian investigation, prosperous families and mothers possessing elevated education levels documented increased utilization of electronic technologies, indicating that amplified resources might unintentionally amplify digital contact.

Cultural anticipations regarding compliance and tranquility additionally influence digital utilization. Within certain Asian societies, children encounter encouragement to remain tranquil and prevent disturbing adults, and digital screens prove convenient instruments. In contrast, communal existence and distributed caregiving in African situations might diminish individual digital consumption yet amplify ambient television contact. The COVID-19 health crisis obscured distinctions between household, educational, and occupational settings, resulting in increased digital duration across societies. Digital learning systems proved crucial, emphasizing the requirement to distinguish recreational from educational digital utilization.

Cultural difference reaches material preferences; for instance, aggressive cartoons might prove more common in particular regions, whereas others highlight educational content. Caregiver convictions regarding technology's function in child maturation affect shared viewing and material choice. Medical practitioners

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

should customize suggestions to cultural situations, recognizing caregiver concerns and resource restrictions. Community health initiatives should incorporate community authorities, modify communications to regional languages, and highlight alternatives including narrative sharing, traditional activities, and exterior recreation. Within LMICs, supplying secure recreation environments and reachable libraries might assist diminish dependence on digital screens.

10 Prevention Approaches and Suggestions

10.1 Recommendations and policy

International recommendations align regarding restricting digital contact during early years. The World Health Organization suggests zero digital duration for newborns (zero through one year) and one hour or less daily for children between two and four years. The American Academy of Pediatrics recommends discouraging digital utilization for children below eighteen months excluding video communication, introducing superior-quality material with shared viewing for eighteen through twenty-four months, and restricting digital duration to one hour daily of educational content for ages two through five. The Canadian Paediatric Society comparably suggests preventing digital screens for children below two years alongside restricting to one hour for ages two through five, highlighting caregiver shared participation and screen-free practices during food consumption and before rest [33]. The Indian Academy of Pediatrics reflects these suggestions and emphasizes the significance of guaranteeing that digital utilization does not substitute active physical movement, rest, or interactive recreation. Governing bodies and medical systems should distribute these recommendations through community health facilities, childcare facilities, and community initiatives [34].

10.2 Function of caregivers and guardians

Caregivers prove essential gatekeepers of children's technology contact. Approaches incorporate postponing introduction of digital screens, establishing definite boundaries (such as, no digital utilization during food consumption or before rest), developing a family technology schedule, and demonstrating healthy technology utilization. Shared viewing and shared interaction enable caregivers to clarify material, pose inquiries, and link technology experiences to authentic-world ideas. Choosing superior-quality, deliberately paced, nonviolent content and applications intended for early acquisition can reduce harmful consequences. Caregivers should observe children's responses and cease viewing when indications of excessive stimulation manifest. Promoting alternative pursuits including reading activities, exterior recreation, manipulation toys, sketching, and imaginary activity assists substitute digital duration. For employed caregivers, organizing for guardians to participate children in interactive pursuits might diminish the dependence on digital screens.

10.3 Function of medical providers

Physicians and primary care specialists should examine for digital duration patterns during standard appointments, inform families regarding recommendations, and examine potential dangers. They can assist families create practical technology schedules customized to their situations. Specialists should highlight that digital screens prove unnecessary for early acquisition and emphasize the advantages of attentive parenting approaches and interactive recreation. For families experiencing difficulty diminishing digital duration, consultations to parenting education or community supports might prove beneficial. Medical practitioners must additionally recognize broader influences, supporting for policies that strengthen caregiver leave opportunities, economical childcare access, and reachable recreation environments, which can indirectly diminish digital screen dependence.

10.4 Technological design and Industry accountability

Technology creators and technology corporations should follow child-maturation standards through producing material that proves deliberately paced, interactive, and devoid of aggressive content or promotional content. Incorporating signals for interruptions promotes caregiver-child engagement. Governing bodies can control promotional content targeting young children and mandate identification of

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

age-suitable material. Partnership between pediatric specialists and industry representatives can generate digital instruments that enhance instead of substitute authentic-life opportunities.

11 Limitations in Current Research and Future Pathways

Notwithstanding expanding research, substantial limitations remain. Initially, numerous investigations prove population snapshot and depend on caregiver documentation, restricting causal relationships. Tracking investigations employing objective assessment (such as, technology records, portable recording devices) prove required to confirm temporal associations and clear pattern upper limits. Subsequently, investigation disproportionately concentrates on wealthy nations; additional investigations within LMICs should investigate cultural practices and resource limitations. Additionally, limited investigations distinguish the consequences of material category, interactivity, and shared viewing. Controlled experimental investigations comparing educational compared to recreational technology with and absent adult guidance could explain these questions. Additionally, mechanisms supporting social-emotional consequences and psychological health results demand subsequent examination, incorporating the function of disrupted sleep, caregiver psychological health, and inherited predisposition. Additionally, differential vulnerability should receive consideration—children experiencing developmental susceptibilities (such as, developmental spectrum, communication impairments) might demonstrate increased sensitivity to digital contact, yet research proves limited.

Subsequent investigation should embrace ecologically appropriate methodology, incorporating multimodal evaluations (brain imaging, visual monitoring) alongside developmental assessments. Investigations should investigate how digital duration engages with protective elements including active physical movement, rest quality, caregiver participation, and socioeconomic position. Community health interventions should undergo thorough assessment for success and cultural suitability. Furthermore, as technology advances (such as, enhanced reality, social automated systems), their consequences on early maturation require evaluation. Collaborative partnerships among brain scientists, developmental researchers, physicians, educators, and technology creators will prove essential.

12 Final Thoughts

Prolonged digital duration during the initial five years of existence proves prevalent and consistently correlates with developmental impairments. Research from comprehensive analyses and tracking investigations indicates that less than one-third of young children satisfy suggested thresholds, and digital contact exceeding one through two hours daily associates with diminished communication, intellectual, physical, and social-emotional results, demonstrating definite clear pattern consequences. Material quality, caregiver shared viewing, and socio-cultural elements adjust these relationships. Although restricted, interactive educational technology might provide modest advantages, inactive digital utilization substitutes essential developmental opportunities. Worldwide recommendations suggest preventing digital screens during early infancy and limiting young preschool utilization. Achieving equilibrium between digital contact alongside children's developmental requirements remains crucial.

We are grateful to all the patients who participated in the research for their cooperation and trust. Special thanks to the medical and technical staff for their assistance in data collection and patient care. MCN: IU/R&D/2026-MCN0004274

Bibliography

1. Massaroni V, Delle Donne V, Marra C, Arcangeli V, Chieffo DPR. The Relationship between Language and Technology: How Screen Time Affects Language Development in Early Life-A Systematic Review. Brain Sci [Internet]. Brain Sci; 2023 [cited 2025 Dec 24];14. https://doi.org/10.3390/BRAINSCI14010027

2. Khanani MI, Khan MR, Farooqi ME, Fazal J, Aabideen Z, Alkawaiti NS. Digital Media Use and Screen Time Exposure Among Youths: A Lifestyle-Based Public Health Concern. Cureus [Internet]. Springer Science and Business Media LLC; 2025 [cited 2025 Dec 24];17:e88373. https://doi.org/10.7759/CUREUS.88373

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

3. To grow up healthy, children need to sit less and play more [Internet]. [cited 2025 Dec 24]. https://www.who.int/news/item/24-04-2019-to-grow-up-healthy-children-need-to-sit-less-and-play-more. Accessed 24 Dec 2025

4. Karani NF, Sher J, Mophosho M. The influence of screen time on children's language development: A scoping review. S Afr J Commun Disord [Internet]. S Afr J Commun Disord; 2022 [cited 2025 Dec 24];69. https://doi.org/10.4102/SAJCD.V69I1.825

5. Lakicevic N, Manojlovic M, Chichinina E, Drid P, Zinchenko Y. Screen time exposure and executive functions in preschool children. Scientific Reports 2025 15:1 [Internet]. Nature Publishing Group; 2025 [cited 2025 Dec 24];15:1839-. https://doi.org/10.1038/s41598-024-79290-6

6. WOLD HEALTH ORGANIZATION. Guidelines on physical activity, sedentary behaviour and sleep. World Health Organization [Internet]. 2019 [cited 2025 Dec 24];4. https://apps.who.int/iris/bitstream/handle/10665/325147/WHO-NMH-PND-2019.4-eng.pdf?sequence=1&isAllowed=y&0Ahttp://www.who.int/iris/handle/10665/325147. Accessed 24 Dec 2025

7. World Health Organization. Report of the Commission on Ending Childhood Obesity: implementation plan: executive summary. Implementation Plan: Executive summary, [Internet]. 2017 [cited 2025 Dec 24];1.No. WHO/NMH/PND/ECHO/17.1. https://apps.who.int/iris/bitstream/handle/10665/259349/WHO-NMH-PND-ECHO-17.1-eng.pdf. Accessed 24 Dec 2025

8. Madigan S, Browne D, Racine N, Mori C, Tough S. Association Between Screen Time and Children's Performance on a Developmental Screening Test. JAMA Pediatr [Internet]. JAMA Pediatr; 2019 [cited 2025 Dec 24];173:244–50. https://doi.org/10.1001/JAMAPEDIATRICS.2018.5056

9. McArthur BA, Volkova V, Tomopoulos S, Madigan S. Global Prevalence of Meeting Screen Time Guidelines Among Children 5 Years and Younger: A Systematic Review and Meta-analysis. JAMA Pediatr [Internet]. American Medical Association; 2022 [cited 2025 Dec 24];176:373. https://doi.org/10.1001/JAMAPEDIATRICS.2021.6386

10. Varadarajan S, Venguidesvarane AG, Ramaswamy KN, Rajamohan M, Krupa M, Christadoss SBW. Prevalence of excessive screen time and its association with developmental delay in children aged <5 years: A population-based cross-sectional study in India. PLoS One [Internet]. PLoS One; 2021 [cited 2025 Dec 24];16. https://doi.org/10.1371/JOURNAL.PONE.0254102

11. Shah RR, Fahey NM, Soni A V, Phatak AG, Nimbalkar SM. Screen time usage among preschoolers aged 2-6 in rural Western India: A cross-sectional study. J Family Med Prim Care [Internet]. Medknow; 2019 [cited 2025 Dec 24];8:1999. https://doi.org/10.4103/JFMPC.JFMPC_206_19

12. Chen H, Sun Y, Luo S, Ma Y, Li C, Xiao Y, et al. Association of Screen Content With Early Development Among Preschoolers in Shanghai: 7-Day Monitoring Study With Auto Intelligent Technology. J Med Internet Res [Internet]. JMIR Publications Inc.; 2025 [cited 2025 Dec 24];27:e65343. https://doi.org/10.2196/65343

13. Yabiku-Soto K, Saavedra-Garcia L, Guerra Valencia J, Hernández-Vásquez A, Diez-Canseco F. Factors Associated With Screen Time Among Preschool Children in Lima, Peru. Child Care Health Dev [Internet]. Child Care Health Dev; 2024 [cited 2025 Dec 24];50. https://doi.org/10.1111/CCH.13330

14. Adams EL, Marini ME, Stokes J, Birch LL, Paul IM, Savage JS. INSIGHT responsive parenting intervention reduces infant's screen time and television exposure. Int J Behav Nutr Phys Act [Internet]. Int J Behav Nutr Phys Act; 2018 [cited 2025 Dec 24];15. https://doi.org/10.1186/S12966-018-0657-5

15. Hill D, Ameenuddin N, Chassiakos YR, Cross C, Radesky J, Hutchinson J, et al. Media and Young Minds. Pediatrics [Internet]. Pediatrics; 2016 [cited 2025 Dec 24];138. https://doi.org/10.1542/PEDS.2016-2591

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 842-854 | ISSN:2251-6727

16. Sticca F, Brauchli V, Lannen P. Screen on = development off? A systematic scoping review and a developmental psychology perspective on the effects of screen time on early childhood development. Frontiers in Developmental Psychology. Frontiers Media SA; 2024;2:1439040. https://doi.org/10.3389/FDPYS.2024.1439040/FULL

17. Takahashi I, Obara T, Ishikuro M, Murakami K, Ueno F, Noda A, et al. Screen Time at Age 1 Year and Communication and Problem-Solving Developmental Delay at 2 and 4 Years. JAMA Pediatr [Internet]. American Medical Association; 2023 [cited 2025 Dec 24];177:1039. https://doi.org/10.1001/JAMAPEDIATRICS.2023.3057

18. Corkin MT, Peterson ER, Henderson AME, Waldie KE, Reese E, Morton SMB. Preschool screen media exposure, executive functions and symptoms of inattention/hyperactivity. J Appl Dev Psychol [Internet]. JAI; 2021 [cited 2025 Dec 24];73:101237. https://doi.org/10.1016/J.APPDEV.2020.101237

19. Lakicevic N, Manojlovic M, Chichinina E, Drid P, Zinchenko Y. Screen time exposure and executive functions in preschool children. Scientific Reports 2025 15:1 [Internet]. Nature Publishing Group; 2025 [cited 2025 Dec 24];15:1839-. https://doi.org/10.1038/s41598-024-79290-6

20. McMath AL, Iwinski S, Shen S, Bost KF, Donovan SM, Khan NA. Adherence to Screen Time and Physical Activity Guidelines is Associated with Executive Function in US Toddlers Participating in the STRONG Kids 2 Birth Cohort Study. Journal of Pediatrics [Internet]. Elsevier Inc.; 2023 [cited 2025 Dec 24];252:22-30.e6. https://doi.org/10.1016/j.jpeds.2022.08.026

21. Bakht D, Yousaf F, Alvi Z, Ali MKB, Khawar MMH, Munir L, et al. Assessing the Impact of Screen Time on the Motor Development of Children: A Systematic Review. Pediatric Discovery [Internet]. Wiley; 2025 [cited 2025 Dec 24];3:e70002. https://doi.org/10.1002/PDI3.70002

22. Vandewater EA, Barr RF, Park SE, Lee S-J. A US Study of Transfer of Learning from Video to Books in Toddlers. J Child Media [Internet]. Taylor & Francis Group; 2010 [cited 2025 Dec 24];4:451–67. https://doi.org/10.1080/17482798.2010.510013

23. Alroqi H, Serratrice L, Cameron-Faulkner T. The association between screen media quantity, content, and context and language development. J Child Lang [Internet]. J Child Lang; 2023 [cited 2025 Dec 24];50:1155–83. https://doi.org/10.1017/S0305000922000265

24. Chen H, Sun Y, Luo S, Ma Y, Li C, Xiao Y, et al. Association of Screen Content With Early Development Among Preschoolers in Shanghai: 7-Day Monitoring Study With Auto Intelligent Technology. J Med Internet Res [Internet]. JMIR Publications Inc.; 2025 [cited 2025 Dec 24];27:e65343. https://doi.org/10.2196/65343

25. Medawar J, Tabullo ÁJ, Gago-Galvagno LG. Early language outcomes in Argentinean toddlers: Associations with home literacy, screen exposure and joint media engagement. Br J Dev Psychol [Internet]. Br J Dev Psychol; 2023 [cited 2025 Dec 24];41:13–30. https://doi.org/10.1111/BJDP.12429

26. da Silva Junior DC, Castro YM, Dutra RP, Caumo DP, da Silva MP. Impact of the Use of Interactive Screens on Language Development in Children up to 6 Years of Age: A Systematic Review. Child [Internet]. John Wiley and Sons Inc; 2025 [cited 2025 Dec 24];51:e70176. https://doi.org/10.1111/CCH.70176

27. Beyond Screen Time: A Parent's Guide to Media Use. Pediatric Patient Education. American Academy of Pediatrics (AAP); 2021; https://doi.org/10.1542/PEO_DOCUMENT099/79942/BEYOND-SCREEN-TIME-A-PARENT-S-GUIDE-TO-MEDIA-USE

28. To grow up healthy, children need to sit less and play more [Internet]. [cited 2025 Dec 24]. https://www.who.int/news/item/24-04-2019-to-grow-up-healthy-children-need-to-sit-less-and-play-more. Accessed 24 Dec 2025

29. Bakht D, Yousaf F, Alvi Z, Ali MKB, Khawar MMH, Munir L, et al. Assessing the Impact of Screen Time on the Motor Development of Children: A Systematic Review. Pediatric Discovery

[Internet]. Wiley; 2025 [cited 2025 Dec 24];3:e70002. https://doi.org/10.1002/PDI3.70002

30. Bakht D, Yousaf F, Alvi Z, Ali MKB, Khawar MMH, Munir L, et al. Assessing the Impact of Screen Time on the Motor Development of Children: A Systematic Review. Pediatric Discovery [Internet]. Wiley; 2025 [cited 2025 Dec 24];3:e70002. https://doi.org/10.1002/PDI3.70002
31. Yuan R, Zhang J, Song P, Qin L. The relationship between screen time and gross motor movement: A cross-sectional study of pre-school aged left-behind children in China. PLoS One [Internet]. PLoS One; 2024 [cited 2025 Dec 24];19. https://doi.org/10.1371/JOURNAL.PONE.0296862
32. Ponti M. Screen time and preschool children: Promoting health and development in a digital world. Paediatr Child Health [Internet]. Paediatr Child Health; 2023 [cited 2025 Dec 24];28:184–92. https://doi.org/10.1093/PCH/PXAC125
33. Screen Time Guidelines for Parents.
34. Digital media: Promoting healthy screen use in school-aged children and adolescents. Paediatr Child Health [Internet]. Paediatr Child Health; 2019 [cited 2025 Dec 24];24:402–8. https://doi.org/10.1093/PCH/PXZ095