REVIEW PAPER

Psychosocial, Behavioural, and Health Consequences of Excessive Digital Device Use among Children and Adults: A Systematic Review

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ABSTRACT

Background: Excessive digital device use has become an important public health concern because of its association with psychosocial, behavioural, and physical health complications among children and adults.

Objective: The present systematic review aimed to evaluate the psychosocial, behavioural, social, and health consequences associated with excessive digital device use across different age groups.

Methods: A systematic review was conducted according to PRISMA 2020 guidelines using PubMed, Scopus, Web of Science, Embase, ScienceDirect, and Google Scholar databases. Studies published between January 2016 and December 2025 were screened using predefined eligibility criteria. After duplicate removal and full-text assessment, 226 studies were included in the final qualitative synthesis.

Results: A total of 226 studies were included in the final qualitative synthesis, with most investigations comprising cross-sectional studies involving adolescents and young adults. The reviewed evidence consistently demonstrated significant associations between excessive digital device use and multiple psychosocial, behavioural, social, and physical health complications across paediatric and adult populations. Prolonged screen exposure was frequently associated with adverse psychological outcomes including anxiety, depressive symptoms, emotional dysregulation, stress, behavioural dependency, and fear of missing out (FOMO). Sleep-related disturbances such as insomnia, delayed sleep onset, circadian rhythm disruption, daytime fatigue, and poor sleep quality were commonly reported among both adolescents and adults. Physical health consequences included obesity, sedentary behaviour, musculoskeletal discomfort, postural abnormalities, headaches, and digital eye strain. Excessive digital engagement was additionally associated with impaired academic performance, reduced occupational productivity, social isolation, cyberbullying exposure, and family communication difficulties. Adolescents and young adults appeared particularly vulnerable because of increased social media engagement, problematic smartphone use, and prolonged recreational screen exposure.

Conclusion: Excessive digital device use is associated with substantial psychosocial, behavioural, social, and physical health consequences across paediatric and adult populations. Evidence-based digital wellness interventions, behavioural counselling, sleep hygiene promotion, and multidisciplinary public health strategies are essential to reduce technology-associated health risks.

Keywords Digital device use; screen time; smartphone addiction; psychosocial health; sleep disturbance; behavioural addiction; digital health; systematic review

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INTRODUCTION

Digital technologies have become indispensable components of modern society, influencing communication, education, employment, entertainment, and healthcare delivery worldwide. The increasing accessibility of smartphones, tablets, laptops, gaming systems, smart televisions, and wearable technologies has markedly altered daily behavioural patterns among both children and adults. Rapid expansion of internet connectivity and smartphone ownership over the past decade has resulted in sustained screen engagement across diverse populations, raising important concerns regarding the health implications of excessive digital exposure. [1,2] The integration of digital devices into everyday life has generated considerable educational, occupational, and social advantages. Online communication platforms improve interpersonal connectivity, facilitate access to information, support telemedicine services, and enhance

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academic and workplace productivity. During the coronavirus disease 2019 (COVID-19) pandemic, digital technologies became essential for remote learning, virtual consultations, teleworking systems, and maintenance of social interaction during mobility restrictions.[3] Despite these benefits, increasing evidence indicates that prolonged and uncontrolled screen exposure may adversely affect psychological well-being, behavioural functioning, sleep quality, and physical health outcomes.[4]

Contemporary research has demonstrated significant associations between excessive digital device use and adverse mental health outcomes, including anxiety, depressive symptoms, emotional instability, psychological distress, impaired concentration, and behavioural dependency.[5,6] Adolescents and young adults appear particularly susceptible because of heightened engagement with social networking platforms, online gaming, and continuous virtual interaction.[7] Repetitive exposure to social comparison, online validation mechanisms, and fear of missing out (FOMO) may further intensify emotional dissatisfaction, loneliness, and low self-esteem among vulnerable individuals.[10]

Children and adolescents represent a high-risk population because excessive screen exposure during developmental stages may interfere with neurocognitive maturation, behavioural adaptation, emotional regulation, language development, and interpersonal interaction. Evidence from paediatric studies has linked prolonged recreational screen time with impaired academic performance, reduced physical activity, attention disturbances, sleep disruption, and behavioural difficulties. [8,9] Excessive dependence on virtual communication may additionally contribute to cyberbullying exposure, reduced social competence, and emotional dysregulation among adolescents.[10]

From a neurobehavioural perspective, problematic digital device use may activate dopaminergic reward pathways involved in compulsive behavioural reinforcement. Continuous exposure to social media notifications, gaming rewards, and online stimulation has been proposed to influence reward-processing mechanisms comparable to behavioural addiction disorders.[11] Emerging neuroscientific findings additionally suggest that excessive screen engagement may impair executive functioning, impulse control, attentional regulation, and emotional processing, particularly during critical developmental periods.[12]

Sleep-related complications remain among the most consistently reported consequences associated with excessive screen exposure. Electronic screens emit blue-wavelength light capable of suppressing melatonin secretion and altering circadian rhythm regulation, thereby delaying sleep initiation and reducing sleep quality.[13] Nighttime smartphone use and prolonged social media engagement have been associated with insomnia, fragmented sleep, daytime fatigue, impaired cognitive performance, and reduced academic productivity.[14] Children and adolescents appear especially vulnerable because of increased physiological sensitivity to circadian rhythm disruption and greater dependence on nighttime digital engagement.[15]

Excessive digital device use also contributes substantially to sedentary lifestyle behaviours and related physical health complications. Prolonged screen engagement reduces participation in outdoor activities and physical exercise, thereby increasing risks of obesity, metabolic dysfunction, insulin resistance, and poor cardiovascular fitness.[16] Musculoskeletal complications, including neck pain, shoulder discomfort, wrist strain, back pain, and postural abnormalities, are increasingly prevalent among individuals with prolonged smartphone and computer usage.[17] Sustained cervical flexion posture associated with mobile device use has contributed to the growing prevalence of "text neck syndrome" among students and office workers.

Visual complications associated with prolonged screen exposure have similarly emerged as important health concerns. Digital eye strain and computer vision syndrome commonly manifest as dry eyes, blurred vision, headaches, ocular fatigue, and visual discomfort.[18] Such complications became increasingly prevalent following the expansion of online learning systems and prolonged screen-based occupational activities during and after the COVID-19 pandemic.

The consequences of excessive digital engagement extend beyond individual health outcomes and may adversely influence interpersonal relationships, academic achievement, family interaction, and occupational performance. Excessive smartphone dependency may reduce face-to-face communication and contribute to emotional distancing, social withdrawal, and impaired family cohesion.[19] Students exposed to continuous digital multitasking frequently demonstrate poor concentration, procrastination, reduced learning efficiency, and impaired academic outcomes.[20] Similarly, adults working in technology-intensive environments commonly experience occupational stress, digital fatigue, emotional exhaustion, and reduced productivity associated with sustained screen dependency.[21]

Global digital exposure increased considerably during the COVID-19 pandemic because of widespread dependence on online educational platforms, virtual communication technologies, and remote working systems.[22] Although these technologies were necessary during periods of social restriction, the substantial rise in daily screen time amplified concerns regarding sleep disorders, sedentary behaviour, social isolation, and technology-associated psychological distress.

From a clinical and public health perspective, understanding the multidimensional consequences of excessive digital device exposure is essential for developing evidence-based preventive strategies and behavioural interventions. Healthcare professionals, including physicians, psychologists, nurses, physiotherapists, public health practitioners, and clinical pharmacists, play important roles in promoting healthy screen practices, sleep hygiene, behavioural counselling, mental health awareness, and lifestyle modification strategies.[23] Clinical pharmacists may additionally contribute through patient

counselling regarding medication-associated sleep disturbances, stress management, behavioural modification, and community-based digital wellness education initiatives.

Although numerous studies have evaluated specific health outcomes associated with excessive screen exposure, a comprehensive synthesis of psychosocial, behavioural, and physical health consequences across different age groups remains limited. Existing evidence demonstrates substantial heterogeneity in exposure measurement methods, outcome assessment tools, study populations, and methodological designs, thereby limiting the consistency of interpretation.[24] Furthermore, the predominance of cross-sectional studies restricts causal interpretation and long-term evaluation of technology-associated health effects.

Therefore, the present systematic review aims to critically evaluate the psychosocial, behavioural, and health consequences associated with excessive digital device use among children and adults by synthesizing current international evidence regarding psychological outcomes, sleep disturbances, behavioural dependency, physical health complications, and social consequences. The review additionally identifies important methodological limitations, research gaps, and future directions for digital health research and evidence-based public health intervention development.

MATERIALS AND METHODS

Study Design

The present systematic review was undertaken to comprehensively evaluate the psychosocial, behavioural, and health consequences associated with excessive digital device use among paediatric and adult populations. The methodological framework of the review was developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines to improve methodological transparency, reproducibility, and quality of evidence synthesis.[25]

Data Sources and Literature Search Strategy

A comprehensive electronic literature search was conducted using multiple scientific databases, including PubMed, Scopus, Web of Science, ScienceDirect, Embase, and Google Scholar. Eligible studies published between January 2016 and December 2025 were retrieved and evaluated. The selected search period was intended to capture contemporary evidence reflecting recent advancements in digital technology, increased smartphone accessibility, expansion of social networking platforms, and evolving post-pandemic digital behavioural patterns.

The search strategy utilized combinations of Medical Subject Headings (MeSH) terms, free-text keywords, and Boolean operators related to digital device exposure and associated psychosocial and health outcomes. Search terms included:

“electronic gadgets”
“digital devices”
“smartphone use”
“screen exposure”
“screen time”
“digital dependency”
“smartphone addiction”
“mental health”
“psychological outcomes”
“sleep disorders”
“social outcomes”
“children”
“adolescents”
“adults”

The Boolean search syntax was developed as follows:

(“electronic gadgets” OR smartphone OR “digital devices” OR “screen exposure” OR “screen time”)
AND
(“psychological outcomes” OR “mental health” OR anxiety OR depression OR “sleep disorders” OR obesity OR “social outcomes”)
AND
(children OR adolescents OR adults)

In addition to database searching, manual screening of reference lists from eligible articles and previously published review papers was performed to identify additional relevant studies not retrieved through the primary electronic search process.

Eligibility Criteria

Inclusion Criteria

Studies were considered eligible for inclusion if they met the following criteria:

Included children, adolescents, or adult participants.
Evaluated exposure to digital devices, including smartphones, tablets, laptops, gaming consoles, or social media platforms.
Reported psychosocial, behavioural, physical, or social health outcomes associated with screen exposure.
Utilized observational, cohort, longitudinal, quasi-experimental, randomized controlled trial study designs.
Were published in peer-reviewed scientific journals.
Were published in the English language between 2016 and 2025.

Exclusion Criteria

Studies were excluded if they fulfilled any of the following criteria:

Editorials, conference proceedings, commentaries, opinion papers, or letters to the editor.
Experimental laboratory-based or non-human studies.
Studies lacking relevant psychosocial or health-related outcome measures.
Publications demonstrating inadequate methodological quality or incomplete reporting.
Duplicate studies or publications containing overlapping datasets.
Studies exclusively focusing on technological development without evaluation of health-related consequences.

Study Selection Process

All retrieved citations were exported into reference management software, and duplicate publications were identified and removed prior to screening. Preliminary screening of titles and abstracts was subsequently performed according to predefined eligibility criteria to identify potentially relevant studies. Articles considered eligible during the initial screening phase underwent detailed full-text evaluation to determine final inclusion suitability.

The screening and eligibility assessment procedures were conducted independently to minimize selection bias and improve methodological reliability. Disagreements regarding study eligibility or outcome relevance were resolved through discussion and consensus based on study objectives, methodological quality, and completeness of outcome reporting.

The study identification, screening, eligibility assessment, and final inclusion procedures were conducted in accordance with PRISMA 2020 recommendations for systematic reviews. The systematic search identified 5,412 records from electronic databases, including PubMed, Scopus, Web of Science, Embase, ScienceDirect, and Google Scholar. Following removal of 1,176 duplicate records, 4,236 articles underwent title and abstract screening. Of these, 3,286 records were excluded because they did not satisfy the predefined inclusion criteria.

A total of 950 full-text articles were assessed for eligibility. Following detailed evaluation, 724 studies were excluded because of inadequate outcome reporting, irrelevant study outcomes, ineligible populations, non-English publications, or publication types such as editorials and commentaries. Finally, 226 studies fulfilled the eligibility criteria and were included in the final qualitative synthesis. The study identification and selection procedure is summarized in **Figure 1.**

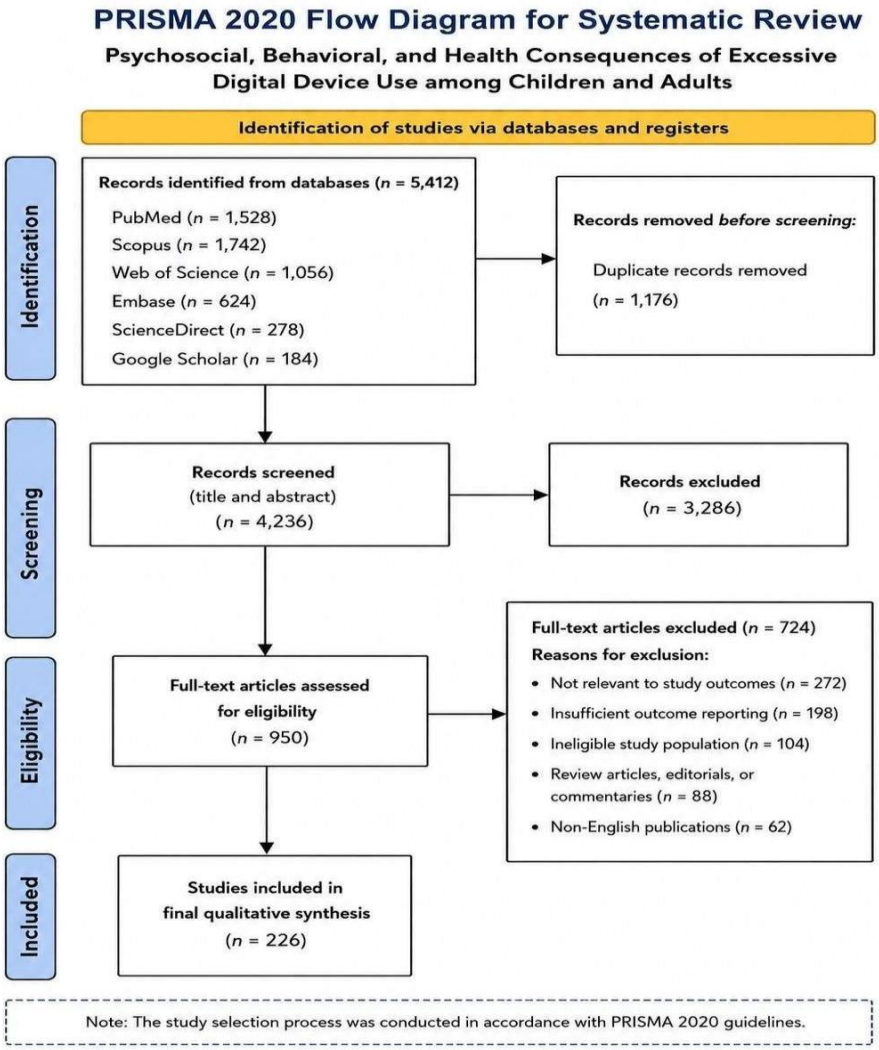

Figure 1. PRISMA 2020 flow diagram illustrating study identification, duplicate removal, screening, eligibility assessment, and final qualitative inclusion conducted according to PRISMA guidelines.

Data Extraction

Relevant information from eligible studies was extracted using a standardized and structured data extraction format to ensure consistency and accuracy of evidence synthesis. Extracted variables included:
author details and publication year,
country and study setting,
study design,
sample size and demographic characteristics,
participant age group,
type of digital device exposure,
duration or intensity of screen exposure,
psychological outcomes,
physical health outcomes,
social and behavioural consequences,
and principal findings and conclusions.
The extracted data were systematically organized to facilitate thematic comparison, evidence interpretation, and synthesis across included studies.

Outcome Measures
The primary outcomes evaluated in the present review included psychosocial, behavioural, social, and physical health consequences associated with excessive digital device use.

Psychological Outcomes
The major psychological outcomes assessed across included studies comprised:
anxiety,
depressive symptoms,
emotional dysregulation,
psychological stress,
behavioural dependency,
attention disturbances,
and fear of missing out (FOMO).

Physical Health Outcomes
The principal physical health outcomes included:
sleep disturbances,
obesity,
sedentary behaviour,
musculoskeletal disorders,
digital eye strain,
headaches,
and postural abnormalities.

Social Outcomes
The major social and behavioural outcomes evaluated included:
social isolation,
impaired family communication,
academic performance difficulties,
reduced occupational productivity,
cyberbullying exposure,
and interpersonal relationship disturbances.

Quality Assessment and Risk of Bias
Methodological quality and risk of bias of included studies were evaluated using validated appraisal tools appropriate for individual study designs. Observational and cohort studies were assessed using the Newcastle–Ottawa Scale (NOS), whereas randomized controlled trials were evaluated according to established methodological quality criteria.[26]
The quality assessment process considered multiple methodological domains, including:
participant selection procedures,
comparability of study groups,
exposure assessment methods,
outcome measurement reliability,
control of confounding variables,
statistical validity,
and adequacy of follow-up.
Studies demonstrating substantial methodological limitations or inadequate reporting quality were interpreted cautiously during evidence synthesis.

Data Synthesis
A narrative thematic synthesis approach was adopted because of substantial heterogeneity among included studies regarding study populations, exposure definitions, outcome assessment methods, and methodological designs. Quantitative meta-analysis was not performed because of considerable variation in screen exposure measurements and inconsistency in reported outcome variables across studies.
The synthesized evidence was categorized into major thematic domains, including:
psychological consequences,
sleep-related disturbances,
physical health complications,
social and behavioural outcomes,
differences between paediatric and adult populations,
and post-pandemic digital behavioural trends.
Comparative interpretation of findings was conducted to identify recurring evidence patterns, contradictory observations, methodological limitations, and important research gaps within the existing literature.

RESULTS

Study Selection
The systematic search strategy identified 5,412 records from PubMed, Scopus, Web of Science, Embase, ScienceDirect, and Google Scholar databases. Following the removal of 1,176 duplicate records, 4,236 studies underwent title and abstract screening according to predefined eligibility criteria. Studies unrelated to psychosocial, behavioural, social, or physical health outcomes associated with digital device use were excluded during the preliminary screening stage.
Subsequently, 950 full-text articles were assessed for eligibility. Of these, 724 studies were excluded because of inadequate outcome reporting, ineligible study populations, irrelevant objectives, non-English publication status, or publication formats such as editorials and commentaries. Finally, 226 studies met the inclusion criteria and were included in the final qualitative synthesis.[27]

The study identification and selection procedures were conducted in accordance with PRISMA 2020 recommendations. The complete screening and inclusion process is summarized in **Figure 1.**

Characteristics of Included Studies

The included studies represented geographically diverse populations from North America, Europe, Asia, the Middle East, and several developing countries. Cross-sectional observational studies constituted the majority of included investigations, whereas cohort studies, longitudinal analyses, randomized controlled trials, and systematic reviews represented smaller proportions of the included evidence base.[28]

The reviewed populations primarily consisted of:
children,
adolescents,
university students,
working professionals,
and community-based adult populations.

Sample sizes varied substantially across studies, ranging from fewer than 100 participants to large population-based cohorts involving several thousand individuals. Smartphones were the most frequently evaluated digital devices, followed by tablets, laptops, gaming consoles, and social networking platforms.

Across multiple studies, daily screen exposure frequently exceeded internationally recommended limits, particularly among adolescents and young adults. Several investigations also reported substantial increases in recreational and occupational screen engagement following the COVID-19 pandemic due to remote learning systems, work-from-home practices, and increased virtual communication.[29]

Table 1. Representative Characteristics of Included Studies Evaluating Excessive Digital Device Use and Health Outcomes

Author	Year	Country	Study Design	Population	Digital Exposure	Major Outcomes
Twenge and Campbell	2018	USA	Cross-sectional	Adolescents	Screen time	Reduced psychological well-being
Woods and Scott	2016	UK	Cross-sectional	Adolescents	Social media use	Anxiety and sleep disturbance
Levenson et al.	2017	USA	Cross-sectional	Young adults	Bedtime social media use	Sleep impairment
Ra et al.	2018	USA	Longitudinal	Adolescents	Digital media exposure	Attention-deficit symptoms
Xie et al.	2017	China	Cross-sectional	Mobile device users	Smartphone use	Musculoskeletal discomfort
Marino et al.	2018	Italy	Cross-sectional	Adolescents	Problematic social media use	Psychological distress
Elhai et al.	2020	Germany	Analytical cross-sectional	Young adults	Smartphone dependency	Behavioural addiction
Scott et al.	2019	UK	Observational	Adolescents	Nighttime smartphone use	Sleep disturbances

PSYCHOLOGICAL OUTCOMES

Anxiety and Depression

Psychological complications were among the most consistently reported outcomes associated with excessive digital device use. Multiple studies demonstrated positive associations between prolonged smartphone exposure, excessive social media engagement, and elevated levels of anxiety, depressive symptoms, psychological distress, and emotional instability among adolescents and adults. [30,31]

Adolescents with prolonged daily screen exposure frequently reported emotional dissatisfaction, loneliness, irritability, low self-esteem, and depressive symptoms. Excessive social networking engagement additionally intensified social comparison behaviour and fear of missing out (FOMO), thereby contributing to emotional distress and reduced psychological well-being.[32]

Among adults, problematic smartphone dependency and continuous occupational screen exposure were associated with increased stress levels, emotional exhaustion, anxiety disorders, and impaired emotional health. Excessive multitasking behaviour and prolonged online connectivity additionally contributed to cognitive overload and attentional fatigue.[33]

Several studies further suggested that nighttime smartphone use indirectly aggravated anxiety and depressive symptoms through sleep disruption, social withdrawal, and reduced physical activity participation.[34]

Digital Dependency and Behavioural Addiction

Behavioural dependency associated with digital devices emerged as a recurring finding across the reviewed literature. Excessive smartphone use demonstrated characteristics resembling behavioural addiction disorders, including compulsive usage patterns, withdrawal

symptoms, impaired self-control, tolerance, and functional impairment.[35]

Adolescents and young adults appeared particularly susceptible to problematic smartphone use and online gaming dependency because of heightened reward-seeking behaviour and increased sensitivity to social reinforcement mechanisms.[36]

Several investigations additionally identified associations between excessive gaming exposure and impaired academic performance, emotional dysregulation, impulsive behaviour, attentional disturbances, and reduced interpersonal interaction. Emerging neuroscientific evidence suggested that repetitive social networking exposure may activate dopaminergic reward pathways involved in addictive behavioural patterns.[37]

Stress and Emotional Dysregulation

Continuous digital engagement and excessive online connectivity contributed substantially to psychological stress and emotional exhaustion. Adults working in technology-intensive environments frequently experienced occupational burnout, cognitive fatigue, digital overload, and impaired work-life balance associated with prolonged screen dependency.[38]

Children and adolescents exposed to excessive digital stimulation demonstrated impaired emotional regulation, increased irritability, behavioural instability, and reduced frustration tolerance. Repetitive exposure to rapidly changing online content and continuous notifications may contribute to attentional fragmentation and emotional overstimulation.[39]

Table 2. Major Psychological Outcomes Associated with Excessive Digital Device Use

Psychological Outcome	Reported Manifestations	Frequently Affected Population
Anxiety	Emotional distress and excessive worry	Adolescents and young adults
Depression	Low mood and psychological dissatisfaction	Adolescents
Behavioural addiction	Compulsive smartphone dependency	University students
Emotional dysregulation	Irritability and behavioural instability	Children and adolescents
FOMO	Social comparison and emotional stress	Social media users
Cognitive overload	Reduced concentration and mental fatigue	Working adults

SLEEP-RELATED OUTCOMES

Sleep Disturbances and Circadian Rhythm Disruption

Sleep impairment represented one of the most frequently reported adverse outcomes associated with excessive digital device exposure. Multiple studies demonstrated strong relationships between prolonged nighttime screen use and poor sleep quality among children, adolescents, and adults.[40]

Blue-wavelength light emitted from electronic screens suppresses melatonin secretion and disrupts circadian rhythm regulation, thereby delaying sleep initiation and reducing sleep duration.[41]

Commonly reported sleep-related complications included:
insomnia,
delayed sleep onset,
fragmented sleep,
reduced sleep efficiency,
daytime fatigue,
and excessive daytime sleepiness.

Adolescents with prolonged nighttime smartphone use frequently demonstrated impaired concentration, mood disturbances, poor academic performance, and cognitive dysfunction secondary to chronic sleep deprivation.[42]

Adults similarly reported reduced sleep quality associated with occupational screen exposure, bedtime social media engagement, and excessive smartphone dependency.[43]

Several investigations additionally observed bidirectional relationships between sleep disturbance and problematic digital device use, whereby impaired sleep quality further increased nighttime screen engagement and compulsive smartphone behaviour.[44]

Table 3. Sleep-Related Consequences Associated with Excessive Digital Device Use

Sleep Outcome	Common Manifestations	Predominant Population
Sleep disturbance	Poor sleep quality	Adolescents
Insomnia	Difficulty initiating sleep	Young adults
Circadian rhythm disruption	Delayed sleep onset	Smartphone users
Daytime fatigue	Reduced alertness	Students and professionals
Excessive daytime sleepiness	Cognitive impairment	Adolescents

PHYSICAL HEALTH OUTCOMES

Obesity and Sedentary Lifestyle

Several studies consistently identified associations between excessive screen exposure and sedentary lifestyle behaviour. Increased recreational screen time reduced participation in outdoor activities and physical exercise, thereby contributing to obesity and metabolic health risks.[45]

Children and adolescents with prolonged screen exposure frequently demonstrated increased body mass index (BMI), reduced physical fitness, unhealthy dietary practices, and

greater sedentary tendencies. Sedentary digital behaviour additionally contributed to increased consumption of energy-dense foods and reduced recreational physical activity.[46]

Among adults, prolonged occupational screen exposure and work-from-home digital dependency contributed to physical inactivity, weight gain, poor posture, and metabolic complications.[47]

Musculoskeletal Disorders

Musculoskeletal complications were frequently observed among individuals with prolonged smartphone and computer use. Commonly reported manifestations included neck pain, shoulder discomfort, wrist strain, back pain, and postural abnormalities.[48]

"Text neck syndrome" emerged as a recurring ergonomic condition associated with sustained cervical flexion posture during prolonged smartphone usage.[49]

Students and office workers involved in extended screen-based activities demonstrated increased prevalence of repetitive strain injuries and chronic musculoskeletal discomfort.

Digital Eye Strain and Visual Problems

Digital eye strain and computer vision syndrome were increasingly reported among individuals with prolonged screen exposure. Frequently observed symptoms included dry eyes, blurred vision, headaches, ocular discomfort, visual fatigue, and burning sensations.[50]

Reduced blinking frequency, prolonged visual concentration, improper screen positioning, and continuous digital exposure substantially contributed to these visual complications. High prevalence of visual fatigue was particularly observed among students participating in online learning systems and adults engaged in prolonged occupational screen activities.[51]

Table 4. Physical Health Consequences Associated with Excessive Digital Device Use

Physical Outcome	Common Manifestations	Frequently Affected Population
Obesity	Increased BMI and sedentary behaviour	Children and adolescents
Musculoskeletal disorders	Neck and back pain	Students and office workers
Digital eye strain	Blurred vision and headaches	Screen-intensive users
Postural abnormalities	Cervical strain and poor posture	Smartphone users
Physical inactivity	Reduced exercise participation	Adults and adolescents

SOCIAL OUTCOMES

Family and Interpersonal Relationships

Excessive digital engagement negatively affected interpersonal communication and family interaction. Several studies reported that problematic smartphone use reduced face-to-face social interaction and impaired emotional bonding within families.[52]

Parental smartphone dependency additionally contributed to reduced parent-child interaction quality and diminished emotional responsiveness during communication.[53]

Adolescents demonstrating excessive digital engagement frequently reported social withdrawal, loneliness, reduced interpersonal communication, and decreased participation in offline social activities.

Academic and Occupational Performance

Multiple investigations identified associations between prolonged recreational screen exposure and impaired academic performance. Students frequently experienced reduced concentration, attentional difficulties, procrastination, cognitive distraction, and decreased academic productivity.[54]

Excessive multitasking associated with social media notifications and continuous smartphone engagement interfered with memory retention and learning efficiency.

Adults similarly experienced occupational stress, reduced workplace productivity, impaired concentration, and digital fatigue associated with continuous online connectivity and prolonged occupational screen exposure.[55]

Cyberbullying and Social Isolation

Excessive social networking engagement increased vulnerability to cyberbullying, online harassment, and social comparison behaviour, particularly among adolescents and young adults.[56]

Several studies additionally reported associations between problematic social media use and loneliness, emotional distress, reduced self-esteem, and perceived social isolation. Although digital devices facilitate virtual communication, excessive dependency paradoxically reduces real-world interpersonal interaction and social participation across several populations.[57]

Table 5. Social and Behavioural Consequences Associated with Excessive Digital Device Use

Social Outcome	Reported Impact	Frequently Affected Population
Social isolation	Reduced interpersonal interaction	Adolescents
Family communication difficulties	Emotional distancing	Families
Academic impairment	Reduced concentration and productivity	Students

Occupational fatigue	Burnout and reduced efficiency	Working adults
Cyberbullying exposure	Emotional distress and low self-esteem	Adolescents and young adults

DISCUSSION

The present systematic review synthesized current international evidence regarding the psychosocial, behavioural, social, and physical health consequences associated with excessive digital device use among paediatric and adult populations. The reviewed literature consistently demonstrated that prolonged and uncontrolled screen engagement contributes to substantial adverse effects on mental well-being, sleep quality, behavioural functioning, physical health, and interpersonal relationships across diverse demographic groups.[58]

One of the most consistently reported findings across the included studies involved the relationship between excessive digital device use and adverse psychological outcomes, particularly anxiety, depressive symptoms, emotional instability, behavioural dependency, and psychological distress. Adolescents and young adults appeared especially vulnerable because of developmental sensitivity to peer influence, social reinforcement, and emotional regulation difficulties.[59] Excessive social networking engagement may intensify social comparison behaviour, fear of missing out (FOMO), emotional dissatisfaction, and cyberbullying exposure, thereby contributing to reduced self-esteem and impaired psychological well-being.[60]

The observed association between problematic digital engagement and mental health disturbances may also be explained through neurobehavioural mechanisms involving dopaminergic reward pathways and compulsive reinforcement processes. Repetitive stimulation from social media notifications, gaming rewards, and continuous online interaction may activate reward-processing systems similar to those involved in behavioural addiction disorders.[61] Emerging neuroscientific evidence additionally suggests that excessive screen engagement may adversely influence attention regulation, executive functioning, impulse control, and emotional processing, particularly during neurodevelopmental stages.[62]

Sleep disturbance represented another major consequence consistently identified across the reviewed evidence. Multiple investigations demonstrated significant associations between prolonged nighttime screen exposure and impaired sleep quality among children, adolescents, and adults.[63] Blue-wavelength light emitted from digital screens suppresses melatonin secretion and disrupts circadian rhythm synchronization, thereby delaying sleep onset and reducing sleep duration.[64] Chronic sleep impairment may subsequently contribute to cognitive dysfunction, emotional instability, reduced academic performance, impaired occupational productivity, and elevated psychological stress levels.

Children and adolescents demonstrated greater susceptibility to sleep-related complications because of increasing nighttime smartphone dependency, prolonged social media engagement, and online gaming behaviour.[65] Several investigations additionally suggested bidirectional relationships between sleep disturbance and problematic smartphone use, whereby poor sleep quality further increases nighttime digital engagement and compulsive screen behaviour.[66]

The findings of the present review additionally highlighted substantial physical health consequences associated with prolonged digital device exposure. Sedentary screen-based behaviours were consistently associated with obesity, reduced physical activity participation, unhealthy dietary patterns, and increased metabolic health risks.[67] Excessive recreational screen time may reduce engagement in outdoor activities and physical exercise, thereby contributing to increased body mass index (BMI), poor cardiovascular fitness, and sedentary lifestyle behaviour among both paediatric and adult populations.[68]

Musculoskeletal complications including neck pain, shoulder discomfort, wrist strain, back pain, and postural abnormalities were frequently observed among heavy smartphone and computer users.[69] Sustained cervical flexion posture during prolonged smartphone usage contributes substantially to the development of "text neck syndrome," which has become increasingly prevalent among students and office workers.[70] Poor ergonomic positioning, repetitive movements, and prolonged static posture may further increase risks of chronic musculoskeletal discomfort and repetitive strain injuries.

Digital eye strain and computer vision syndrome similarly emerged as important health concerns associated with prolonged screen exposure. Frequently reported manifestations included visual fatigue, headaches, dry eyes, blurred vision, ocular discomfort, and reduced blinking frequency.[71] Increased dependence on online learning systems and prolonged occupational screen exposure following the COVID-19 pandemic substantially increased the prevalence of visual complaints across multiple populations.[72]

The psychosocial burden associated with excessive digital engagement extends beyond individual health outcomes and significantly influences family relationships, academic productivity, occupational performance, and interpersonal communication. Several studies reported that problematic smartphone use reduced face-to-face social interaction and impaired emotional bonding within families.[73] Excessive parental smartphone dependency may additionally interfere with parent-child interaction quality and reduce emotional responsiveness during communication.

Academic and occupational implications associated with excessive screen exposure were also consistently evident across the reviewed literature. Students with prolonged recreational screen exposure frequently demonstrated reduced concentration, attentional difficulties, impaired memory retention, procrastination, and reduced academic productivity.[74] Continuous online connectivity, social media multitasking, and persistent smartphone notifications

may contribute to attentional fragmentation and impaired learning efficiency. Adults similarly experienced occupational stress, digital fatigue, impaired work-life balance, and reduced workplace productivity associated with prolonged screen dependency.[75]

The COVID-19 pandemic substantially accelerated global digital dependence through remote educational systems, teleworking practices, telemedicine utilization, and virtual communication platforms.[76] Although digital technologies played essential roles during periods of social restriction, the rapid increase in screen exposure simultaneously intensified concerns regarding sleep disorders, psychological distress, sedentary behaviour, and technology-associated dependency. Post-pandemic behavioural changes therefore represent an important public health issue requiring continued monitoring and evidence-based intervention strategies.

Despite the substantial evidence identified in the present review, several methodological limitations remain evident within the existing literature. Most available studies employed cross-sectional designs, thereby limiting causal interpretation between excessive digital exposure and adverse health outcomes.[77] Reliance on self-reported screen time assessment methods may additionally contribute to recall bias, reporting inaccuracies, and exposure misclassification. Considerable heterogeneity also exists regarding definitions of problematic digital device use, exposure measurement tools, and outcome assessment methods across studies, thereby limiting direct comparability of findings.[78]

Another important limitation involves the relative scarcity of longitudinal evidence evaluating long-term psychosocial, developmental, and neurobehavioural consequences associated with prolonged digital exposure. Existing investigations primarily focus on short-term associations, whereas long-term cognitive and behavioural implications remain insufficiently explored. Furthermore, evidence from rural populations, low-income communities, and culturally diverse settings remains comparatively limited despite increasing global smartphone accessibility.[79]

From a public health perspective, the findings of the present review emphasize the importance of evidence-based digital wellness strategies aimed at promoting healthy screen practices and minimizing technology-associated health risks. Schools, families, healthcare institutions, policymakers, and community organizations should collaboratively implement interventions focusing on sleep hygiene, ergonomic awareness, physical activity promotion, screen-time education, and responsible social media engagement.[80]

Healthcare professionals including physicians, psychologists, nurses, physiotherapists, and clinical pharmacists play important roles in identifying technology-associated behavioural risks and implementing preventive counselling strategies. Clinical pharmacists may contribute through patient education regarding sleep hygiene, behavioural modification, stress management, medication-associated insomnia, and mental health awareness initiatives.[81] School-based behavioural interventions and family-centered digital wellness programs may additionally support healthier technology habits among children and adolescents.

Future investigations should prioritize longitudinal cohort studies, standardized exposure assessment methods, and intervention-based research evaluating behavioural modification strategies, digital detoxification approaches, and public health policies targeting problematic screen exposure. Comparative investigations evaluating paediatric versus adult vulnerability and post-pandemic digital behavioural trends are also necessary to strengthen current evidence.[82]

CLINICAL AND PUBLIC HEALTH IMPLICATIONS

The increasing prevalence of excessive digital device use has important implications for healthcare systems, educational institutions, workplaces, and public health policy development. The multidimensional psychological, behavioural, social, and physical health consequences identified in the present review indicate the need for integrated preventive and therapeutic approaches involving healthcare professionals, schools, families, and policymakers.[83]

Healthcare professionals should routinely evaluate screen exposure patterns and technology-associated behavioural risks during patient interactions, particularly among adolescents and young adults presenting with sleep disturbances, anxiety, depressive symptoms, behavioural dependency, or reduced academic performance.[84] Early identification of problematic digital engagement may facilitate timely behavioural interventions and reduce progression toward severe psychosocial and physical health complications.

Clinical pharmacists may contribute substantially to digital wellness promotion through:

patient counselling regarding healthy screen practices,

sleep hygiene education,

stress management counselling,

medication review for insomnia and anxiety,

and community-level awareness initiatives promoting responsible digital engagement.[85]

School-based interventions emphasizing digital literacy, physical activity promotion, ergonomic education, and healthy sleep habits may reduce technology-associated health burdens among paediatric populations.[86] Family-centered behavioural approaches and parental supervision are similarly important for regulating recreational screen exposure and encouraging balanced offline social interaction.

Public health authorities should develop evidence-based recommendations regarding age-appropriate screen exposure, safe digital practices, and preventive strategies targeting technology-associated behavioural addiction and sedentary lifestyle behaviour.[87] Workplace policies encouraging ergonomic practices, scheduled screen breaks, and mental wellness support may additionally reduce

occupational digital fatigue and musculoskeletal complications among working adults.

RESEARCH GAPS AND FUTURE DIRECTIONS

Despite increasing scientific interest regarding digital health behaviour, several important research gaps remain within the existing literature. Most available evidence is derived from cross-sectional studies, thereby limiting causal interpretation between excessive digital device exposure and adverse psychosocial outcomes.[88] Longitudinal cohort investigations evaluating developmental, behavioural, and neurocognitive consequences associated with prolonged screen exposure are therefore required.

Definitions and measurement tools used to assess problematic digital engagement remain inconsistent across studies. Future investigations should utilize validated exposure assessment instruments and standardized outcome measures to improve methodological comparability and evidence synthesis.[89]

Intervention-based studies evaluating digital detoxification programs, behavioural modification therapies, family-centered counselling, school-based interventions, and technology-assisted wellness programs remain comparatively limited.[90] Additional research involving low-income populations, rural communities, and culturally diverse settings is also required because most currently available evidence originates from urban and high-income populations.

Future investigations should additionally explore:
long-term neurodevelopmental effects among children,
occupational digital burden among adults,
post-pandemic digital behavioural patterns,
artificial intelligence-driven screen exposure trends,
and multidisciplinary public health intervention models.[91]

LIMITATIONS

The present review has several limitations. Considerable heterogeneity existed among included studies regarding methodological design, exposure measurement methods, outcome assessment tools, and population characteristics. Most investigations relied on self-reported screen exposure data, thereby increasing risks of recall bias and exposure misclassification.[92]

The predominance of cross-sectional study designs additionally limits causal interpretation between excessive digital device use and observed psychosocial or physical health outcomes. Restriction to English-language publications may have excluded potentially relevant evidence from non-English studies. Furthermore, variability in definitions of excessive screen exposure and digital dependency limited direct comparability across investigations.[93]

CONCLUSION

Excessive digital device use represents an emerging global biopsychosocial health concern affecting children, adolescents, and adults across diverse populations. The present systematic review demonstrated consistent associations between prolonged screen exposure and adverse psychological, behavioural, social, and physical health outcomes, including anxiety, depressive symptoms, sleep disturbances, obesity, musculoskeletal complications, visual strain, behavioural dependency, social isolation, and impaired academic or occupational performance.[94]

Children and adolescents appear particularly vulnerable because of developmental sensitivity to excessive digital stimulation, emotional dysregulation, and social reinforcement mechanisms. Adults similarly experience significant technology-associated burdens including occupational stress, digital fatigue, impaired sleep quality, and sedentary lifestyle complications.[95]

Comprehensive public health strategies emphasizing digital wellness education, behavioural intervention, ergonomic awareness, parental supervision, and multidisciplinary healthcare involvement are essential to reduce technology-associated health risks. Healthcare professionals, including clinical pharmacists, should actively participate in digital health promotion, behavioural counselling, and preventive education initiatives.[96]

Future longitudinal and intervention-based investigations utilizing standardized assessment methods are required to strengthen current evidence and support development of evidence-based digital exposure guidelines aimed at promoting healthier technology engagement across all age groups.

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AUTHOR CONTRIBUTIONS

Maheshwaram Vidhya contributed to the conceptualization of the review topic, literature search, study screening, data extraction, evidence synthesis, manuscript drafting, and preparation of the final manuscript. Dr. Manjula Devi Kasirajen provided academic supervision, methodological guidance, critical review of the manuscript and approved the final version for publication. Both authors satisfy the authorship criteria and accept responsibility for the integrity and accuracy of the work.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to the publication of this manuscript.

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Ethical Approval

Ethical approval was not required because the study used previously published research articles and did not involve human participants directly.

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